APPENDIX D

Biological Resources

Biological Evalution

ESA & Sensitive Species Memorandum

Species Lists

References

APPENDIX D

Biological Resources

Biological Evaluation

Sarah Potter

From: Sarah.Potter@landrumbrown.com
Subject: FW: SEA SAMP NTPs Biological Evaluation and Section 7 Consultation Request

From: Krull, Kandice (FAA) <Kandice.Krull@faa.gov>
Sent: Tuesday, September 24, 2024 5:22 PM
To: Potter, Sara <spotter@nwseaportalliance.com>
Cc: Rybolt, Steve (Rybolt.S@portseattle.org) <Rybolt.S@portseattle.org>; Pozzuto, Adele <Pozzuto.A@portseattle.org>; Sarah Potter <Sarah.Potter@landrumbrown.com>
Subject: SEA SAMP NTPs Biological Evaluation and Section 7 Consultation Request

Good afternoon Sara,

It has been a few months since we last talked and I apologize for the delay in getting the Biological Evaluation submitted to you for review. We ran into a few hiccups along the way that delayed the report, but I think we have gotten them all sorted out now.

The FAA would like to request informal consultation under the Endangered Species Act for the Near-Term Projects (Proposed Project) at the Seattle-Tacoma International Airport (Airport). The purpose of the Proposed Action is to accommodate projected passenger demand and cargo levels; provide airfield infrastructure that meets current FAA airport design standards; enhance the efficiency of the taxiway layout; and to meet projected fuel storage demand including sustainable aviation fuel initiatives. All NTPs are anticipated to be complete or in final construction by 2032.

A Biological Evaluation (BE), prepared by the FAA, is enclosed. The BE evaluated the potential project effects on twelve listed species, one proposed for listing species, and one candidate species. The FAA made the following effect determinations:

- Chinook salmon (Oncorhynchus tshawytscha, Puget Sound ESU) - **May affect, not likely to adversely affect.**
- Chinook salmon critical habitat- **May affect, not likely to adversely affect.**
- Steelhead (O. mykiss, Puget Sound ESU) - **May affect, not likely to adversely affect.**
- Steelhead critical habitat No effect
- Bull trout (Salvelinus confluentus, Coastal-Puget Sound DPS) - **May affect, not likely to adversely affect.**
- Bull trout critical habitat- **May affect, not likely to adversely affect.**
- Bocaccio rockfish (Sebastes paucispinus, Puget Sound/Georgia Basin DPS) - **May affect, not likely to adversely affect.**
- Bocaccio rockfish critical habitat- **May affect, not likely to adversely affect.**
- Yelloweye rockfish (S. ruberrimus, Puget Sound/Georgia Basin DPS) - **May affect, not likely to adversely affect.**
- Yelloweye rockfish critical habitat- **May affect, not likely to adversely affect.**
- Killer whale (Orcinus orca, Southern Resident DPS) - **May affect, not likely to adversely affect.**
- Killer whale critical habitat- **May affect, not likely to adversely affect.**
- North American wolverine (Gulo gulo luscus) – **No effect**
- Yellow-billed cuckoo (Coccyzus americanus) – **No effect**
- Marbled murrelet (Brachyramphus mamoratus) – **No effect**
- Northwestern pond turtle (Actinemys marmorata) – **No effect**
- Monarch butterfly (Danaus Plexippus) - **Not likely to jeopardize continued existence**
- Southern Pacific eulachon (Thaleichthys pacificus) – **No effect**
- Central America/Western North Pacific Humpback Whale (Megaptera novaeangliae) – **No effect**
- Southern green sturgeon (Acipenser medirostris) – **No effect**

DPS – Distinct population segment; ESU – Evolutionarily significant unit

The basis for the effect determinations is provided in the BE. The FAA considered the following in reaching the effect determinations:

- The Port's existing and proposed structural and operational pollution controls are robust and state of the art. All stormwater generated at SEA meets Ecology's requirements before being released into area streams.
- Rainbow trout (RBT) early life stages (ELS) *in situ* monitoring tests completed twice a year in accordance with the NPDES permit includes testing sites upstream of SEA and downstream of treated stormwater discharges into Des Moines Creek. The downstream location consistently has better results than the upstream location, demonstrating how the release of treated stormwater is actually helping to improve the water quality of Des Moines Creek.
- The Port has been testing four commercially available filter media individually and in combination with Chitosan Enhanced Sand Filtration to identify an alternative BMP to 100% infiltration to treat 6PPD-Q in stormwater for the past eight months and has identified methods that show promising results (up to 98.8% removal efficiency). The NTPs will include the effective BMPs as part of the proposed project.
- There is insufficient information available to quantify potential biologically significant effects on listed species from exposure to chronic surface water pollutants generated by the Proposed Action.
- The fate and transport of many of the stormwater contaminants and their synergistic effects are not fully understood, therefore, the extent, duration, and severity of stormwater effects cannot currently be quantified with certainty.

The BE is attached to this email. The following link also has the BE as well as the Rainbow Trout Early Life Stages in-situ Monitoring reports (Appendix E): 4_NMFS-FAA Coordination

The FAA respectfully requests written concurrence with our effect determinations. If you have any comments, questions, or concerns regarding the analyses and conclusions used to determine the potential effects of the proposed project on ESA resources, or have any questions regarding the project, please do not hesitate to contact me.

Thanks so much,
Kandice

Kandice Krull
Environmental Protection Specialist
FAA - Denver Airports District Office
303-342-1261

US Department of Transportation
Federal Aviation Administration
Northwest Mountain Region – Seattle Airports District Office

Seattle-Tacoma International Airport
Sustainable Airport Master Plan Near Term Projects

FINAL BIOLOGICAL EVALUATION

Prepared by:

Kandice Krull
Environmental Protection Specialist
FAA Denver Airports District Office

September 2024

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS V

EXECUTIVE SUMMARY VII

Summary of Anticipated Effects to Listed Species vii

Summary of Anticipated Effects to Essential Fish Habitat viii

1.0 INTRODUCTION 9

1.1 Purpose for the Project 10

1.2 Biological Evaluation Contents 10

1.3 Key Issue and Species Addressed 11

1.4 Species Not Addressed 11

1.4.1 North American Wolverine 12

1.4.2 Yellow-Billed Cuckoo 12

1.4.3 Marbled Murrelet 13

1.4.4 Northwestern Pond Turtle 13

1.4.6 Monarch Butterfly 14

1.4.7 Southern Pacific Eulachon 14

1.4.8 Central America and Western North Pacific Humpback Whale 14

1.4.9 Southern Green Sturgeon 15

2.0 PROJECT DESCRIPTION 16

2.1 Project Location 16

2.2 Consultation History 16

2.3 Proposed NTPs 18

2.3.1 Airside Projects 22

2.3.2 Terminal Projects 23

2.3.3 Cargo Projects 24

2.3.4 Landside Projects 24

2.3.5 Airport/Airline Support Projects 25

2.4 Proposed Program Support Projects 27

2.4.1 Utilities Projects 27

2.4.2 Stormwater and Wastewater Projects 31

2.5 Project Construction 41

2.5.1 Construction Equipment 41

2.5.2 Preliminary Project Schedule 42

2.6 Wetland Mitigation 42

2.6.1 Anticipated Wetland Mitigation Requirements 43

2.6.2 Mitigation Plan and Sequencing 44

2.7 Best Management Practices 44

2.7.1 Construction Best Management Practices 44

2.7.2 Operational Source Control Best Management Practices 46

2.8 Additional Conservation Measures 50

3.0 ACTION AREA 51
3.1 Terrestrial Component 53
3.2 Aquatic Component 53
4.0 ENVIRONMENTAL SETTING/BASELINE 54
4.1 Terrestrial Habitat 54
4.2 Aquatic Habitat 54
4.2.2 Des Moines Creek 56
4.2.3 Miller Creek 56
4.2.4 Walker Creek 57
4.2.5 Puget Sound 57
4.3 Water Quality 57
4.4 ESA-listed Species and Critical Habitat Occurrence in Action Area 60
4.4.1 Puget Sound Chinook Salmon 60
4.4.2 Puget Sound Steelhead 62
4.4.3 Coastal-Puget Sound Bull Trout 62
4.4.4 Puget Sound/Georgia Basin Boccacio Rockfish 64
4.4.5 Puget Sound/Georgia Basin Yelloweye Rockfish 65
4.4.6 Southern Resident Killer Whale 66
5.0 ANALYSIS OF EFFECTS 68
5.1 Direct Effects 69
5.1.1 Noise 69
5.1.2 Habitat Modification 69
5.1.3 Stormwater 70
5.2 Indirect Effects/Delayed Consequences 76
5.2.1 Indirect Effects on ESA-listed Salmonids 77
5.2.2 Indirect Effects on ESA-listed Rockfish 78
5.2.3 Indirect Effects on Southern Resident Killer Whale 78
5.3 Interrelated/Interdependent Actions 80
5.4 Cumulative Effects 80
6.0 CONCLUSIONS AND EFFECT DETERMINATIONS 81
6.1 Puget Sound Chinook Salmon 81
6.2 Chinook Salmon Critical Habitat 82
6.3 Puget Sound Steelhead 82
6.4 Steelhead Critical Habitat 82
6.5 Coastal-Puget Sound Bull Trout 83
6.6 Bull Trout Critical Habitat 83
6.7 Puget Sound/Georgia Basin Bocaccio and Yelloweye Rockfish 83
6.8 Bocaccio and Yelloweye Rockfish Critical Habitat 84
6.9 Southern Resident Killer Whale 84
6.10 Southern Resident Killer Whale Critical Habitat 84

7.0 EFFECTS TO ESSENTIAL FISH HABITAT 85
7.1 Essential Fish Habitat Background 85
7.2 Location and Description of Proposed Action 85
7.3 Conservation Measures and Best Management Practices 85
7.4 Identification of Essential Fish Habitat 86
7.4.1 Groundfish 88
7.4.2 Coastal Pelagics 88
7.4.3 Pacific Salmon 89
7.5 Potential Adverse Effects of Proposed Action 89
7.5.1 Puget Sound 89
7.5.2 Miller Creek, Walker Creek, and Des Moines Creek 90
7.6 Conclusion and Effect Determinations 90
7.6.1 Groundfish Essential Fish Habitat 90
7.6.2 Coastal Pelagic Essential Fish Habitat 90
7.6.3 Pacific Salmon Essential Fish Habitat 90
8.0 REFERENCES 91

TABLES

Table ES-1. Effects determinations for ESA-listed species and designated critical habitat viii
Table 1. ESA-listed species and critical habitat with No Effects 12
Table 2. Estimated NTP and PSP construction footprints, net change in impervious surface area, and permanent habitat impacts. 20
Table 3. UMP projects needed to support NTP development. 27
Table 4. Existing and proposed structural and OSC BMPs and net change in impervious area and PGIS resulting from the Proposed Action by drainage basin and receiving body 38
Table 5. Structural treatment level definitions 40
Table 6. Proposed stormwater and wastewater PSPs 40
Table 7. Anticipated construction equipment types 41
Table 8. Recommended compensatory wetland impact mitigation ratios by mitigation type 43
Table 9. Anticipated compensatory wetland mitigation acreage requirements 43
Table 10. OSC BMP summary 47
Table 11. OSC BMP activities to avoid/minimize risks to aquatic habitat from 6PPD-Q and metals. 49
Table 12. Action area dimensions 51
Table 13. Wetlands in action area 55
Table 14. Water quality parameters in the action area 58
Table 15. ESA-listed species and critical habitat in the action area 60
Table 16. Preliminary Treatability Testing Results 74
Table 17. Proposed action effects determinations for ESA-listed species and critical habitat 81
Table 18. Species of fish with designated EFH that may be present in the Puget Sound action area 87

Table 19. Pacific salmon species with designated EFH that may be present in the freshwater aquatic component of the action area 88

FIGURES

Figure 1. Project vicinity and GSA 17
Figure 2. Locations of proposed SAMP NTPs 19
Figure 3. Proposed UMP projects, northeast section of project area. 28
Figure 4. Proposed UMP projects, southeast section of project area. 29
Figure 5. Proposed UMP projects, southwest section of project area. 30
Figure 6. Existing SDS and IWS drainage basins and stormwater infrastructure 33
Figure 7. Proposed SDS and IWS projects, northeast section of project area 34
Figure 8. Proposed SDS and IWS projects, east section of project area. 35
Figure 9. Proposed SDS and IWS projects, southeast section of project area 36
Figure 10. Proposed SDS and IWS projects, southwest section of project area 37
Figure 11. Preliminary NTP construction schedule 42
Figure 12. Action area 52

APPENDICES

Appendix A- Species Lists
Appendix B- SEA Water Quality Compliance Monitoring
Appendix C- Impacts Assessment for Aquatic Critical Areas
Appendix D- Species Life Histories
Appendix E- Rainbow Trout Early Life Stages *in situ* Monitoring

ACRONYMS AND ABBREVIATIONS

6PPD	N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine
6PPD-Q	6PPD-quinone
ARFF	Aircraft Rescue and Firefighting
BE	Biological evaluation
Biochar	Biochar-Black Owl Stormwater Mix
BMPs	Best management practices
BOD	Biological oxygen demand
CESF	Chitosan enhanced sand filtration
CFR	Code of Federal Regulations
Construction SWPPP	Site-specific construction stormwater pollution prevention plan
CRDC	Centralized receiving and distribution center
dBA	A-weighted decibel
DPS	Distinct population segment
Ecology	Washington State Department of Ecology
EEZ	Exclusive economic zone
EFH	Essential fish habitat
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
FAA	Federal Aviation Administration
FMO	Foraging, migration, and overwintering
FR	Federal Register
GSA	General study area
GSE	Ground service equipment
HS250	Hydrosil HS-250
IWS	Industrial wastewater system
IWTP	Industrial Wastewater Treatment Plant IWTP
km	Kilometer
mg/L	Milligrams per liter
MLLW	Mean lower low water
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAE	North Airport Expressway
NGT	North Ground Transportation
NMFS	National Marine Fisheries Service
NOS	Natural-origin spawners
NPDES	National Pollutant Discharge Elimination System
NPGIS	Non-pollution-generating impervious surface
NTPs	Near-term project
NWSA	Northwest Seaport Alliance’s
OSC	Operational source control
PAHs	Polyaromatic hydrocarbons
PBF	Physical and biological feature
PCE	Primary constituent element

PFMC	Pacific Fishery Management Council
PGIS	Pollution-generating impervious surface
Port	Port of Seattle
ppb	Parts per billion
PPP	Pollution Prevention Plan
PSP	Program support project
RIM	Runway incursion mitigation
RM	River mile
SAMP	Sustainable Airport Master Plan
SCU	SCU-Evoqua
SDS	Stormwater drainage system
SEA	Seattle-Tacoma International Airport
SEA SWPPP	Seattle-Tacoma International Airport Stormwater Pollution Prevention Plan
Section 404	Section 404 of the Clean Water Act
Services	National Marine Fisheries Service, and U.S. Fish and Wildlife Service
SRKW	Killer whale, Southern Resident Distinct Population Segment
UMP	Utilities Master Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VCC	Virgin coconut carbon
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resources Inventory Area
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

The Port of Seattle (Port) completed a Sustainable Airport Master Plan for the Seattle-Tacoma International Airport (SEA) that identified a Long-Term Vision to accommodate future needs over the 20-year planning horizon. From this, the Port developed 31 Near-Term Projects (NTPs) that would improve the efficiency and safety of SEA, access to SEA, and support facilities for the airlines and SEA. While the NTPs are the Port's intended development at SEA, only some of these development components are subject to federal approval and/or funding. The Federal Aviation Administration (FAA) determined it does not have approval authority for L04 – Northeast Ground Transportation Center and S01 – Fuel Farm Expansion in accordance with of Section 163 of HR 302, the "FAA Reauthorization Act of 2018" (P.L. 115-254) and Section 743 of HR 3935, the "FAA Reauthorization Act of 2024" (P.L. 118-63).

The Proposed Action addressed in this Biological Evaluation (BE) comprises the construction and operation of 29 NTPs funded and/or authorized by FAA, the construction and operation of associated program support projects necessary for implementation of these NTPs, habitat mitigation for unavoidable impacts to wetlands and wetland buffers resulting from project construction, and best management practices used by the Port to avoid and minimize environmental impacts from the construction and operation of the Proposed Action.

The federal actions associated with the Proposed Action constitutes a federal nexus necessitating consultation under Section 7 of the Endangered Species Act (ESA). This BE evaluates the Proposed Action's potential effects on ESA-listed species and critical habitats that occur in the action area. The action area includes terrestrial and aquatic habitats in Water Resources Inventory Area 9 (Green/Duwamish and Central Puget Sound Watershed). The aquatic component of the action area is limited to hydrologic unit code 17110019 (Central Puget Sound) while the terrestrial component overlaps the boundary between hydrologic unit codes 17110019 and 17110013 (Duwamish).

Summary of Anticipated Effects to Listed Species

Table ES-1 summarizes the species evaluated in the BE and effects determinations for each species and critical habitat. The Proposed Action would not result in direct construction effects on ESA-listed species or critical habitat. Anticipated effects would result from delayed consequences associated with operational treated stormwater runoff and treated industrial wastewater discharges 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 (*Oncorhynchus tshawytscha,* Puget Sound ESU)	Not likely to adversely affect
Chinook salmon critical habitat	Not likely to adversely affect
Steelhead (*O. mykiss*, Puget Sound ESU)	Not likely to adversely affect
Steelhead critical habitat	No effect
Bull trout (*Salvelinus confluentus*, Coastal-Puget Sound DPS)	Not likely to adversely affect
Bull trout critical habitat	Not likely to adversely affect
Bocaccio rockfish (*Sebastes paucispinus*, Puget Sound/Georgia Basin DPS)	Not likely to adversely affect
Bocaccio rockfish critical habitat	Not likely to adversely affect
Yelloweye rockfish (*S. ruberrimus,* Puget Sound/Georgia Basin DPS)	Not likely to adversely affect
Yelloweye rockfish critical habitat	Not likely to adversely affect
Killer whale (*Orcinus orca*, Southern Resident DPS)	Not likely to adversely affect
Killer whale critical habitat	Not likely to adversely affect
North American wolverine (Gulo gulo luscus)	No effect
Yellow-billed cuckoo (Coccyzus americanus)	No effect
Marbled murrelet (Brachyramphus mamoratus)	No effect
Northwestern pond turtle (*Actinemys marmorata)*	No effect
Monarch butterfly (Danaus Plexippus)	Not likely to jeopardize continued existence
Southern Pacific eulachon (Thaleichthys pacificus)	No effect
Central America/Western North Pacific Humpback Whale (*Megaptera novaeangliae)*	No effect
Southern green sturgeon (*Acipenser medirostris)*	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 is not likely to adversely affect EFH for groundfish, coastal pelagic, and Pacific salmon species in Puget Sound and EFH for Pacific salmon species in tributaries that drain to Puget Sound from SEA. All effects to EFH would result from delayed consequences associated with operational treated stormwater runoff and treated industrial wastewater discharges that are generated by the Proposed Action.

1.0 INTRODUCTION

The Port of Seattle (Port) completed a Sustainable Airport Master Plan (SAMP) for the Seattle-Tacoma International Airport (SEA) that identified a Long-Term Vision to accommodate future needs over the 20-year planning horizon. From this, the Port developed 31 Near-Term Projects (NTPs) to meet forecasted rising passenger and cargo demand by improving efficiency, safety, access, and support facilities for airlines and SEA. The NTPs include airfield projects, terminal projects, cargo projects, landside projects, and airline/airport support projects.

This biological evaluation (BE) has been developed to initiate consultation between the Federal Aviation Administration (FAA), the lead federal action agency, and the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), collectively "the Services," under Section 7 of the Endangered Species Act (ESA) of 1973 (16 United States Code 1531-1544). Section 7 requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or species proposed for listing under the ESA or result in the destruction or adverse modification of critical habitat for those species.

Section 163 of H.R. 302, the "FAA Reauthorization Act of 2018" (Public Law 115-254) limited the FAA's authority in certain circumstances. Section 743 of H.R. 3935 (Public Law 118-63) amended Section 163.

- Section 163(a) limits the FAA's authority to regulate, directly or indirectly, an airport operator's transfer or disposal of certain types of airport land.
- Section 163(b) identifies exceptions to this general rule.
- Section 163(c) preserves the statutory revenue use restrictions regarding the use of revenues generated by the use, lease, encumbrance, transfer, or disposal of the land, as set forth in 49 U.S.C. §§ 47107(b) and 47133.
- Section 163(d) limits the FAA's review and approval authority for Airport Layout Plans.

While the Port intends to develop all 31 NTPs, only some of these NTPs are subject to federal approval and/or funding. The FAA determined it does not have approval authority for L04 – Main Terminal North GT Lot and S01 – Fuel Farm Expansion; therefore, these projects are not considered in this consultation. These projects are considered as part of the future environmental baseline.

The Proposed Action addressed in this BE comprises the construction and operation of 29 NTPs and associated program support projects (PSPs), habitat mitigation for unavoidable impacts to wetlands, and best management practices (BMPs) to avoid and minimize environmental impacts from the construction and operation of the 29 NTPs. The provision of federal funding and/or authorization for these projects constitutes a federal nexus necessitating consultation under Section 7 of the ESA.

The action area comprises terrestrial and aquatic habitats in Water Resources Inventory Area 9 (Green/Duwamish and Central Puget Sound Watershed). The aquatic component of the action area is in hydrologic unit code 17110019 (Central Puget Sound). The terrestrial component of the action area overlaps the boundary between hydrologic unit codes 17110019 and 17110013 (Duwamish).

This BE evaluates the potential direct effects and delayed consequences of the Proposed Action on species that are listed, or proposed to be listed, as endangered or threatened under the ESA. Wherever possible, NMFS utilizes existing interagency coordination processes to fulfill consultation requirements for the Magnuson-Stevens Fishery Conservation and Management Act (MSA) consultations with federal agencies. For this Proposed Action, this goal is being met by incorporating MSA consultation into this ESA Section 7 consultation.

1.1 Purpose for the Project

The Proposed Action addresses the five following independent needs that affect the future ability of SEA to maintain its essential function as the primary commercial airport in the Pacific Northwest.

- Insufficient passenger processing facilities and gates to accommodate 56 million annual passengers at an optimal level of service.
- Insufficient facilities to accommodate projected cargo demand.
- Airfield infrastructure that does not meet current FAA airport design standards.
- Insufficient/inadequate taxiway layout.
- Lack of fuel storage to meet projected demand and the Port's Sustainable Aviation Fuel initiative.

The purpose of the Proposed Action is to accommodate projected passenger demand and cargo levels; provide airfield infrastructure that meets current FAA airport design standards; enhance the efficiency of the taxiway layout; and to meet projected fuel storage demand including sustainable aviation fuel initiatives. All NTPs are anticipated to be complete or in final construction by 2032.

1.2 Biological Evaluation Contents

To assist the reader in navigating this BE, a general roadmap of the contents is provided here:

- Chapter 1.0, Introduction, provides an overview of the project, explains the federal nexus, and introduces the species covered in the BE.
- Chapter 2.0, Project Description, describes the Proposed Action, including specific details of each of the NTPs, PSPs, plans for mitigation, and BMPs to minimize environmental impacts.
- Chapter 3.0, Action Area, defines the project's action area.
- Chapter 4.0, Environmental Setting/Baseline, describes the baseline conditions within the terrestrial and aquatic portions of the action area, and the federal status, occurrence, and critical habitat of listed species that may be affected by the Proposed Action.
- Chapter 5.0, Analysis of Effects, analyzes direct effects and delayed consequences of the Proposed Action, identifies interrelated and interdependent actions, and cumulative effects of the Proposed Action, organizing the discussion by potential mechanism of effect to listed species.
- Chapter 6.0, Conclusions and Effects Determinations, summarizes the conclusions of the effects analysis for each listed species and designated critical habitat.
- Chapter 7.0, Effects to Essential Fish Habitat (EFH), assesses impacts to EFH resulting from the Proposed Action.

1.3 Key Issue and Species Addressed

While all potential direct and indirect effects of the Proposed Action were analyzed (see Chapter 5.0), the key issue addressed in this BE is the potential effects that could result from permitted treated stormwater and industrial wastewater discharges. Stormwater is the surface runoff that results from rain and snow melt. Urban development alters the land's natural infiltration, and human activity generates a host of pollutants that can accumulate on paved surfaces. Current treatment technologies can reliably reduce the concentrations of known, commonly occurring stormwater contaminants like polyaromatic hydrocarbons (PAHs) and metals.

While the list of contaminants prioritized for regulation under the National Pollutant Discharge Elimination System (NPDES) is broad (USEPA 2010), it represents a fraction of the thousands of chemicals that routinely occur in stormwater runoff and wastewater discharges. It is unknown if treatment effectively removes contaminants not included under NPDES because neither testing methods nor thresholds have been established. There is uncertainty about the effectiveness of current stormwater treatment technology for emerging contaminants of concern. For example, the chemical 6PPD-quinone (6PPD-Q) has been identified as a causal agent of pre-spawn mortality of salmonids in urban streams (Ecology 2022). Vehicle tires contain the chemical 6PPD (N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine) to prevent tires from degrading. Tires wear down through contact with roads, releasing particles into the environment. When 6PPD in these particles reacts with ozone in the air, it forms 6PPD-Q. When it rains, stormwater from hard surfaces like parking lots and streets washes these particles into streams and other water bodies.

The extent of potential downstream transport of treated stormwater and industrial wastewater discharges defines the action area for this BE (see Chapter 3.0) and therefore the species addressed. Species lists from USFWS (2024a) and NMFS (2024a) were obtained from the agencies' websites in April 2024 (Appendix A). The following species are addressed because they occur in, have potential to occur in, and/or have designated critical habitat present in the action area (see Section 4.4):

- Chinook salmon, Puget Sound Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha)*
- Steelhead, Puget Sound Distinct Population Segment (DPS) (*O. mykiss)*
- Bull trout, Coastal-Puget Sound DPS (*Salvelinus confluentus)*
- Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)
- Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*S. ruberrimus*)
- Killer whale, Southern Resident DPS (SRKW) (*Orcinus orca*)

1.4 Species Not Addressed

Table 1 shows NMFS and USFWS-listed species that may occur in King County but that are not found in the action area for the reasons described below and the Proposed Action will have no effect on.

Table 1. ESA-listed species and critical habitat with No Effects

Species	Scientific Name	Lead Agency	Federal Status	Critical Habitat in Action Area
North American wolverine	*Gulo gulo luscus*	USFWS	Threatened	No
Yellow-billed cuckoo	*Coccyzus americanus*	USFWS	Threatened	No
Marbled murrelet	*Brachyramphus marmoratus*	USFWS	Threatened	No
Northwestern pond turtle	*Actinemys marmorata*	USFWS	Proposed Threatened	No
Monarch butterfly	*Danaus plexippus*	USFWS	Candidate	No
Southern Pacific eulachon	*Thaleichthys pacificus*	NMFS	Threatened	No
Central America/Western North Pacific Humpback Whale	*Megaptera novaeangliae*	NMFS	Endangered	No
Southern green sturgeon	*Acipenser medirostris*	NMFS	Threatened	No

1.4.1 North American Wolverine

1.4.1.1 *Federal Status*

The North American wolverine is listed as a threatened species (88 Federal Register [FR] 83726) under the ESA. Critical habitat has not been proposed in Washington.

1.4.1.2 *Occurrence*

The North American wolverine is found in the western and northwestern United States, Canada, and Alaska. Wolverines are rare in Washington State and generally occur in alpine and sub-alpine habitats of the Cascades and eastern Washington. The Washington Department of Fish and Wildlife (WDFW) estimates the population within the Cascades to be less than 25 individuals (2024a). Wolverines are very solitary and tend to avoid interactions with humans and areas of human activity.

1.4.1.3 *Rationale for Exclusion*

The Proposed Action would have no effect on the North American wolverine or its habitat because the urbanized environment of the action area does not provide suitable habitat for the species.

1.4.2 Yellow-Billed Cuckoo

1.4.2.1 *Federal Status*

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

1.4.2.2 *Occurrence*

Yellow-billed cuckoos are migratory birds that arrive in western North America in May, nest from June through August, and leave in September. They have a strong preference for large, continuous riparian zones composed of willows and cottonwoods (at least 50 acres). They were once considered abundant along the Columbia River and occasionally observed in western Washington, but they no longer breed in Washington (Wiles and Kalasz 2017). Recent reports of individual cuckoos in Washington are rare and occur east of the Cascade Mountains (Wiles and Kalasz 2017).

1.4.2.3 *Rationale for Exclusion*

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

1.4.3 Marbled Murrelet

1.4.3.1 *Federal Status*

The USFWS listed the marbled murrelet as threatened in 1992 (57 FR 45328). Critical habitat was designated in 1996 (61 FR 26256) and revised in 2011 (76 FR 61599), covering 3,698,100 acres in Washington, Oregon, and California.

1.4.3.2 *Occurrence*

Marbled murrelets spend most of their life foraging in shallow, nearshore marine waters across the west coast but migrate inland for nesting in old-growth forests with large trees and multiple canopies (USFWS 2024c). Murrelets live and forage in Puget Sound, and adults and subadults are routinely observed at a long-term monitoring location approximately 2 km west of the IWTP outfall (Falxa et al. 2013; McIver et al. 2021). Designated critical habitat is limited to remaining tracts of old growth and mature late-successional forest that provide suitable habitat conditions for nesting.

1.4.3.3 *Rationale for Exclusion*

Though the marbled murrelet may occur in the action area, the likelihood of effects is insignificant and discountable for this wide-ranging species. Critical habitat does not occur in the action area.

1.4.4 Northwestern Pond Turtle

1.4.4.1 *Federal Status*

The USFWS proposed to list the northwestern pond turtle as threatened in 2023 (88 FR 68370). Critical habitat has not been proposed in Washington.

1.4.4.2 *Occurrence*

The northwestern pond turtle is native to the northwest United States, occurring in Washington, Oregon, Nevada, and California. The northwestern pond turtle is primarily aquatic, leaving the water only to lay eggs, overwinter, or disperse to new water bodies. 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 King County.

1.4.4.3 *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.

1.4.6 Monarch Butterfly

1.4.6.1 *Federal Status*

The monarch butterfly is currently a candidate for listing under the ESA (USFWS 2024b).

1.4.6.2 *Occurrence*

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

1.4.6.3 *Rationale for Exclusion*

The Proposed Action is not likely to jeopardize the continued existence of the monarch butterfly or its habitat because this species does not occur in the action area.

1.4.7 Southern Pacific Eulachon

1.4.7.1 *Federal Status*

The Southern DPS of eulachon is listed as threatened (75 FR 13012). Critical habitat for the Southern DPS of eulachon was finalized in 2011 (76 FR 65323). Critical habitat in Washington is limited and has not been designated in any documented spawning tributaries in Puget Sound.

1.4.7.2 *Occurrence*

Eulachon are anadromous; they spawn in fresh water and spend their juvenile and adult lives in marine waters. Although eulachon range from northern California to western Alaska, the Southern DPS consists of populations spawning in rivers south of the Nass River in British Columbia, Canada, to and including the Mad River in California. The major production areas include the Columbia and Fraser rivers (WDFW and ODFW 2023). The species is not known to spawn in Puget Sound streams and has been found infrequently in Puget Sound (Pietsch and Orr 2015).

1.4.7.3 *Rationale for Exclusion*

The Proposed Action would have no effect on the Southern Pacific eulachon or its critical habitat because the eulachon are unlikely to occur in the action area.

1.4.8 Central America and Western North Pacific Humpback Whale

1.4.8.1 *Federal Status*

The Central America DPS and Western North Pacific DPS of humpback whale are listed as endangered under the ESA (listed December 2, 1970 (35 FR 18319) and revised in 2016 (81 FR 62259)). The NMFS designated critical habitat for the Western North Pacific DPS and Central America DPS on April 21, 2021 (86 FR 21082). Critical habitat for humpback whale is not present in the action area.

1.4.8.3 Occurrence

Humpback whales are found throughout the world, including along Washington's coastline. Puget Sound is not considered a part of their natural habitat, and they are unlikely or infrequent in Puget Sound (City of Seattle 2015). Prior to 1990, humpback whale sightings in Puget Sound were extremely rare (Calambokidis and Steiger 1990). In recent years, incidental sightings have occurred within Puget Sound, including humpbacks visiting Puget Sound during migration and some documented staying through the winter months (Calambokidis et al. 2018; Whale Museum 2023). Humpback whales are unlikely to occur in shallow nearshore habitats in Puget Sound.

1.4.8.4 *Rationale for Exclusion*

The Proposed Action would have no effect on the humpback whale or its critical habitat because critical habitat does not occur in Puget Sound and the humpback whale is unlikely to occur in the action area.

1.4.9 Southern Green Sturgeon

1.4.9.1 *Federal Status*

The Southern DPS of green sturgeon is listed as threatened (50 CFR 223.102) under the ESA. In Washington, critical habitat for this DPS is established in the lower Columbia River, Willapa Bay, and Grays Harbor (50 CFR 226.219). No critical habitat is present in the action area.

1.4.9.2 *Occurrence*

In Washington, green sturgeon is found primarily in the Columbia River basin and coastal waters including Willapa Bay and Grays Harbor. The current spawning range is limited to the Sacramento and Klamath river basins in California and the Rogue River in Oregon. Green sturgeon is migratory and anadromous, spending most of their lifecycle in coastal marine waters and large coastal estuaries of Washington, Oregon, and California. Very little information on the use of Puget Sound is available. Occurrence in northern Puget Sound is rare at best (Moser et al. 2020).

1.4.9.3 *Rationale for Exclusion*

The Proposed Action would have no effect on the Southern DPS of green sturgeon or its critical habitat because critical habitat does not occur in Puget Sound and green sturgeon are unlikely to occur within the action area.

2.0 PROJECT DESCRIPTION

The Proposed Action comprises the following elements:

- NTPs (Section 2.3): Airfield, terminal, cargo, landside, and airport/airline support projects designed to increase airport capacity and operational efficiency to meet projected future needs.
- PSPs (Section 2.4): Infrastructure improvements needed to support NTP development, as identified in the Port of Seattle Utilities Master Plan (UMP; Port 2022a):
  - Operational infrastructure improvements (electrical, fuel, gas, water, sewer, and information and telecommunications technology).
  - Stormwater drainage system (SDS) and industrial wastewater system (IWS) improvements.
- Mitigation (Section 2.6): Planned mitigation for anticipated wetland and buffer impacts.
- BMPs (Section 2.7): BMPs used by the Port to avoid and minimize environmental impacts from the construction and operation of the NTPs and UMP PSPs.

All components of the Proposed Action are currently at planning or conceptual levels of development. NTP and PSP dimensions and construction footprints may change during project design. The Port and FAA anticipate such changes would be small and would not measurably alter the effects to ESA-listed species and critical habitat or effects determinations presented herein.

2.1 Project Location

The Proposed Action would be implemented entirely on Port property within and adjacent to SEA in the general study area (GSA) considered in the National Environmental Policy Act analysis for the project. The GSA is shown in Figure 1.

2.2 Consultation History

The FAA submitted an initial BE for the Proposed Action to the Northwest Seaport Alliance's (NWSA's) ESA consultation liaison on March 19, 2024. The ESA liaison conducts ESA Section 7 consultations for NWSA member projects on behalf of the Services, with the intent of streamlining and expediting the consultation process. The liaison provided initial comments and recommendations to the Port and FAA, identifying additional information and analyses needed to initiate consultation. The Port and FAA subsequently met with NMFS staff on April 26, 2024, to discuss BE requirements and obtain guidance on consultation requirements.

Figure 1. Project vicinity and GSA

2.3 Proposed NTPs

The NTPs are grouped into five categories (Figure 2):

- Airfield projects (A): Modification and improvement of runways, taxiways, aircraft holding areas, and related facilities to improve operational efficiency and meet FAA airport design standards.
- Terminal projects (T): Development of new terminal concourses, aircraft loading/unloading aprons, and associated parking facilities to provide increased passenger handling capacity.
- Cargo projects (C): Development of new cargo warehouses and appurtenant loading/unloading, parking, and administrative facilities to meet projected needs for increased cargo capacity.
- Landside projects (L): Improvements to existing and construction of new airport access roads, mass transit infrastructure, holding lots, and parking facilities needed to meet projected future passenger and employee transportation requirements.
- Airport/airline support projects (S): Improvements to airport infrastructure needed to support routine operations and maintenance activities, including aircraft fueling, aircraft maintenance, firefighting and emergency response, and de-icing and snow removal.

The NTPs are identified by their category prefix and project number (e.g., airfield project A01). Recognizing that treated stormwater and wastewater discharges are the primary source of potential impact to ESA-listed species from the Proposed Action, the estimated total and net acres of pollution-generating and non-pollution-generating impervious surface (PGIS and NPGIS, respectively) are included and summarized in Table 2. The Proposed Action would add approximately 72 acres of impervious surface, which includes 50.03 acres of PGIS and 21.42 acres of NPGIS.

Certain NTPs require the demolition of existing buildings and infrastructure to make room for construction. Demolished buildings and structures would either be relocated elsewhere on Port property, replaced by new facilities, or incorporated into existing facilities with improvements.

Figure 2. Locations of proposed SAMP NTPs

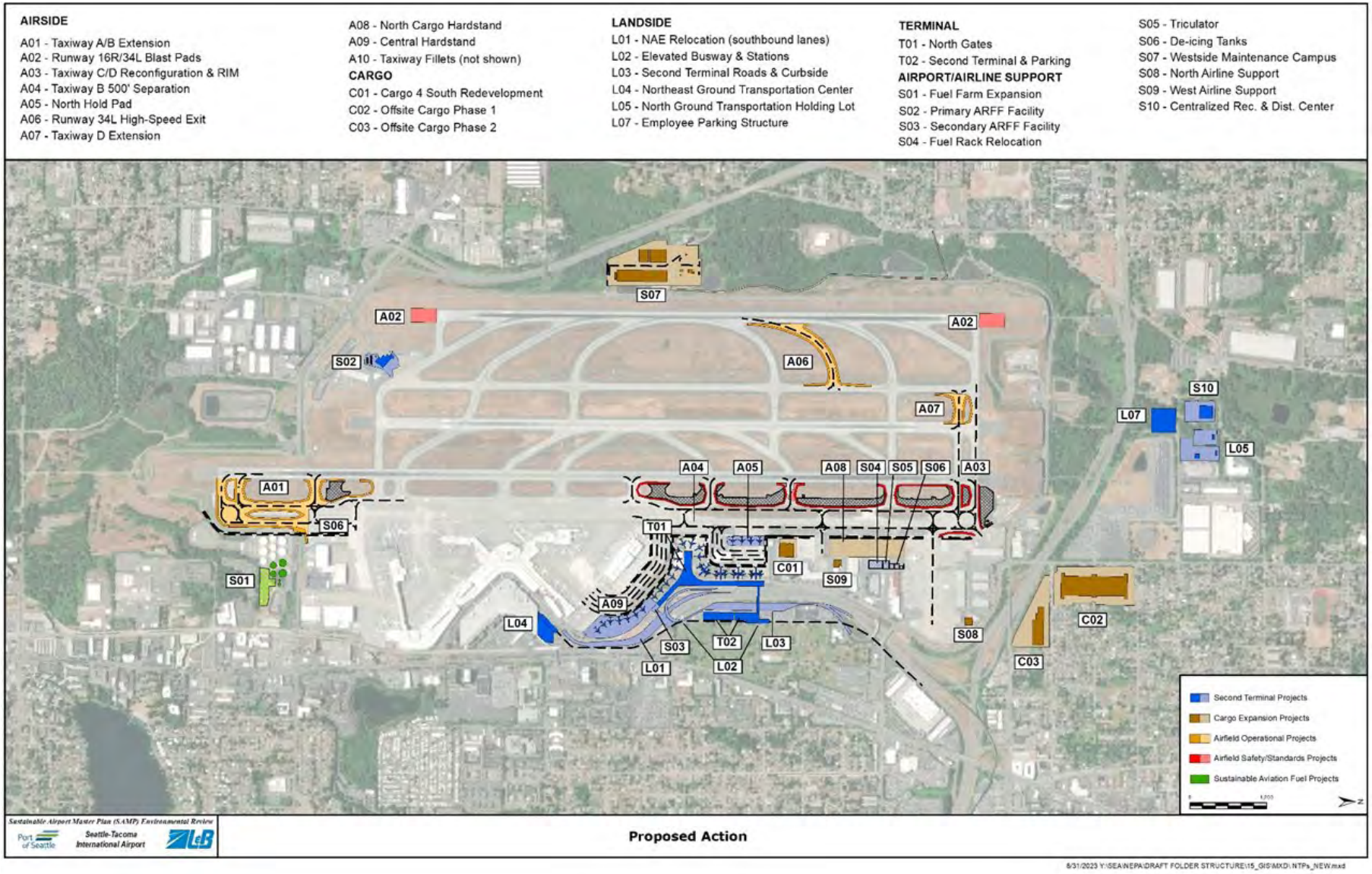


Table 2. Estimated NTP and PSP construction footprints, net change in impervious surface area, and permanent habitat impacts.

Project	Construction Footprint (acres)	Existing Impervious (acres)	Total Impervious Added (acres)	Net Change NPGIS (acres)	Net Change PGIS (acres)	Drainage Basin	Wetland	Wetland Buffer	Stream	Stream Buffer
A01 – Taxiway A/B Extension	33.2	17.83	1.84	0.00	1.84	SDS4; SDS3	--	--	--	--
A02 – Runway 16R/34L Blast Pads	7.2	2.17	1.87	1.87	0.00	SDS6-7 SDN3A	--	--	--	--
A03 – Taxiway C/D Reconfiguration & RIM	17.1	10.52	-0.41	0.00	-0.41	IWS	--	--	--	--
A04 - Taxiway B 500-foot Separation	46.8	51.17	-6.36	0.00	-6.36	SDN2; SDS3; SDE4; IWS	--	--	--	--
A05 – North Hold Pad	3.9	2.06	0.00	0.00	0.00	IWS	--	--	--	--
A06 – Runway 34L High-Speed Exit	13.6	1.53	5.17	0.00	5.17	SDW1B; SDS3A	--	--	--	--
A07 – Taxiway D Extension	6.3	1.38	1.47	0.00	1.47	SDN3	--	--	--	--
A08 – North Cargo Hardstand	11.5	7.87	0.09	-2.40	2.49	IWS	--	--	--	--
A09 – Central Hardstand	10.1	4.13	2.58	0.00	2.58	IWS	--	--	--	--
A10 – Taxiway Fillets	<1	--	<1	--	--	--	--	--	--	--
T01 – North Gates	11.5	11.77	7.31	3.35	3.96	SDE4; IWS	--	--	--	--
T02 – Second Terminal & Parking Garage	4.9	2.37	0.00	2.37	-2.37	SDE4; IWS	--	--	--	--
C01 – Cargo 4 South Redevelopment	3.3	1.84	0.00	0.00	0.00	SDE4	--	--	--	--
C02 – Offsite Cargo Phase 1	21.5	0.64	16.41	7.57	8.84	N of SR 518	--	--	--	--
C03 – Offsite Cargo Phase 2	12.7	0.23	8.85	2.04	6.81	N of SR 518	--	--	--	--
L01 – NAE Relocation	13.0	2.85	2.60	0.00	2.60	SDE4	--	--	--	--
L02 – Elevated Busway and Stations	1.7	0.36	0.15	0.51	-0.36	SDE4	--	--	--	--
L03 – Second Terminal Roads/Curbside	16.7	5.03	1.08	0.00	1.08	SDE4	--	--	--	--
L05 – NGT Holding Lot	8.5	0.00	5.63	0.24	5.39	N of SR 518	--	--	--	--
L07 – Employee Parking Structure	5.2	0.09	3.19	0.00	3.19	N or SR 518	0.02	0.60	--	--
S02 – Primary ARFF Facility	4.9	2.26	0.40	0.00	0.40	IWS	--	--	--	--
S03 – Secondary ARFF Facility	0.9	0.12	0.09	0.21	-0.12	IWS	--	--	--	--
S04 – Fuel Rack Relocation	1.6	0.61	0.02	0.63	-0.61	IWS	--	--	--	--
S05 – Triculator	1.3	0.37	0.04	0.41	-0.37	IWS	--	--	--	--
S06 – De-icing Tanks	1.0	0.21	0.01	0.22	-0.21	IWS	--	--	--	--
S07 – Westside Maintenance Campus	25.5	4.56	15.91	2.88	13.03	SDW2; SDW2A; IWS	<0.01	1.70	0.01	0.07
S08 – North Airline Support	1.0	0.31	0.00	0.31	-0.31	IWS	--	--	--	--
S09 – West Airline Support	1.0	0.29	0.00	0.29	-0.29	SDE3	--	--	--	--
S10-Centralized Receiving and Distribution	5.6	0.00	3.51	0.92	2.59	N of SR 518	--	--	--	--

Project	Construction Footprint (acres)	Existing Impervious (acres)	Total Impervious Added (acres)	Net Change NPGIS (acres)	Net Change PGIS (acres)	Drainage Basin	Wetland	Wetland Buffer	Stream	Stream Buffer
Information/Communications Technology	19.6	12.90	0.00	0.00	0.00	--	--	--	--	--
Power	8.4	4.50	0.00	0.00	0.00	--	--	--	--	--
Water	6.6	5.80	0.00	0.00	0.00	--	--	--	--	--
Sanitary Sewer	9.3	5.80	0.00	0.00	0.00	--	--	0.01	--	--
Aviation Fuel	2.2	2.10	0.00	0.00	0.00	--	--	--	--	--
SDS4 Pond Expansion	0.63	0.10	0.00	0.00	0.00	--	--	<0.01	--	--
Pond M Expansion	1.87	0.80	0.00	0.00	0.00	--	--	0.11	--	--
Miller Creek Detention Pond Construction	1.27	0.30	0.00	0.00	0.00	--	0.55	--	--	--
Pond F Relocation/Replacement	2.56	0.90	0.00	0.00	0.00	--	--	<0.01		
Walker Creek Detention Pond Construction	1.18	1.40	0.00	0.00	0.00	--	--	--	--	--
Stormwater Lines	14.4	9.70	0.00	0.00	0.00	--	0.01	0.23	0.01	0.05
Industrial Wastewater Lines	13.7	8.80	0.00	0.00	0.00	--	--	--	--	--
Grand Total	373.21	185.67	71.45	21.42	50.03	--	0.58	2.65	0.02	0.12

2.3.1 Airside Projects

2.3.1.1 *A01 – Taxiway A/B Extension*

Extension of parallel Taxiway A/B by approximately 1,800 feet to provide access to the south end of Runway 16L/34R. This NTP includes:

- Shifting Taxiway A east by approximately 100 feet and Taxiway B west by approximately 100 feet to create two separate taxiways. Existing pavement will be reconfigured, including relocation of Taxiway S 310 feet to the south.
- Relocation of Runway 34R glideslope antenna and associated equipment shed approximately 100 feet east. These features are in the mowed field between Taxiway A/B and Runway 16L/34R.
- Relocation of a service vehicle road bridge over S 188th Street approximately 60 feet east of the existing road. This bridge would be approximately 100 feet long by 25 feet wide (0.06 acre).

NTP A01 relocates or retrofits approximately 17.83 acres of PGIS and creates 1.84 acres of new PGIS.

2.3.1.2 *A02 – Runway 16R/34L Blast Pads*

Expansion of Runway 16R/34L blast pads from the existing 200 by 200 feet (0.9 acre) to 220 by 400 feet (2.0 acres) to meet FAA design standards. Blast pads would be poured concrete construction on cleared and compacted ground. Includes relocation of navigational aids to enable construction. Blast pad expansion would retrofit 2.17 acres of existing NPGIS and create 1.87 acres of new NPGIS.

2.3.1.3 *A03 – Taxiway C/D Reconfiguration and Runway Incursion Mitigation*

Modification of existing taxiway geometry of Taxiways C and D to correct non-standard intersection angles and reconfigure non-standard intersections. Includes the extension of Taxiways C and D by approximately 500 feet to intersect with Taxilane A and the removal of 2,670 square feet (0.06 acre) of existing impervious surfaces for runway incursion mitigation. Approximately 100,000 square feet (2.3 acres) of pavement north of Taxiway C would be removed to offset the increase in impervious surfaces. In total, this NTP would result in a net reduction in PGIS of 0.41 acres.

2.3.1.4 *A04 - Taxiway B 500-foot Separation*

Relocation of Taxiways A and B 100 feet east between Taxiways C and L to provide the required 500 ft runway/taxiway separation. This would require extending Taxiways C, D, E, H, and K 100 feet to connect with the relocated Taxiway B. Existing paved surfaces would be removed to offset the increase in impervious area, resulting in a net reduction in PGIS of 6.36 acres.

2.3.1.5 *A05 – North Hold Pad*

Construction of an approximately 90,000-square-foot (2.1-acre) hold pad for up to four aircraft to reduce congestion on the taxiways and at the terminal. This new surface would be constructed entirely on existing PGIS, resulting in no net change in PGIS.

2.3.1.6 *A06 – Runway 34L High-Speed Exit*

Construction of a new high-speed exit for Runway 34L arrivals between Taxiways J and E to allow for more efficient use of the runway by arriving aircraft. Construction would require clearing and grading of the field and relocation of the multilateration remote unit. This NTP would add a total of approximately 5.2 acres of mostly new PGIS. A small percentage (less than 5%) of NTP acreage would be constructed on existing impervious surfaces on the runway and taxiway shoulders.

2.3.1.7 *A07 – Taxiway D Extension*

Extension of Taxiway D by approximately 500 feet from Runway 16C/34C west to Taxiway T. This NTP would add approximately 1.47 acres of new PGIS. Construction would require clearing and grading of approximately 1.6 acres of maintained field between the runway and taxiway. A small percentage (less than 5%) would be constructed on existing taxiway shoulders.

2.3.1.8 *A08 – North Cargo Hardstand*

Construction of an approximately 360,000-square-foot (8.3-acre) cargo aircraft hardstand in the North Cargo area east of Taxiway A. The hardstand would accommodate five aircraft for loading and unloading of cargo freight and parking of cargo aircraft. Construction would require the relocation of the United maintenance hangar and Swissport cargo facility (S08), the Port's aviation maintenance facility (S07), and ground service equipment (GSE) maintenance facility (S09). All construction would occur on existing impervious surfaces. This NTP would increase PGIS by 2.49 acres.

2.3.1.9 *A09 – Central Hardstand*

Construction of an approximately 292,000-square-foot (6.7-acre) hardstand for seven aircraft north of Concourse D and east of the North Satellite to accommodate increased demand for passenger hardstand operations and overnight parking of passenger aircraft. Requires relocating portions of the North Airport Expressway (NAE) (L01). This NTP would add approximately 2.58 acres of PGIS.

2.3.1.10 *A10 – Taxiway Fillets*

Construction of new full strength pavement panels and shoulders to meet FAA standards. This NTP would be constructed entirely on existing impervious surfaces and would result in no net change in impervious area or PGIS. The anticipated project footprint is small (less than 1 acre) and too broadly distributed to be displayed on Figure 2 but would be associated with all taxiways.

2.3.2 Terminal Projects

2.3.2.1 *T01 – North Gates*

Construction of a new multi-level concourse and aircraft apron to accommodate up to 19 gates. The new concourse would have a footprint of approximately 203,000 square feet (4.7 acres), all of which would be NPGIS. The associated aircraft apron would have a footprint of approximately 500,000 square feet (11.5 acres) of existing and new impervious surfaces. The new facility would displace the Aircraft Rescue and Firefighting (ARFF) station (S02), Cargo 6 warehouse (C01), deicing tanks (S06), NAE (L01) and fuel rack (S04). This NTP would increase PGIS by 3.96 acres.

2.3.2.2 *T02 – Second Terminal and Parking Garage*

Construction of a new multi-level passenger terminal on the east side of the NAE from proposed T01, connected via an elevated pedestrian walkway. Includes the construction of a new multi-level parking garage with approximately 1,350 parking spaces. The new terminal and garage would have a combined footprint of approximately 286,000 square feet (6.6 acres). The new facilities would displace the Doug Fox Parking Lot and would reduce existing PGIS by approximately 2.37 acres.

2.3.3 Cargo Projects

The three cargo projects are needed to enable construction of T01 and to expand and improve the Port's cargo handling efficiency and capacity to meet projected future needs.

2.3.3.1 *C01 – Cargo 4 South Redevelopment*

Construction of an approximately 80,000-square-foot cargo facility (warehouse, office space, truck terminals, and parking) at the Cargo 4 South site in the central cargo area to replace the Cargo 6 warehouse, which will be demolished for T01. The new facility would have a footprint of approximately 1.8 acres. This NTP would result in no net change in NPGIS or PGIS.

2.3.3.2 *C02 – Offsite Cargo Phase 1*

Construction of a new 330,000-square-foot (7.6-acre) cargo warehouse on the Port's L-shaped parcel located north of SR 518. The facility footprint (warehouse, office space, truck terminals, parking, and access roads) would cover approximately 16.0 acres. Approximately 98% of the project footprint is vegetated pervious surface that would be cleared for construction. This NTP would create approximately 7.6 and 8.8 acres of new NPGIS and PGIS, respectively.

2.3.3.3 *C03 – Offsite Cargo Phase 2*

Construction a new 90,000-square-foot (2.1-acre) cargo warehouse on the triangular portion of the Port's L-shaped parcel located north of SR 518. The entire facility footprint (warehouse, office space, truck terminals, parking, and access roads) would cover approximately 8.1 acres. Approximately 98% of the project footprint is vegetated pervious surface that would be cleared for construction. This NTP would create approximately 2.1 and 6.8 acres of new NPGIS and PGIS, respectively.

2.3.4 Landside Projects

The five landside projects include the relocation of existing roadways and creation of new roadway segments to support the development of the terminal projects, mass transit infrastructure, and expanded and new parking facilities for passengers and Port employees.

2.3.4.1 *L01 – North Airport Expressway Relocation (Southbound Lanes)*

Construction of approximately 7,300-linear-feet of NAE to replace the existing section displaced by construction of A09 and T01. The relocated portion of the NAE would be widened from 3 to 4 lanes. The relocated NAE provides access to T02 and the increased capacity needed to alleviate congestion on existing intra-facility roadways. This NTP would create approximately 2.60 acres of new PGIS.

2.3.4.2 *L02 – Elevated Busway and Stations*

Construction of approximately 6,000-linear-feet of elevated busway and three stations to connect the main terminal, new second terminal, and rental car facility. The busway and stations would be located along the eastern edge of SEA property and would tie into existing bus routes. L02 would displace the existing ground transportation holding lot by cutting off access to SEA, which would be replaced with L05. In total, this NTP would reduce existing PGIS by approximately 0.36 acre.

2.3.4.3 *L03 – Second Terminal Roads and Curbside*

Construction of a new loop ramp connecting the NAE to T02 from the existing S 160th Street Loop, westbound SR 518 on-ramp at S. 160th Street, and existing northbound lanes of the NAE. Split-level curbsides would be constructed for arriving vehicles, departing vehicles, and commercial vehicles (shuttles, taxis, and ride-share companies). This NTP would increase existing PGIS by 1.08 acres.

2.3.4.4 *L05 – North Ground Transportation Holding Lot*

Relocation of Ground Transportation Holding Lot to Port property north of SR 518 and south of S 144th Street to replace the parking lot displaced by L02. Construction would require clearing and grading of existing vegetated upland habitat and would create approximately 0.24 and 5.39 acres of new NPGIS and PGIS, respectively.

2.3.4.5 *L07 – Employee Parking Structure*

Construction of a new 8-story (1 below grade and 7 above grade), 3,500-stall employee parking structure on Port property north of SR 518 and south of S 144th Street. The structure would have a footprint of approximately 3.3 acres. This NTP would create approximately 3.19 acres of new PGIS.

2.3.5 Airport/Airline Support Projects

The nine airport/airline support projects upgrade and expands the Port's operational infrastructure. These include enabling projects to relocate existing facilities displaced by other NTPs and expansion of existing and new facilities to provide additional capacity necessary to meet projected future needs.

2.3.5.1 *S02 – Primary Aircraft Rescue and Firefighting Facility*

Relocation of the Primary ARFF station to accommodate construction of T01. The new 50,000-square-foot (1.1-acre) ARFF would be located on the south airfield between Runway 16R/34L and Runway 16C/34C. The ARFF building and associated vehicle pads, access roads, and parking areas would have a combined footprint of approximately 2.7 acres. This NTP would displace an existing building and parking lot. The new facility would increase PGIS by 0.40 acres.

2.3.5.2 *S03 – Secondary Aircraft Rescue and Firefighting Facility*

Construction of an approximately 10,000-square-foot (0.2-acre) secondary ARFF to provide ambulatory and fire response to the terminals and concourses and back-up emergency response to the airfield. The Secondary ARFF facility would be integrated within T01 at the southeast end of the concourse, decreasing existing PGIS by 0.12 acre.

2.3.5.3 *S04 – Fuel Rack Relocation*

Relocation of the fuel rack from its existing location in the Cargo 6 area to the Cargo 3 area to accommodate T01. The fuel rack is part of the airport fuel distribution system where aircraft fuel trucks refill. The replaced facility would have a construction footprint of approximately 1.6 acres and would be constructed entirely on existing impervious surfaces, reducing existing PGIS by 0.61 acre.

2.3.5.4 *S05 – Triculator*

Relocation of the airport triculator building from east of the ARFF to the north cargo area for construction of A09. The triculator transfers aircraft waste to the sewer system. The relocated facility would have a footprint of approximately 12,200 square feet (0.4 acre) of NPGIS and would be constructed entirely on existing impervious surfaces, resulting in a net reduction in PGIS of 0.37 acre.

2.3.5.5 *S06 – De-icing Tanks*

Relocation of the de-icing fluid tanks from Cargo 6 and Cargo 7 to the east of A08 and near A01 service vehicle bridge to accommodate T01. Each site would have a containment system, blending station, and two tanks (Type I de-icing fluid and Type IV de-icing fluid). The two sites would have a combined footprint of approximately 14,000 square feet (0.3 acre) of NPGIS and would be constructed entirely on existing impervious surfaces, reducing existing PGIS by 0.21 acre.

2.3.5.6 *S07 – Westside Maintenance Campus*

Relocation of the Port's Aviation Maintenance Facility to the west side of the airfield for construction of A08. The facility includes a vehicle fuel rack, airfield deicer storage, snow equipment storage, multi-bay buildings, and associated maintenance facilities. The Westside Maintenance Campus would have a combined total footprint of approximately 29.1 acres, comprising approximately 6.0 acres of new buildings/structures and 15.3 acres of access roads, parking areas, hardstands, and retaining walls. In total, this NTP would add approximately 13.03 acres of PGIS.

NTP S07 would be developed on an existing slope on an 11-acre upper and 6-acre lower platform constructed on the hillside, bounded by retaining walls with a footprint. Retaining walls would reach a maximum height of up to 65 feet at the southern end of the site and would most likely be mechanically stabilized earth construction. Facility construction could require up to 1,550,000 cubic yards of combined cut and fill. Construction would permanently displace a fraction (<0.01) of an acre of wetland and 1.7 acres of wetland buffer habitat. Includes the reconstruction of S. 168th St. access and construction of a new access road from S. 157th Place to the new facility. The S 157th Place access road would require improvements to an existing culvert crossing over Miller Creek to support long-term operations. Roadway surfacing and stormwater improvements at this crossing would result in approximately 0.01 and 0.07 acre of permanent impacts to stream and stream buffer, respectively.

2.3.5.7 *S08 – North Airline Support*

Construction of an approximately 15,000-square-foot (0.3-acre) airline support building in the northeast corner of the North Cargo area on existing impervious surface. This enabling project would accommodate aircraft maintenance functions displaced by construction of A08. The new building would replace existing PGIS with NPGIS, resulting in a net reduction in PGIS of 0.31 acre.

2.3.5.8 *S09 – West Airline Support*

Expansion of the existing AMB/AFCO III building by approximately 12,500 square feet (0.3 acre) to replace GSE maintenance functions displaced by construction of A08. The new building would replace existing PGIS with NPGIS, resulting in a net reduction in PGIS of 0.29 acre.

2.3.5.9 *S10 – Centralized Receiving and Distribution Center (CRDC)*

Construction of an approximately 55,000-square-foot (1.3-acre) CRDC on Port property north of SR 518 and south of S 144th Street. This facility would service the dining and retail concessionaires in passenger terminals and is needed to improve the security and efficiency of food, beverage, and inventory distribution. The new CRDC building would be constructed on vacant ground, requiring clearing and grading of the entire project footprint. This NTP would create 2.59 acres of new PGIS.

2.4 Proposed Program Support Projects

The Proposed Action includes infrastructure and utilities projects to support NTP development. This includes new utility lines and service connections and improvements to SDS and IWS infrastructure.

2.4.1 Utilities Projects

The UMP (Port 2022a) identified several water, sewer, electrical, heating and cooling, and information and communications technology projects necessary to support NTP development. In addition, T01 would require the installation of new jet fuel distribution lines. The Proposed Action includes the construction of new underground lines, ducts, and utility tunnels. Table 3 summarizes the planned length and construction footprint acreages for utilities projects by category. Utility line corridors would be installed under existing pervious and impervious surfaces. Corridor segments outside of NTP footprints would be restored to pre-construction conditions and would result in no net change in impervious surface area. Planned utility locations are shown in Figures 3 to 5.

The Proposed Action also includes planned upgrades to the SEA mechanical plant. These upgrades comprise replacement of and improvements to internal equipment and systems within existing infrastructure footprints. No measurable effects on the outside environment are anticipated.

Table 3. UMP projects needed to support NTP development.

Utility Type	Construction Type	Length (miles)	Temporary Construction Footprint (acres)	Impervious Surfaces Construction Footprint (acres)
Water	Buried mainlines	2.74	6.6	5.8
Sanitary sewer	Buried trunk lines	3.82	9.3	5.8
Power	Underground lines/duct banks	3.39	8.4	4.5
Information/Communication Technology	Underground duct banks	7.70	19.6	12.9
Aviation fuel	Buried lines	0.89	2.2	2.1

Figure 3. Proposed UMP projects, northeast section of project area.

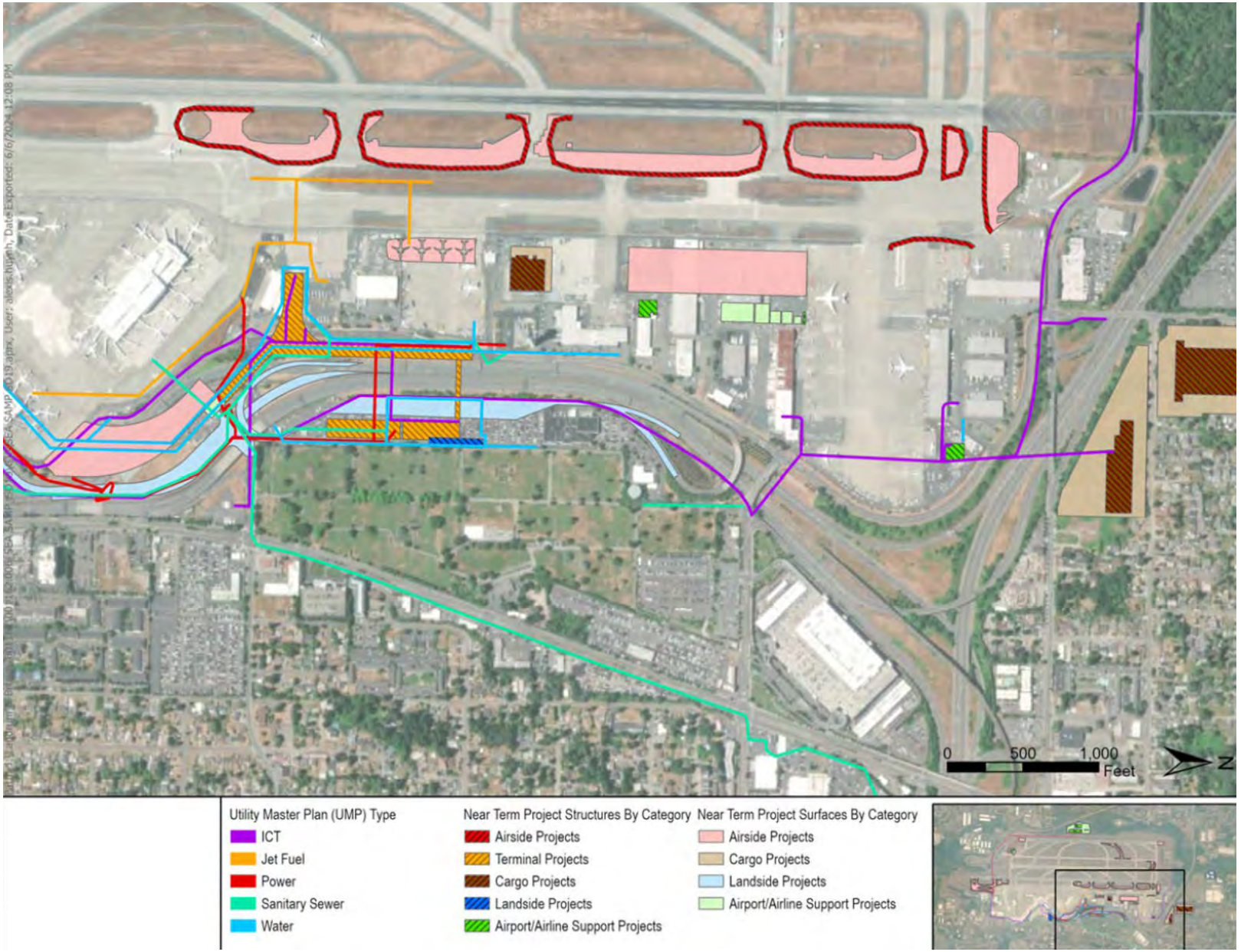


Figure 4. Proposed UMP projects, southeast section of project area.

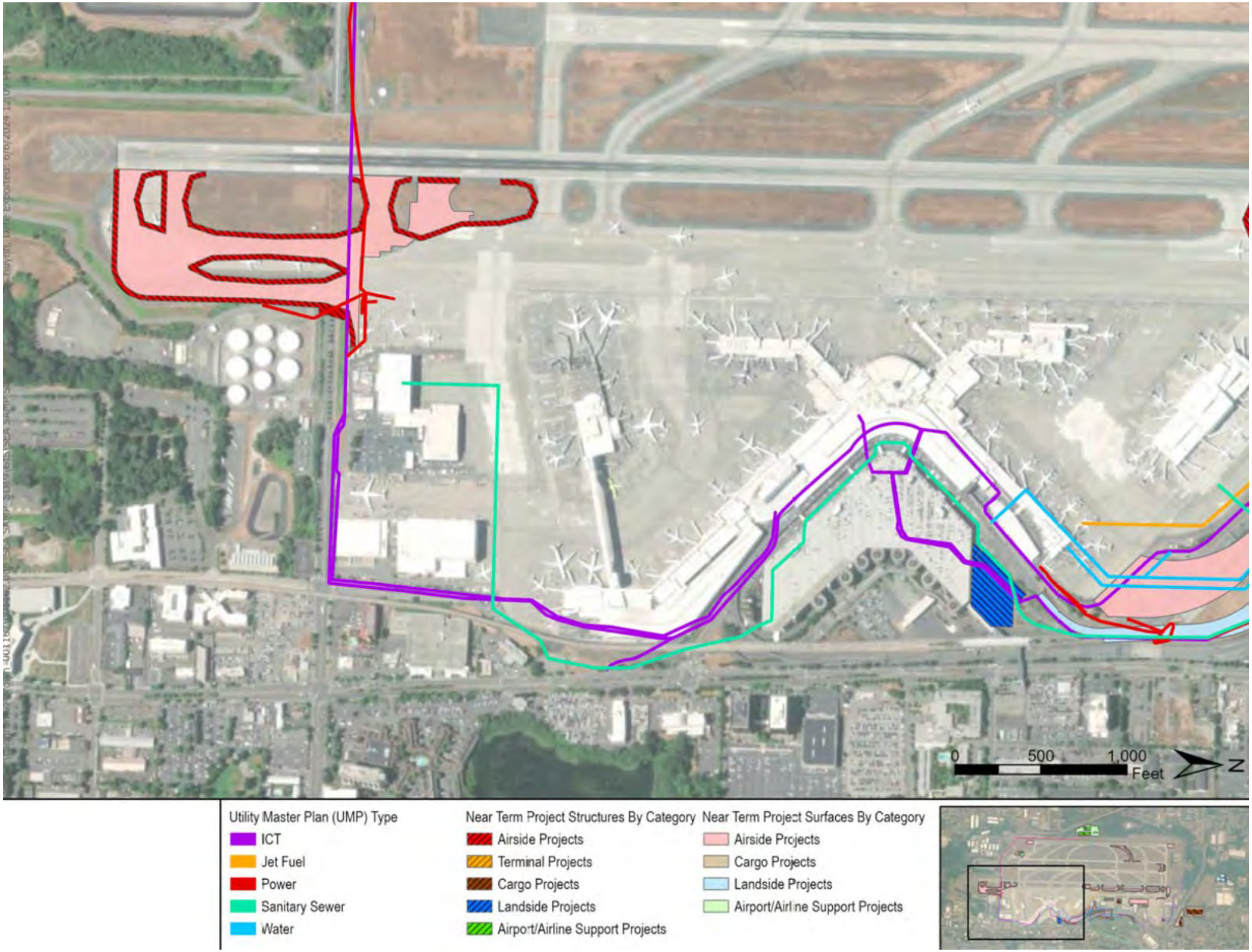
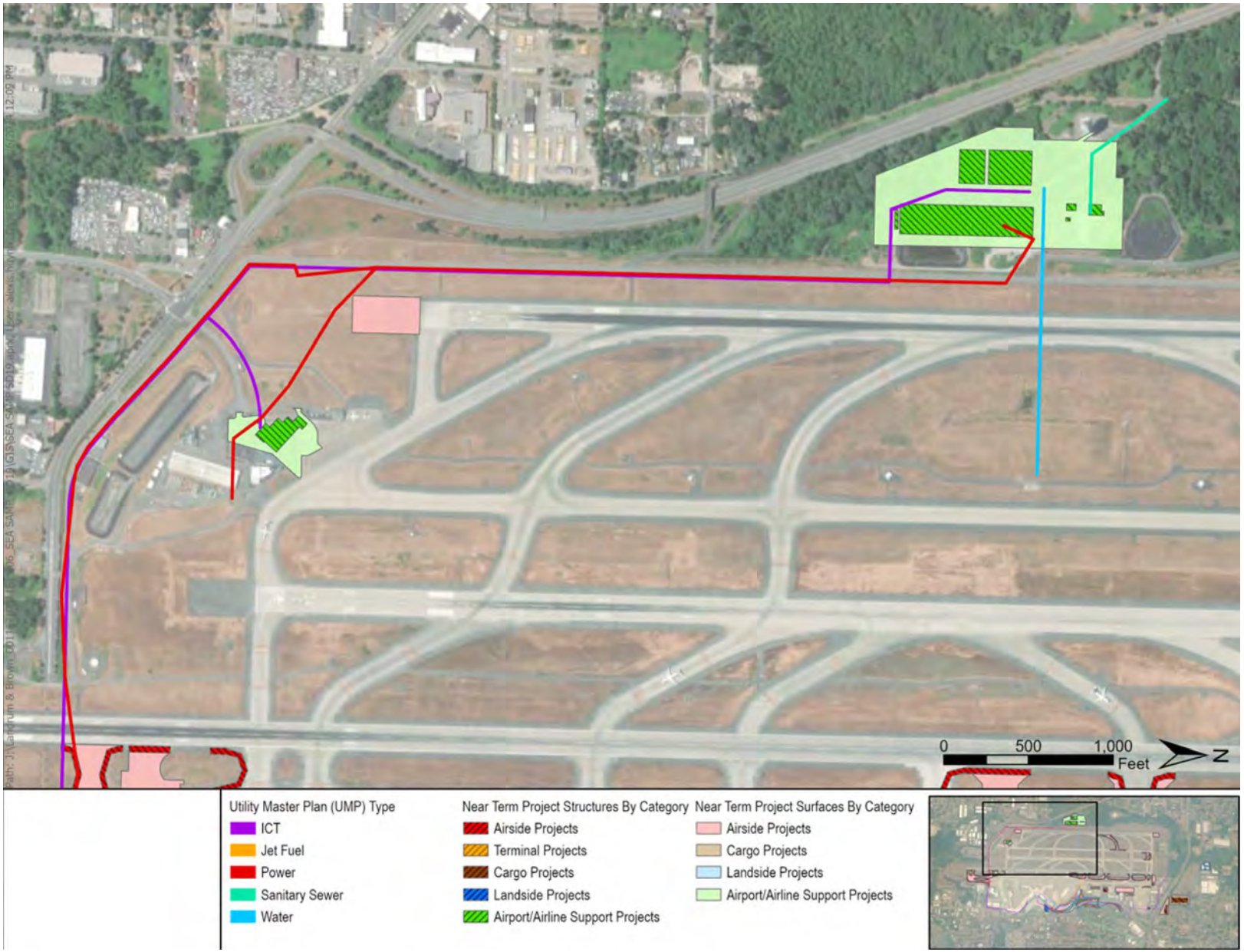


Figure 5. Proposed UMP projects, southwest section of project area.



2.4.2 Stormwater and Wastewater Projects

The Proposed Action includes improvements to and expansion of the SDS and IWS to provide the additional detention and treatment capacity needed to support NTP development. This program, described in detail in the *Seattle-Tacoma International Airport Stormwater Pollution Prevention Plan* (SEA SWPPP) (Port 2022b), comprises 4 primary components:

- The SDS: Structural stormwater detention and treatment infrastructure.
- The IWS: The Port's permitted Industrial Wastewater Treatment Plant (IWTP) system, wastewater drainage basins, and associated detention and conveyance infrastructure.
- Operational source controls (OSCs): BMPs used to avoid and minimize pollutant releases from SEA operations, reducing the quantity of pollutants discharging to the SDS.
- Water quality monitoring: The Port's NPDES permit is broken down into three parts: Part 1: Industrial Wastewater, Part 2: Industrial Stormwater, and Part 3: Construction Stormwater. The NPDES permit establishes conditions, prohibitions, and management practices designed to reduce the discharge of pollutants from the SDS and IWS, to protect water quality, and to comply with appropriate CWA requirements. One of the conditions is compliance monitoring at all points of discharge for the SDS and IWS systems. A summary of the Port's water quality monitoring activities, including priority constituents and monitoring frequency, is provided in Appendix B. The Port has established pollutant monitoring protocols for the sanitary sewer system (Port 2021a), the IWS (Port 2020, 2021b), and the SDS (Port 2021c, 2021d).

Existing SDS and IWS drainage basins and detention infrastructure are shown on Figure 6. The SDS comprises 12 stormwater drainage basins and a network of conveyance pipes, detention vaults, and ponds used to capture and treat stormwater runoff from approximately 1,284 acres of SEA property. Half of this area is impervious and primarily associated with airport runways, taxiways, parking lots, roads, and roof tops. The remainder is pervious which consists of landscaped or fallow open spaces and areas associated with stormwater treatment BMPs such as runway filter strips. About 25 percent of the area drained by the SDS flows to Miller Creek. This drainage area represents about 7 percent of Miller Creek's watershed. Approximately 71 percent of the total SDS area drains to the Northwest Ponds and Des Moines Creek, which represents about 21 percent of Des Moines Creek's watershed.

The Airport's SDS is segregated into separate stormwater subbasins that each drain to individual outfall locations. The NPDES permit lists a total of thirteen (13) outfalls in two categories: Existing & New Outfalls and Subbasins, and Future Outfalls to be activated during future development. As of June 30, 2023, eleven (11) of the thirteen (13) outfalls are active.

The IWS comprises 2 drainage basins covering a combined 325.1 acres that service the aircraft operations area and a 26.5-acre drainage basin servicing the airport parking garage. The IWS services portions of the Port where aircraft de-icing and handling of fuel, paint, lubricants, degreasers, and other hazardous materials routinely occur. The IWS conveyance system includes approximately 35 miles of piping, 1,200 manholes and catch basins, two below-grade vaults in the parking garage, and 11 pump stations. The IWS collects stormwater from flush gutters and catch basins and conveys the stormwater to the IWS storage lagoons. Prior to entering the storage lagoons, the wastewater is automatically analyzed, and flow is directed to specific lagoons based upon biological oxygen demand (BOD) concentration. The primary purpose of Lagoons #1 and #2 is for collection of the "first flush" of

high BOD influent from the South Aviation and North Aviation areas, respectively. Although the primary purpose of Lagoon #3 is for collection of low BOD runoff, high BOD runoff during de-icing periods may also be stored in Lagoon #3 when Lagoons #1 and #2 reach full capacity. Prior to treatment, the wastewater flows from Lagoons #1 and #2 through mechanical screening devices, which are sized to remove large objects. Water stored in Lagoons #1 and #2 drain by gravity to the IWTP. Water is pumped from Lagoon #3 to the IWTP. Some settling of solids occurs in the lagoons. The lagoons are typically cleaned every other year pending summer weather conditions. The IWTP discharges treated effluent to either the Puget Sound or to the sanitary sewer system.[1]

Quantification of existing impervious surface acreage in SDS and IWS drainage basins affected by the Proposed Action and changes in impervious, NPGIS, and PGIS acreages resulting from NTP and UMP project construction are provided in Table 4. Table 4 also summarizes the existing structural source controls and level of treatment provided in each drainage basin, proposed SDS and IWS improvements, and relevant OSC BMPs. Treatment levels are defined in Table 5 and apply Washington State Department of Ecology (Ecology) terminology (Ecology 2019).

As detailed in Table 2, the Proposed Action would increase the total amount of impervious surface by approximately 71 acres and increase PGIS by approximately 50 acres. None of the vegetation that will be removed is located directly adjacent to or near water sources or habitat for aquatic species. All new PGIS would be treated prior to draining to the Puget Sound via Miller, Walker, or Des Moines creeks or the IWTP discharge. The Proposed Action includes construction of new and improvements to existing SDS and IWS infrastructure. The stormwater and wastewater projects included in the Proposed Action are shown on Figures 7 to 10 and are summarized in Table 6.

OSCs comprise an array of operational BMPs designed to prevent avoidable releases of pollutants, minimize unavoidable releases, and reduce the quantity of pollutants discharged to the SDS and IWS. All NTPs would be subject to the OSC BMPs applicable to the functions they provide. OSC BMPs are described in Section 2.7.2. Table 4 identifies 3 specific BMP actions—runway rubber removal, dry sweeping of impervious surfaces, and sediment management—that are relevant for avoiding and minimizing impacts to ESA-listed species from stormwater contaminants. Additional information about the frequency and extent of these activities is provided in Section 2.7.2.

Construction of proposed SDS and IWS improvements would result in permanent impacts to approximately 0.01 acre of streams and 0.05 acre of stream buffer and up to 0.56 acre of wetland and 0.35 acre of wetland buffer habitats. These impacts are described in Section 5.1.2. Anticipated mitigation requirements are summarized in Section 2.6.

[1] The receiving body for IWTP discharge is determined by effluent BOD. Per Individual NPDES Permit WA-0024651 effluents with BOD concentrations below the BOD threshold are permitted for direct discharge to Puget Sound. Effluents exceeding this threshold are diverted to the sanitary sewer per King County Industrial Waste Discharge Permit 7810-05.

Figure 6. Existing SDS and IWS drainage basins and stormwater infrastructure

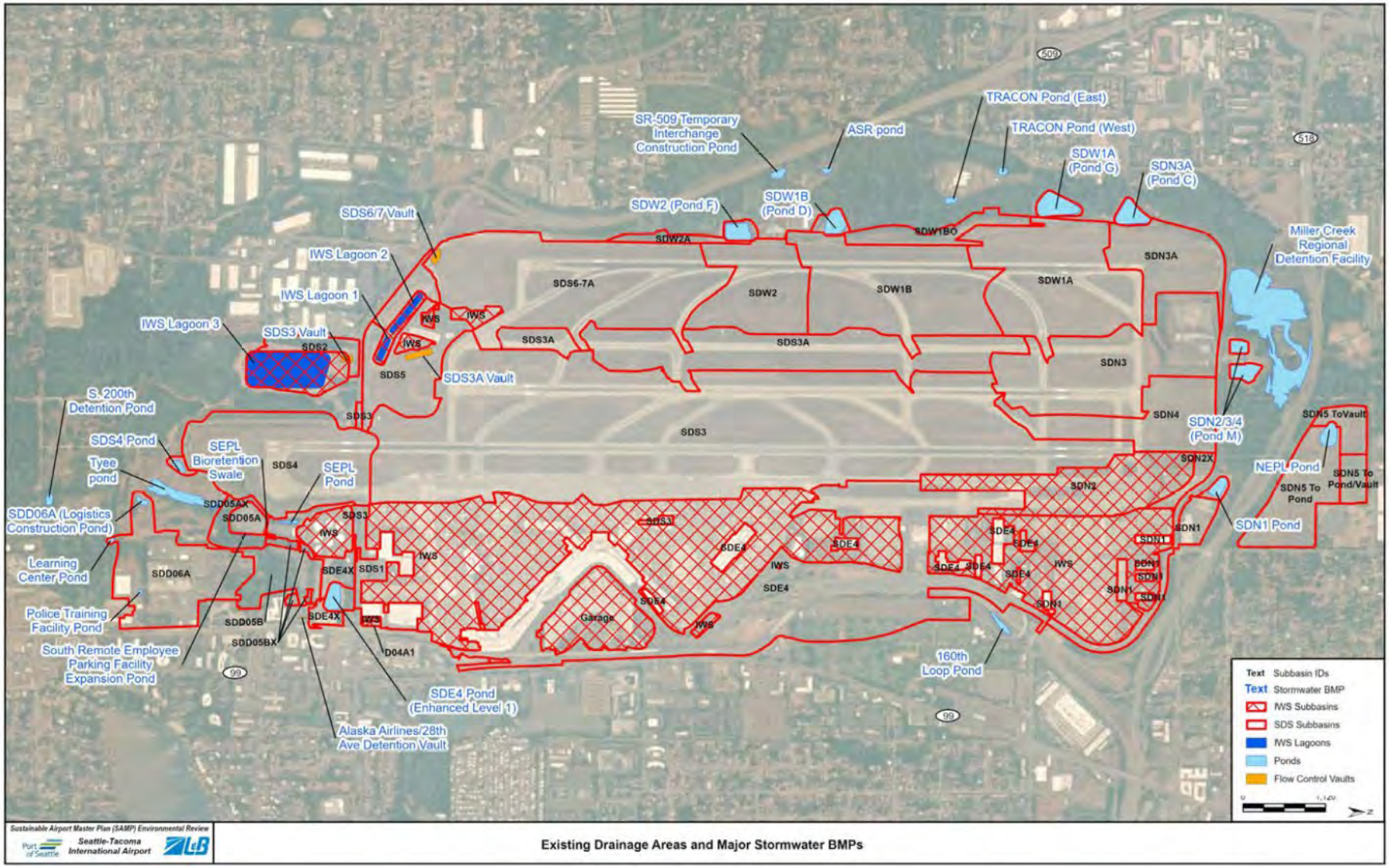


Figure 7. Proposed SDS and IWS projects, northeast section of project area

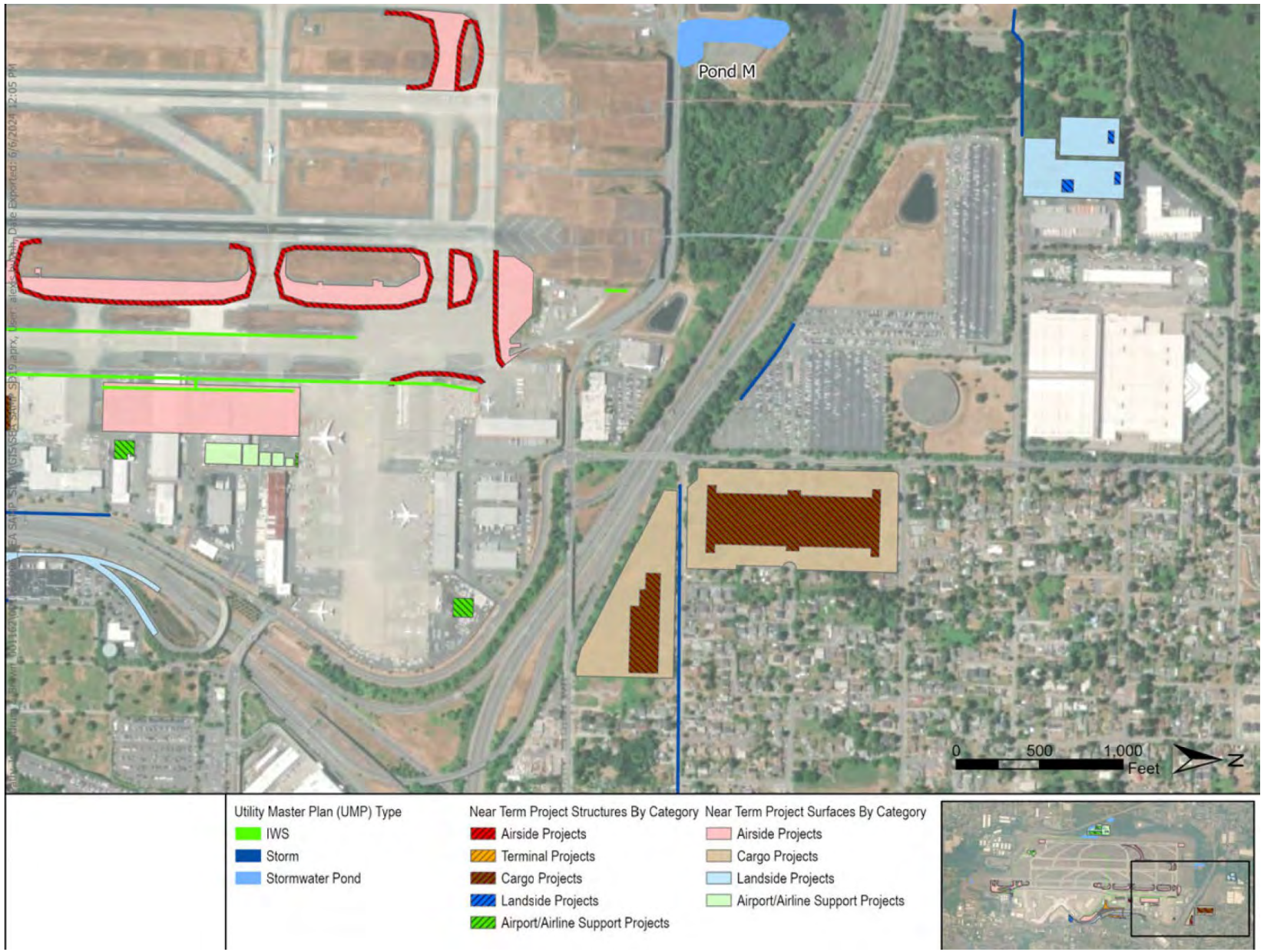


Figure 8. Proposed SDS and IWS projects, east section of project area

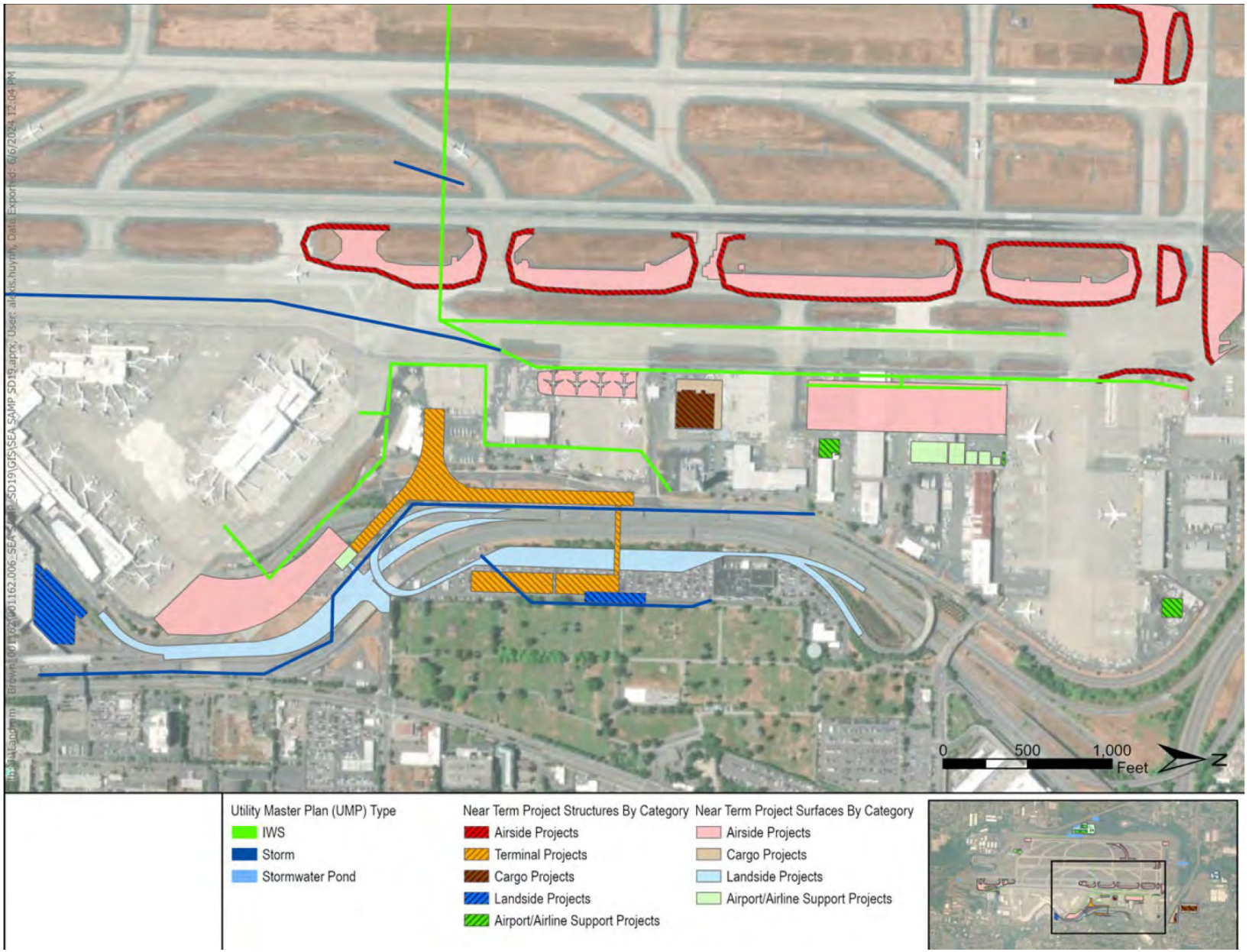


Figure 9. Proposed SDS and IWS projects, southeast section of project area

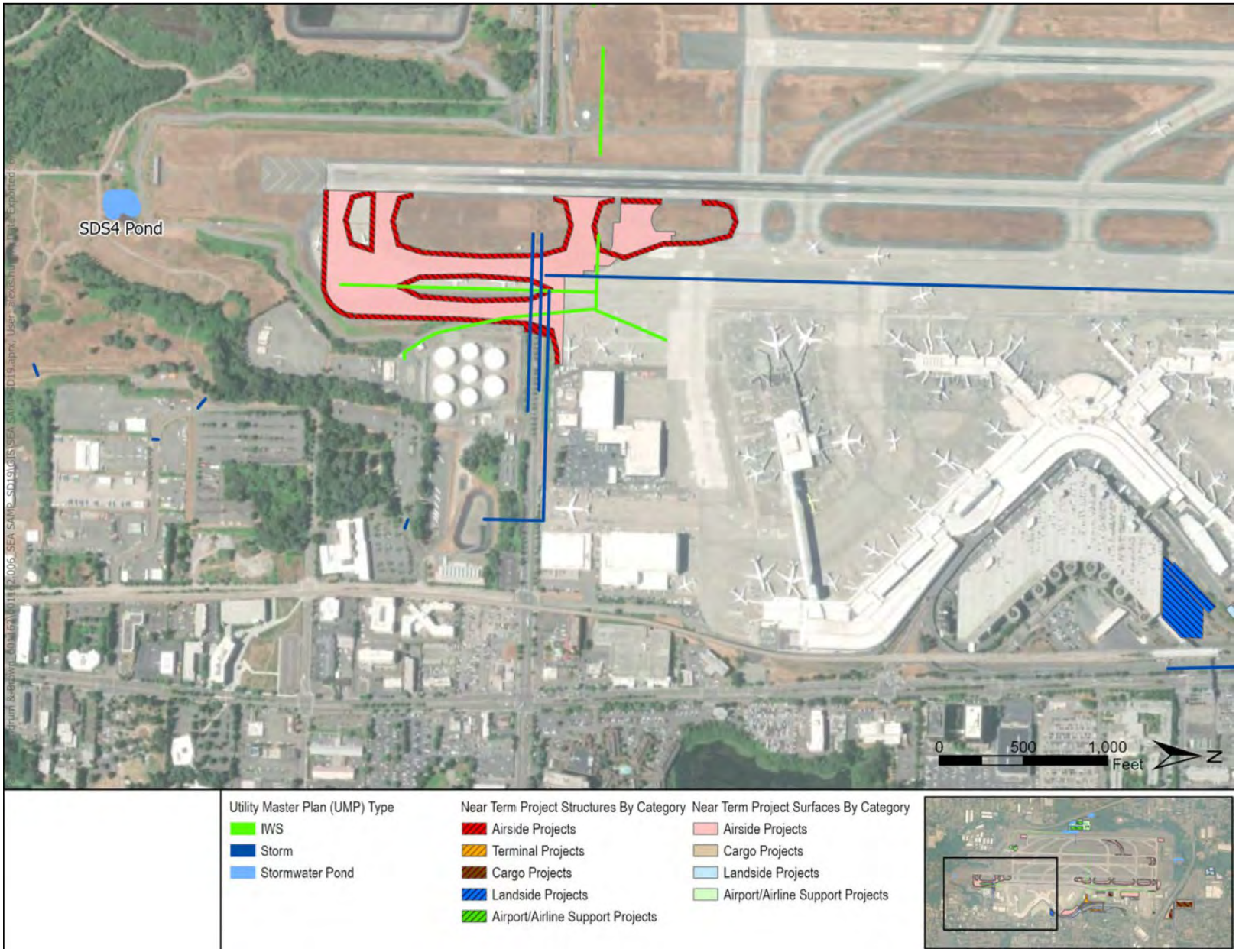


Figure 10. Proposed SDS and IWS projects, southwest section of project area

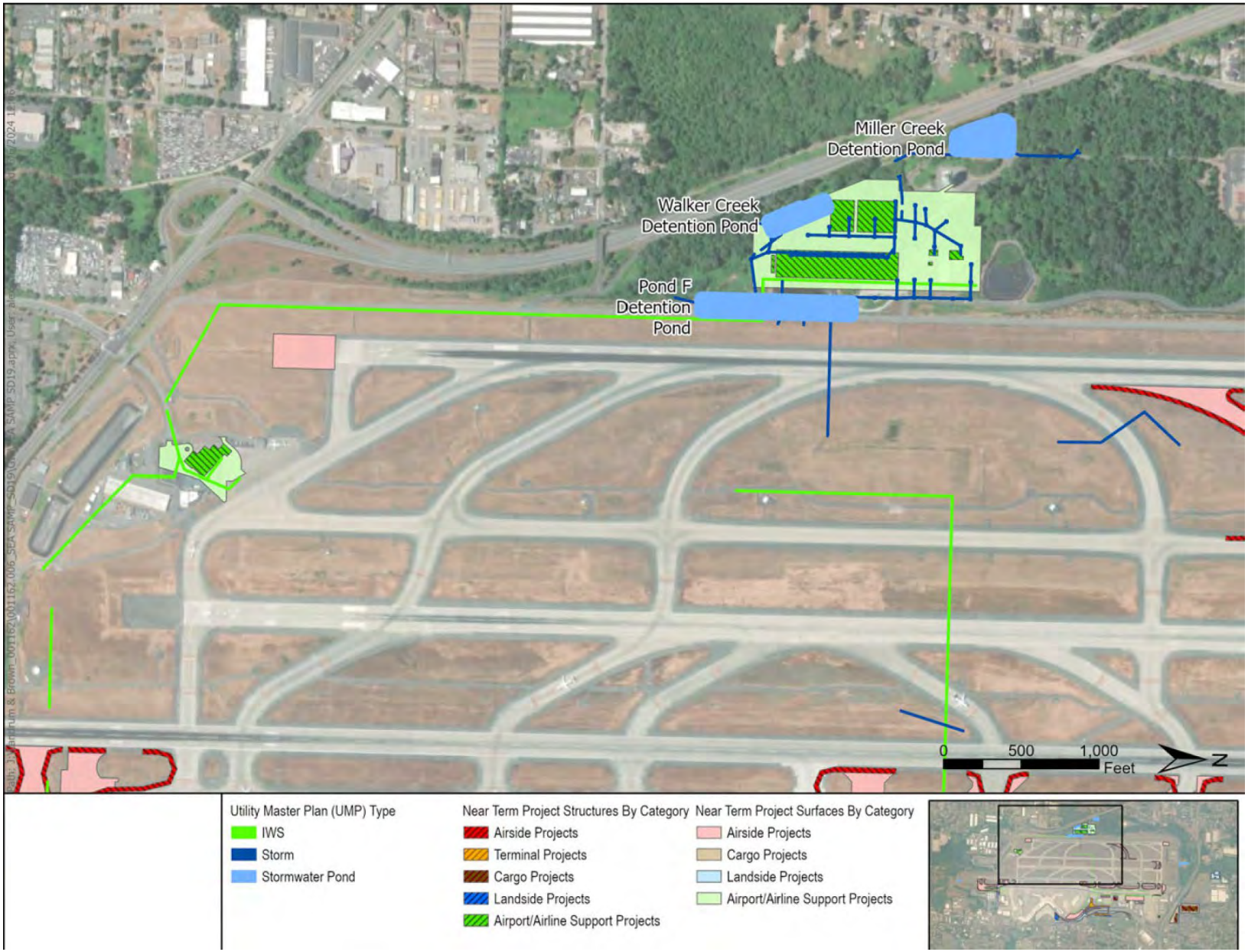


Table 4. Existing and proposed structural and OSC BMPs and net change in impervious area and PGIS resulting from the Proposed Action by drainage basin and receiving body.

Receiving Water	SDS/IWS Drainage Basin	Existing Drainage Total Area (acres)	Existing Drainage Basin Total Impervious (acres)	Existing Drainage Basin NPGIS (acres)	Existing Drainage Basin PGIS (acres)	Existing Structural Source Control BMPs and Treatment Level[2]	Proposed Structural Source Control BMPs and Treatment Level[2]	OSC BMPs[3]
Des Moines Creek East	SDD05B	22.8	9.6	0.2	9.5	Oil/Enhanced ▪ Vegetated filter strips. ▪ SEPL Bioretention Swale. ▪ SDD05B Pond, enhanced level 1 flow control.	Increase Enhanced treatment capacity: ▪ Expand SDD05B Pond volume by 2.3 acre-feet. ▪ Pursue opportunities for infiltration if practicable. ▪ Integrate on-site LID techniques where practicable.	SM
	SDD06A	45.3	27.2	3.0	24.1	Oil/Enhanced ▪ 4 Biofiltration swales followed by oyster shell media bed. ▪ Oil/water separators. ▪ SDD06A Pond – Level 1 flow control detention pond.	Increase Enhanced treatment capacity: ▪ Expand existing detention pond volume by 6.4 acre-feet. ▪ Pursue opportunities for infiltration if practicable. ▪ Integrate on-site LID techniques where practicable.	SM
	SDE4/SDS1	190.2	141.9	40.4	101.5	Oil/Enhanced ▪ SDS1: Bioswales (SDS1). ▪ SDE4: SE Pond detention and treatment – Enhanced Level 1. ▪ 600-cartridge media filter vault with enhanced treatment. ▪ Media-augmented biotreatment swale. ▪ Oil/water separators.	Increase Oil/Enhanced treatment capacity: ▪ Install two oil/water separators and canister filters. ▪ Additional water quality treatment for runoff from garage and toll booth plaza.	SS, SM
	Receiving water totals	*258.3*	*178.6*	*43.6*	*135.1*			
NW Ponds and Des Moines Creek West	SDS4	67.6	25.9	0.1	25.9	Oil/Enhanced: ▪ Compost amended vegetated filter strips. ▪ SDS4 Pond. ▪ Biotreatment swale with design media. ▪ Oil/water separators.	Add additional Basic treatment capacity: ▪ Expand SDS4 Pond detention volume and bioretention swale footprint at outfall. ▪ Expand detention volume by 0.1 acre-feet to address development within basin only (assuming no diversion from SDS3/5). ▪ Expand bioretention swale footprint by 90 square feet or provide equivalent detention and treatment alternative. ▪ Integrate on-site low-impact development techniques as feasible. ▪ Pursue opportunities for shallow / deep infiltration to offset storage requirements.	R3, SM
	SDS3/5	456.8	250.6	3.2	247.3	Oil/Enhanced: ▪ Compost amended vegetated filter strips. ▪ Two bioswales. ▪ Two enhanced Level 1 flow control detention facilities.	Expand Basic treatment capacity: ▪ Divert runoff to SDS4 outfall to avoid need for additional storage. ▪ Increase detention pond volume.	R3, SM
	SDS6/7	117.1	48.2	0.1	48.1	Enhanced: ▪ 3.5-acre-foot vault for enhanced level 1 flow control. ▪ Compost-amended vegetated filter strips. ▪ Bioswales adjacent to runways and taxiways.	Maintain existing Enhanced treatment capacity	R3, SM
	Receiving water totals	*641.5*	*324.7*	*3.4*	*321.3*			
Miller Creek	SDW1b	87.5	25.3	0.0	25.3	Enhanced: ▪ Compost amended vegetated filter strips. ▪ SDW1B Pond (Pond D) for flow control. ▪ Sedimentation management for water quality.	Increase Enhanced treatment capacity: ▪ Expand SDW1b Pond detention volume by 4.4 acre-feet. ▪ Provide additional source controls, including oil/water separator. ▪ Pursue opportunities for infiltration. ▪ Integrate LID techniques where practicable.	R3, SM
	SDN3A	33.9	8.1	0.1	8.0	Enhanced: ▪ Compost amended vegetated filter strips. ▪ SDN3A Pond (Pond C) -- Level 2 flow control. ▪ Sedimentation management for water quality.	Maintain existing Enhanced treatment capacity	R3, SM
	New Development North of SR 518	42.7	0.9	0.0	0.9	N/A	Develop new Enhanced treatment capacity: ▪ Install new on-site detention and water quality treatment.	SM
	Receiving water totals	*121.4*	*33.4*	*0.1*	*34.2*			

2 Oil, Basic, and Enhanced structural treatment levels as defined by Ecology (2019), see Table 5.
3 OSC BMPs applicable to 6PPD-Q and other stormwater contaminants: R3 (runway rubber removal); SS (dry sweeping of PGIS); SM (sedimentation management). See Section 2.7.2 for details.

Receiving Water	SDS/IWS Drainage Basin	Existing Drainage Total Area (acres)	Existing Drainage Basin Total Impervious (acres)	Existing Drainage Basin NPGIS (acres)	Existing Drainage Basin PGIS (acres)	Existing Structural Source Control BMPs and Treatment Level[2]	Proposed Structural Source Control BMPs and Treatment Level[2]	OSC BMPs[3]
Miller Creek vía Lake Reba	SDN2/3/4	115.9	44.6	0.4	44.2	Enhanced: ▪ Compost amended vegetated filter strips in airfield. ▪ SDN2/3/4-POND (Pond M) for flow control. ▪ Sedimentation management for water quality.	Increase Enhanced treatment capacity: ▪ Expand SDN2/3/4 Pond detention volume by up to 4.7 acre-feet. ▪ Pursue opportunities for infiltration at SR518 Pond. ▪ Integrate on-site LID techniques where practicable.	R3, SM
	Receiving water total	*115.9*	*44.6*	*0.4*	*44.2*			
Walker Creek	SDW2/SDW2A	44.4	10.8	0.0	10.8	Basic/Enhanced: ▪ Compost amended vegetated filter strips. ▪ SDW2-POND (Pond F) for flow control. Sedimentation management for water quality.	Increase Enhanced treatment capacity, add Oil treatment: ▪ Detention Pond F displaced by NTP S07. Relocate or convert to an underground vault with total storage capacity of 14.3 acre-feet (existing plus 2.4 acre-feet of additional storage). ▪ Expand SDW2 Pond detention volume and relocate basin to accommodate development. ▪ Integrate on-site LID techniques where practicable. ▪ Pursue opportunities for shallow / deep infiltration to offset storage requirements if practicable. ▪ Provide additional treatment including oil/water separator. ▪ Pursue opportunities for infiltration.	R3, SM
	Receiving water totals	44.4	10.8	0.0	10.8			
Puget Sound and/or Sanitary Sewer	IWS Combined	372.4	339.1	16.1	323.0	IWTP treatment (oil/basic): ▪ Oil/water separators. ▪ 6 dissolved air flotation units (DAFs) ▪ Settling Lagoons 1, 2, and 3	Increase on-site IWTP treatment and storage capacity: ▪ Convert SDS vaults SDS3 and SDS3A to IWS vaults. ▪ Construct 5.68 miles of new IWS pipe for vault discharge to IWS.	SS, SM
	Receiving water totals	*372.4*	*339.1*	*16.1*	*323.0*			

Table 5. Structural treatment level definitions

Structural Treatment Level	Treatment Objectives
Oil	▪ No ongoing or recurring visible sheen. ▪ Daily average total petroleum hydrocarbon concentration no greater than 10 milligrams per liter (mg/L) with a maximum of 15 mg/L for discrete (grab) samples.
Basic	▪ 80 percent removal of total suspended solids for an influent concentration range of 100 mg/L to 200 mg/L.[1] ▪ For influent concentration less than 100 mg/L the effluent goal is 20 mg/L total suspended solids.[1]
Enhanced	Meet Basic Treatment objectives, and provide: ▪ 30 percent removal of dissolved copper for influent concentration range of 0.005 mg/L to 0.02 mg/L[1] ▪ 60 percent removal of dissolved zinc for influent concentration range of 0.02 mg/L to 0.30 mg/L[1]
Phosphorous	▪ Meet Basic Treatment objectives and provide 50 percent total phosphorus removal for an influent concentration range of 0.1 to 0.5 mg/L.[1]

[1] Samples with influent concentrations that are greater than the range may be included by artificially setting the value at the upper end of the concentration range prior to completing the pollutant removal efficiency calculations. If the applicant opts to include samples with concentrations that are greater than the influent concentration range, they must include all valid samples that are greater than the range.

Table 6. Proposed stormwater and wastewater PSPs

Project Type	PSP	Permanent Footprint (acres)	Temporary Construction Footprint (acres)	Impervious Surface in Construction Footprint (acres)[1, 2]
SDS lines	Construct 5.93 miles of new SDS lines	n/a (buried)	14.4	9.7
IWS lines	Construct 5.68 miles of new IWS lines	n/a (buried)	13.7	8.8
Expand existing detention ponds	Expand SDS4 Pond by 0.1 acre	0.13	0.63	0.1
	Expand Pond M by 0.7 acre	0.76	1.87	0.8
Construct new detention ponds	Miller Creek pond	1.13	1.27	0.3
	Pond F relocation	1.69	2.56	0.9
	Walker Creek pond	0.49	1.18	1.4

[1] SDS and IWS lines are buried construction. A portion of line length routed under existing impervious surfaces (e.g., access roads). All affected surfaces are PGIS as detailed in Table 2. Remaining length would require clearing and excavation of managed fields and existing vegetation. All excavated surfaces would be restored to prior condition on completion of construction and would result in no net change in impervious and PGIS acreage.

[2] Detention pond construction activities would impact impervious surfaces around pond perimeters. The affected acreage is all NPGIS.

2.5 Project Construction

The Proposed Action would be constructed in stages beginning in 2025 and continuing through 2032[4]. The project designs for each NTP and associated PSPs are still in development and project-specific details are not yet available. Each project would be constructed using typical methods and equipment employed in large facility and infrastructure development. The specific types of construction equipment, number of equipment units, and construction scheduling would be determined during the project design process and may be modified to comply with relevant permit requirements.

2.5.1 Construction Equipment

Anticipated equipment types are shown in Table 7. Not all the equipment types shown would be used on every NTP project. For example, the hardstand and blast pad projects would not require cranes or power tools but would likely require excavators, graders, ground compactors, concrete mixers, and haul trucks. In contrast, new terminal development would require a broad range of construction equipment at various stages of construction.

Table 7. Anticipated construction equipment types

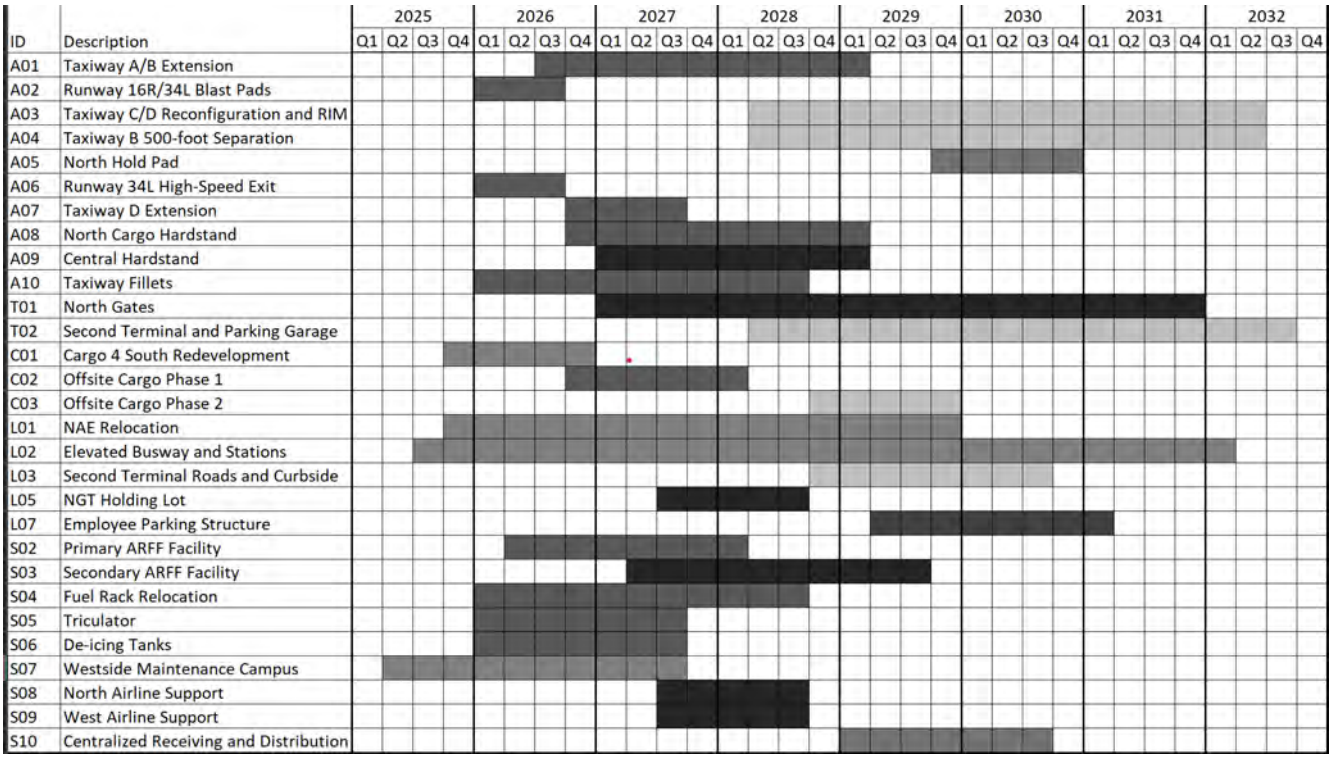
Equipment Category	Equipment Type		
General	Asphalt Truck	Flat Bed Truck	Street Sweeper
	Water Tanker Truck		
Heavy	Auger Drill Rig	Drill Rig Truck	Mounted Impact Hammer (hoe ram)
	Backhoe	Drum Mixer	Rock Drill
	Clam Shovel (dropping)	Dump Truck	Roller
	Compactor (ground)	Excavator	Slurry Plant
	Compressor (air)	Forklift	Slurry Trenching Machine
	Concrete Mixer Truck	Front End Loader	Vacuum Excavator (Vac-Truck)
	Concrete Pump Truck	Grader	Vibrating Hopper
	Crane	Horizontal Boring Hydraulic Jack	Vibratory Pile Driver
	Dozer	Impact Pile Driver	Woodchipper
Light	Boring Jack Power Unit	Jackhammer	Vacuum Street Sweeper
	Generator	Man Lift	Vibratory Concrete Mixer
	Grapple (on backhoe)	Sand Blasting	
Paving	Concrete Saw	Paver	Pavement Scarifier
Misc.	Hot Tar Kettle Trailer	Refrigerator Unit	Ventilation Fan
	Pumps	Scraper	Warning Horn
Power/Hand Tools	Chain Saw	Hammer Drill	Rivet Buster/Chipping Gun
	Grinder	Pneumatic Tools	Welder/Torch

4 Construction will begin once all environmental processes have been completed, all permits are acquired, and the project is ready to move forward.

2.5.2 Preliminary Project Schedule

The preliminary construction schedule for the NTPs and associated PSPs is provided in Figure 11. As shown, NTP construction would commence in 2025[5] and would continue through 2032. The 29 planned NTP projects would be staggered, with four projects commencing construction in 2025, 11 in 2026, six in 2027, five in 2028, and three in 2029. The anticipated duration of construction varies depending on the complexity of the project, ranging from less than one year to over 6 years.

Figure 11. Preliminary NTP construction schedule



2.6 Wetland Mitigation

The Port selected the proposed sites for project development to avoid and minimize impacts to wetlands, streams, and buffers to the extent practicable. The Port will continue to explore opportunities to further reduce impacts during design; however, based on the proposed NTP footprints, some impacts to wetlands, streams, and associated buffers are likely to occur. The anticipated permanent impacts, which are described in Section 5.1.2, are used to estimate mitigation requirements. These impact estimates represent a worst-case scenario based on currently available information. The Port would fully restore all sites temporarily impacted by project construction.

5 Construction will begin once all environmental processes have been completed, all permits are acquired, and the project is ready to move forward.

2.6.1 Anticipated Wetland Mitigation Requirements

The Port anticipates that the Proposed Action could result in up to 0.58 acre of permanent impacts to delineated Category II and III wetlands. Up to 0.55 acre of this total may be avoided if a stormwater vault is constructed in lieu of the proposed Miller Creek detention pond.

Compensatory mitigation requirements are dictated by federal, state, and local guidance. Table 8 identifies the compensatory mitigation ratios for Category II and III wetlands recommended by an interagency review committee representing the U.S. Army Corps of Engineers (USACE) Seattle District, U.S. Environmental Protection Agency (USEPA) Region 10, and Ecology (Ecology et al. 2021).

Table 8. Recommended compensatory wetland impact mitigation ratios by mitigation type.

Wetland Category[1]	Buffer Mitigation	Wetland Mitigation Ratio[2]		
		Creation or Reestablishment	Rehabilitation	Enhancement
Category II	1:1	3:1	6:1	12:1
Category III	1:1	2:1	4:1	8:1

[1] Hruby and Yahnke (2023).

[2] Ecology, USACE Seattle District, and USEPA Region 10 (2021).

Parametrix (2024a) characterized projected impacts to wetlands and wetland buffers resulting from the NTPs and associated PSPs (Appendix C). Projected mitigation requirements for the anticipated acres of impacts from the Proposed Action on Category II and III wetlands are provided in Table 9.

The Proposed Action would include 2.65 acres of mitigation for wetland buffer impacts and at least 1.17 acres and potentially up to 4.68 acres of compensatory mitigation for wetland impacts, depending on the type of mitigation provided. In addition, improvements to an existing culvert crossing on Miller Creek as part of S07 would result in impacts to streams (0.02 acre) and stream buffers (0.13 acre).

Table 9. Anticipated compensatory wetland mitigation acreage requirements.

Project Element	Wetland Category	Impacts Resulting from Proposed Action (acres)		Compensatory Wetland Mitigation Requirement by Type (acres)			
		Wetland	Buffer	Re-establishment	Rehabilitation	Enhancement	Buffer
NTPs	III	0.02	2.30	0.04	0.08	0.16	2.30
PSP – UMP sanitary sewer line	III	0.00	0.01	0.00	0.00	0.00	0.01
PSP – Stormwater conveyance	II	0.01	0.23	0.03	0.06	0.12	0.23
PSP – Stormwater ponds	III	0.55	0.11	1.10	2.75	4.40	0.11
Total Areas		0.58	2.65	1.17	2.89	4.68	2.65

Source: Parametrix (2024a).

2.6.2 Mitigation Plan and Sequencing

The Port would develop a compensatory mitigation plan for unavoidable permanent impacts to wetlands, streams and associated buffers, and temporary impacts to wetlands lasting more than one year during the permitting phase for each project in accordance with applicable state and federal guidance (Ecology et al. 2006, 2021). The mitigation plan would be developed following a mitigation sequencing approach based on a hierarchy of avoiding and minimizing impacts during design, rectifying temporary impacts, and compensating for unavoidable impacts.

The Port has seven sites within its ownership identified as being suitable for compensatory wetland mitigation (Anchor QEA 2019). Six sites are on SEA property and one site is located along the Green River in Auburn. They encompass over 150 acres and include potential for greater than 40 acres of wetland re-establishment, 11 acres of wetland enhancement, almost eight acres of preservation, and 80 acres of buffer enhancement (Anchor QEA 2019). The Port anticipates that these sites have sufficient capacity to accommodate the mitigation requirements for the Proposed Action. However, other mechanisms, such as purchasing mitigation credits from banks or in-lieu fee programs, or a combination of these mechanisms may be used to meet mitigation requirements.

If practicable, all permanent stream and stream buffer impacts would be mitigated by fully restoring the affected habitat functions on site or in proximity to the impacts. Should this approach prove infeasible, SEA is within the service area of several existing mitigation banks and in-lieu fee programs with available mitigation credits sufficient to offset the projected impacts.

To the extent possible, the Port would emphasize in-kind mitigation within the same watershed where the impacts occurred. However, out of watershed mitigation (e.g., at the Green River site) may be considered should state and federal resource agencies determine this would produce the most desirable ecological outcomes. Regardless of mechanism, the Port will commit to providing sufficient mitigation to comply with local, state, and federal requirements at the highest replacement ratios.

2.7 Best Management Practices

The Port would comply with standard specifications, BMPs, and applicable federal and state regulatory requirements during design, construction, and operation of the Proposed Action. BMPs that are designed to protect water and sediment quality with vegetation are expected to be most effective at reducing adverse effects from stormwater discharges over short and long terms.

2.7.1 Construction Best Management Practices

The SEA SWPPP (Port 2021e, or current version) defines compliance requirements and expectations for all construction activities that occur on Port property. This plan is periodically updated to reflect current state and federal guidance and regulatory requirements for avoiding and minimizing impacts to the environment. It comprises the following 13 programmatic elements:

1. Preserving Vegetation and Marking Clearing Limits: Maintain natural vegetation to the extent practicable, and clearly mark construction limits to minimize land-disturbing impacts.
2. Establishing Construction Access: Minimize construction activity in unpaved areas, establish stabilize access points, and use vacuum sweeping and wheel washing to limit sediment track out.

3. Control Flow Rates: Stormwater management measures to minimize discharge and runoff from construction sites.
4. Sediment Controls: Filter all stormwater runoff through appropriate sediment removal BMPs and test to verify compliance with turbidity and pH limits before discharge from the site.
5. Soil Stabilization: Stabilize exposed and unworked soil with application of effective BMPs to prevent erosion throughout the life of the project.
6. Slope Protection: Design, construction, and protection of cut and fill slopes to minimize erosion.
7. Drain Inlet Protection: Protect storm drain inlets/culverts using temporary plugs, phasing, and/or inlet protection to prevent untreated water from entering drainage conveyance system.
8. Channel and Outlet Stabilization: Design, construction, and protection of temporary onsite conveyance channels to prevent erosion from the expected peak 10-minute velocity of flow from a 10-year, 24-hour recurrence-interval storm.
9. Pollutant Control: All pollutants, including waste and demolition debris, generated onsite will be handled and disposed of in a manner that does not cause contamination of stormwater.
10. Dewatering Control: Discharge dewatering water from open-cut excavation, tunneling, foundation work, trenches, or underground vaults into a controlled conveyance system prior to discharge to a sediment trap or sediment pond.
11. Construction BMP Maintenance: Inspection, maintenance, and repair of temporary and permanent erosion and sediment control BMPs as needed to ensure continued performance in accordance with intended functions. Visual monitoring of the BMPs should be conducted daily and within 24 hours of any stormwater or non-stormwater discharge from the site.
12. Project Management: Scheduling, phasing, inspecting, maintaining, and managing construction projects to avoid/minimize stormwater impacts. Includes seasonal phasing of ground-disturbance.
13. Protect Low-Impact Development (LID) BMPs: All LID BMPs on and downstream of Port property will be protected by appropriate erosion and sediment control BMPs.

The Port requires every construction project on SEA property to develop a site-specific construction SWPPP that details the methods and procedures used to comply with the programmatic elements listed above, and the Port's standard operating procedures for construction water quality monitoring (Port 2016a). The Port would require each contractor to develop Construction SWPPPs for their respective projects. The typical Construction SWPPP comprises:

- Stormwater BMP implementation and site-specific performance monitoring plan, (required for all sites larger than 1 acre)
- Pollution Prevention Plan (PPP): site-specific hazardous materials management plan
  - Site specific description and drawings
  - Contractor pollution prevention contact personnel
  - Known or potential hazardous materials inventory list
  - Safety data sheets all inventoried hazardous materials
  - Container labeling system

- Container storage and handling procedures
- Spill prevention, control, and response procedures
- Hazardous material cleanup and disposal procedures
- Reporting procedures
- Signed acknowledgement of PPP requirements by all subcontractors

- Contractor Erosion and Sediment Control Plan (site-specific)
  - Site description and drawings
  - Contractor-designated erosion and sediment control personnel
  - Construction schedule and sequencing
  - BMP installation, maintenance, and inspection procedures
  - Record keeping requirements
  - BMP removal procedures
  - Emergency response plan
  - Construction dewatering plan
  - Fugitive dust management plan
  - Utility plan
  - Contractor education procedures
- Contract plans and specifications

2.7.2 Operational Source Control Best Management Practices

The Port would continue to implement the 16 OSC BMPs detailed in the SEA SWPPP (Port 2022b) to avoid and minimize adverse impacts to ESA-listed species. These BMPs, outlined in Table 10, would be adapted as needed to address ongoing and new operational activities resulting from the Proposed Action. OSC BMP 1.0 defines a set of 39 management measures grouped into 8 categories. These categorical measures apply to all potential pollutant generating operations that occur on Port property. The remaining 15 OSC BMPs specify the additional categorical measures used to avoid and minimize stormwater impacts from specific operations and maintenance activities.

Table 10. OSC BMP summary

OSC BMP	Purpose	Targeted Pollutant(s)	Measures
1.0 – General Industrial Activities	Established general compliance measures for preventing and reducing discharge of pollutants to the SDS and IWS. This BMP comprises 39 compliance measures that are applicable to all Port and tenant operations with potential to impact stormwater.	All potential pollutants used or generated on Port property.	39 general measures in 8 categories: ▪ *Pollution prevention team:* Establishes responsibilities, points of contact, and communication protocols. ▪ *Good housekeeping practices*: Establish standard practices for pollutant prevention, interception, and IWS and SDS maintenance of treatment systems to limit pollutant releases. ▪ *Minimizing exposure of pollutants to stormwater*: Limits industrial activities and hazardous materials handling to IWS drainage basins. ▪ *Preventative maintenance*: Routine maintenance of SDS and IWS to ensure that system is functioning at maximum pollutant control capacity and efficacy. ▪ *Spill prevention and response planning*: Spill prevention and response planning and compliance procedures. ▪ *Facility inspections*: Routine inspection of Port facilities and Port and tenant activities to ensure proper function and compliance with BMPs. ▪ *Employee/tenant/contractor training*: Training to ensure familiarity and compliance with Port environmental policies and procedures, including BMP implementation. ▪ *Recordkeeping and reporting*: Establishes procedures for compliance with NPDES Permit reporting requirements.
2.0 – Aircraft, Vehicle, and Equipment Maintenance	Preventing and reducing releases of pollutants associated with aircraft, vehicle, and equipment maintenance activities.	▪ Fuel, oil, grease ▪ Solvents/ cleaning solutions ▪ Battery acid ▪ Paint ▪ Anti-freeze ▪ Other vehicle fluids	13 activity-specific pollution control measures in the *good housekeeping practices, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response,* and *routine facility inspections* categories.
3.0 – Aircraft, Vehicle, and Equipment Cleaning	Prevent and reduce releases of pollutants associated with aircraft, vehicle, and equipment washing, and cleaning and degreasing actions.	▪ Oil and grease ▪ Solvents ▪ Vehicle fluids ▪ Cleaning solutions	Nine activity-specific pollution control measures in the *good housekeeping practices, minimize exposure of pollutants to stormwater, preventative maintenance, routine facility inspections,* and *recordkeeping and reporting* categories.
4.0 – Aircraft, Vehicle, and Equipment Storage	Prevent fuel spills/leaks, prevent contact with petroleum products and metals, and reduce their impacts to stormwater.	▪ Oil and grease ▪ Fuel ▪ Vehicle fluids ▪ Metals	Five activity-specific pollution control measures in the *good housekeeping practices* and *minimize exposure of pollutants to stormwater* categories.
5.0 – Outdoor Handling, Storage, and Disposal of Wastes and Materials	Prevent or reduce the discharge of pollutants to stormwater from outdoor handling, storage, and disposal of materials and waste.	All potential pollutants used or generated on Port property	▪ 24 activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response, routine facility inspections, employee/contractor training,* and *recordkeeping and reporting* categories. ▪ Management of stormwater runoff measures to protect waste material storage areas from stormwater accumulation and runoff (e.g., prioritizing indoor storage, coverage for outdoor storage areas, secondary containment, etc.).

OSC BMP	Purpose	Targeted Pollutant(s)	Measures
6.0 – Fuel Storage and Delivery	Prevent fuel spills and leaks and reduce their impacts to stormwater.	Fuel and petroleum products	21 activity-specific pollution control measures in the *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response, routine facility inspections, employee/contractor training, and recordkeeping* and *reporting* categories.
7.0 – Building and Grounds Maintenance	Prevent or reduce discharge of pollutants through best practices for building/grounds maintenance, keeping debris from entering storm drains, and routine maintenance of stormwater system.	▪ Pesticides/herbicides /fertilizers ▪ Oil and grease ▪ Zinc ▪ Landscape waste ▪ Washdown waste ▪ Sediment ▪ Particulate matter (paint chips, roofing aggregate, tire dust)	24 activity-specific pollution control measures in the *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response, routine facility inspections,* and *employee/contractor training* categories. These measures include: ▪ Dry sweeping of aircraft and vehicle operations surfaces. ▪ Runway rubber removal. ▪ Routine maintenance and cleaning of catch basins, vaults, and separators to remove accumulated particulates, including rubber particles.
8.0 – Vehicle and Equipment Painting	Prevent the discharge of pollutants to stormwater from vehicle and equipment painting.	▪ Paint ▪ Metals ▪ Solvents	14 activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response, management of stormwater runoff,* and *employee/contractor training* categories.
9.0 – Garbage Handling and Disposal	Prevent or reduce discharge of pollutants to stormwater from garbage/municipal solid waste handling/disposal by preventing runoff from trash compactors and dumpsters.	▪ Dumpster waste ▪ Compactor fluids ▪ Trash ▪ Nutrient pollution contributing to biological oxygen demand (BOD)	Nine activity-specific pollution control measures in the *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, routine facility inspections, management of stormwater runoff,* and *employee/contractor training* categories.
10.0 – Aircraft De-icing and Anti-icing	Prevent discharge of pollutants to stormwater from aircraft de-icing and anti-icing procedures.	▪ Ethylene glycol ▪ Propylene glycol ▪ BOD	10 activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response,* and *routine facility inspections* categories.
11.0 – Aircraft Lavatory Waste Servicing	Prevent the discharge of pollutants to stormwater from aircraft de-icing and anti-icing procedures.	▪ Lavatory chemicals ▪ Lavatory waste ▪ Lavatory truck wash water	10 activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, spill prevention and response, routine facility inspections,* and *management of stormwater runoff* categories.
12.0 – Potable Water System Flushing	Prevent discharges to the storm drain system associated with flushing of aircraft and vehicle potable water systems.	▪ Purine ▪ Chlorine bleach	Two activity-specific pollution control measures in the minimize exposure of pollutants to stormwater category.
13.0 – Roadway, Ramp, and Runway Maintenance and Cleaning	Prevent or reduce the discharge of pollutants to stormwater from maintenance activities, and through routine cleaning of roads, ramps, and runways.	▪ Oil and grease ▪ Fuel ▪ De-icing/anti-icing compounds ▪ Solvents/cleaning solutions ▪ Chemicals ▪ Sediments ▪ Foreign object debris ▪ Tire particles	10 activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance, routine facility inspections,* and *management of stormwater runoff* categories.

OSC BMP	Purpose	Targeted Pollutant(s)	Measures
14.0 – Fire Suppression and Aqueous Film Forming Foam Discharge	Prevent discharges to the storm drain system associated with flushing or testing of firefighting foam systems.	Aqueous film-forming foam	Five activity-specific pollution control measures in *good housekeeping, minimize exposure of pollutants to stormwater, preventative maintenance,* and *routine facility inspections* categories.
15.0 – Animal Handling	Prevent discharges to the storm drain system associated with animal handling and cargo.	Fecal coliform	Five activity-specific pollution control measures in *good housekeeping* and *minimize exposure of pollutants to stormwater* categories.
16.0 – Spill Response and Clean-Up	Identify and establish roles and responsibilities for all spills at SEA.	▪ Fuels ▪ Biffy spills ▪ Hydraulic fluids ▪ Oil and grease ▪ Glycols ▪ De-icing/anti-icing chemicals	Establishes standard spill response practices and notification procedures for spills by pollutant category.

Table 4 (see Section 2.4.2) identifies 3 OSC activities that are relevant for avoiding and minimizing impacts to ESA-listed species from stormwater contaminants: runway rubber removal, impervious surface sweeping, and detention basin, vault, and separator maintenance. These specific activities, associated OSC BMPs, and typical frequency are described in Table 11.

Table 11. OSC BMP activities to avoid/minimize risks to aquatic habitat from 6PPD-Q and metals.

OSC Activity (code)	Associated OSC BMPs	BMP Activities and Frequency
Runway rubber removal (R3)	1.0, 13.0	▪ Regular testing of runways for rubber accumulation. ▪ Rubber removals are scheduled based on observed accumulation levels. ▪ Typical removal frequencies are every 6 weeks for runway 16R/34L, twice a year on 16C/34C, and four times/year for 16L/34R.
Surface sweeping (SS)	1.0, 7.0, 13.0	▪ Dry sweeping of roads, ramps, and runways to prevent or reduce the discharge of pollutants to stormwater from maintenance and cleaning of PGIS. ▪ Sweeping occurs daily on both landside and airside pavements.
Detention basin, vault, and separator maintenance (SM)	1.0, 7.0	▪ Regular cleaning and maintenance of manhole sumps and oil/water separators. ▪ Regularly clean any catch basins which receive runoff from a maintenance area. Install and maintain catch basin filter inserts in areas prone to high volumes of debris. ▪ Regularly inspect and maintain stormwater control devices. ▪ Remove accumulated sediment from targeted ponds and vaults annually in the summer, prior to fall rains (i.e., first flush).

2.8 Additional Conservation Measures

The Port's Aviation Environmental staff have been proactively reviewing available research and guidance on stormwater management of 6PPD-Q since the University of Washington published their findings on this emerging contaminant in late 2020. The Port is voluntarily conducting research on the fate and transport of 6PPD-Q at SEA, and the effectiveness of available treatment methods. Current activities include:

- Ongoing participation in Ecology's Stormwater Working Group and 6PPD-Q subgroup.
- Funding an independent stormwater media treatment study (Treatability Testing) to determine if available technologies can effectively remove 6PPD-Q from SEA stormwater discharge. Four commercially available filter media are being evaluated individually and in combination with Chitosan Enhanced Sand Filtration (CESF):
  - Chitosan Enhanced Sand Filtration (CESF) - Combines chitosan (shells from crustaceans) with sand filtration to remove pollutants from water.
  - Virgin Coconut Carbon (VCC) - Adsorption media effective at removing most compounds found in both stormwater and process water.
  - Hydrosil HS-250 (HS250) - A 50/50 mix of a pure zeolite based organoclay and 6 x 30 tyler mesh anthracite coal that is effective at removing oil, heavy metals, and organics from water.
  - SCU-Evoqua (SCU) - An Ion exchange media effective at removing trace metals from water.
  - Biochar-Black Owl Stormwater Mix (Biochar) - A biochar-based media effective at removing COD, TSS, metals, and Mercury from stormwater.

The Treatability Testing study is an incredibly proactive approach. The Port is searching for solutions years before regulations are in place. The results of this study will be useful in finding BMPs other than 100% infiltration that are effective at removing 6PPD-Q from stormwater given the limited availability of 100% infiltration. Completion of the final Treatability Testing study report is anticipated in 2024, depending on when the USEPA finalizes their guidance on testing methods for 6PPD-Q. The Port is prepared to share the findings of this study with NMFS and Ecology's Stormwater Working Group when the results are available. The Port is hopeful that this effort will contribute to regional efforts to reduce the adverse effects of 6PPD-Q on the aquatic environment.

3.0 ACTION AREA

The action area for this 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 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.

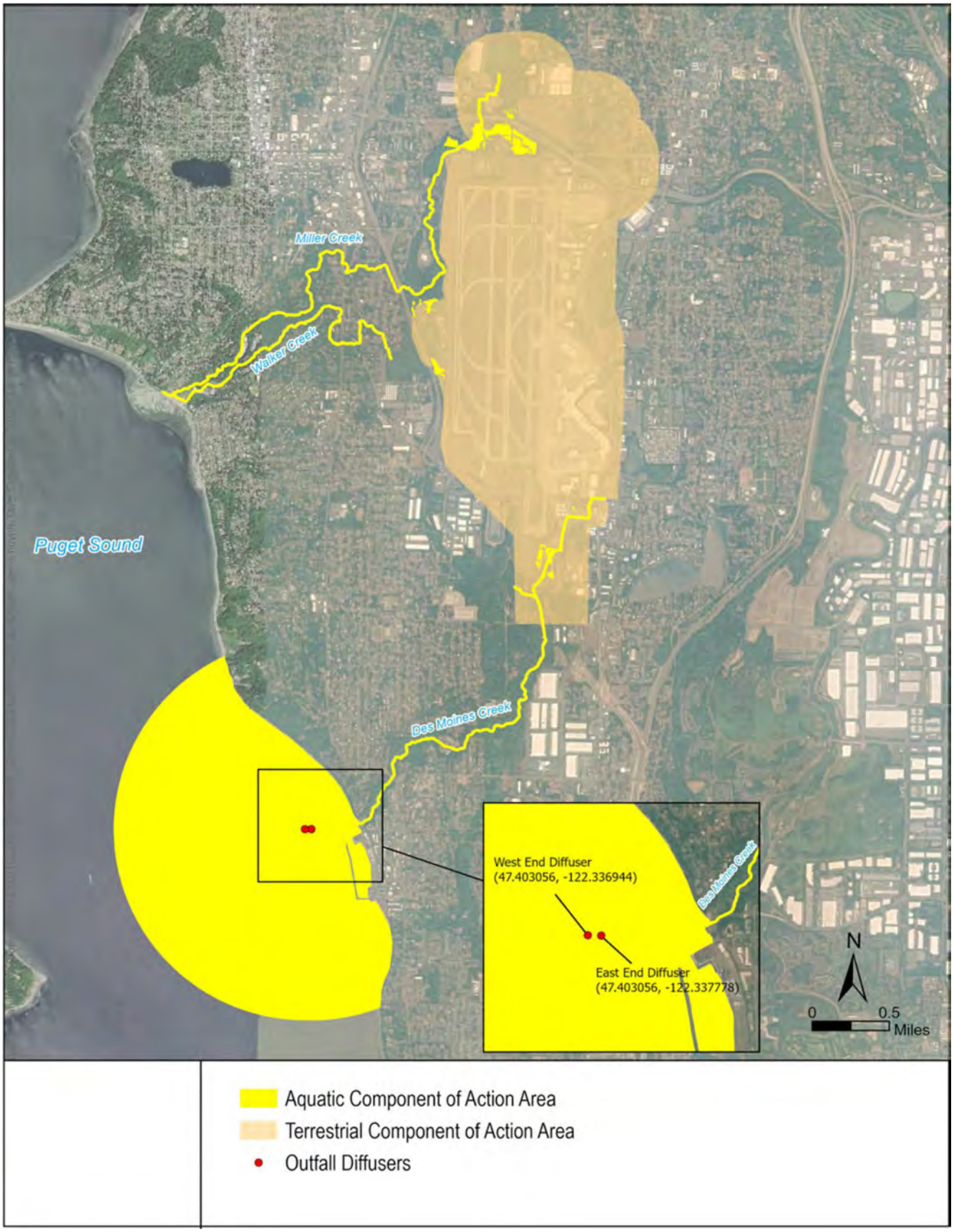
The Proposed Action would result in temporary and permanent modification to existing developed and undeveloped surfaces on Port property. The Proposed Action would retrofit existing and create new impervious surfaces. In addition, project construction would result in temporary and permanent impacts to wetlands, streams, and buffer habitats.

The action area comprises discrete terrestrial and aquatic components, which are summarized in Table 12 and displayed on Figure 12. As described in Section 3.1, the terrestrial component of the action area comprises all habitats directly within the construction footprint of the NTPs, PSPs, and mitigation, areas exposed to construction noise and activity levels that exceed baseline conditions, and project operations. The aquatic component of the action area is described in Section 3.2 and comprises all aquatic habitats exposed to temporary and permanent construction impacts and anticipated operational stormwater and industrial treated wastewater discharges from the NTPs.

Table 12. Action area dimensions

Action Area Component	Location(s)	Impact Producing Activity	Dimensions
Terrestrial	Locations where construction or operations would occur, including wetland buffers and areas exposed to construction noise above ambient levels.	▪ NTP and PSP construction ▪ NTP operations ▪ Wetland mitigation	2,554 acres
Aquatic	Wetlands on SEA property	▪ NTP and PSP construction ▪ Operational stormwater	43.9 acres
	Miller Creek	NTP construction	0.02 acre (stream) 0.12 acre (stream buffer)
		Operational stormwater	4.76 miles
	Walker Creek	Operational stormwater	2.42 miles
	Des Moines Creek	Operational stormwater	3.66 miles
	Puget Sound	Industrial wastewater	1,833 acres
		Operational stormwater	~2 acres

Figure 12. Action area



3.1 Terrestrial Component

The terrestrial component of the action area is defined by the physical extent of measurable effects (both temporary and permanent) resulting from the construction and operation of the Proposed Action. The Proposed Action comprises a range of activities, including the construction and operation of the NTPs and PSPs, habitat mitigation, and the ongoing implementation of operational BMPs. These activities will occur at multiple locations throughout SEA. Therefore, the terrestrial component of the action area is defined by the SEA property boundary.

3.2 Aquatic Component

The aquatic component of the action area includes construction activities proposed within wetland and stream aquatic habitats, areas potentially exposed to treated stormwater pollutants, and the dilution zones around treated stormwater outfalls that service the Proposed Action. Construction activities would not cause elevated underwater noise levels outside of the temporary impact from project construction anticipated for aquatic habitats.

The Proposed Action would generate stormwater and industrial wastewater that would discharge through new and existing infrastructure after treatment to Miller Creek, Walker Creek, Des Moines Creek, and the Puget Sound. The Proposed Action includes structural SDS and IWS improvements and OSC BMPs to service the new, replaced, and retrofitted PGIS.

Miller Creek and Des Moines Creek flow into Puget Sound, and Walker Creek flows into Miller Creek near its confluence with Puget Sound. As detailed in Section 4.2, the action area includes several wetlands in the headwaters of these tributaries that would receive treated stormwater discharge. SEA's IWTP discharges treated industrial wastewater to Puget Sound from an NPDES-permitted offshore outfall with 2 diffusers located at a mean lower low water (MLLW) depth of 148 feet.

The action area also includes theoretical contaminant exposure zones around the NPDES-permitted outfall for the SEA IWTP, located approximately 1,600 feet offshore of the mouth of Des Moines Creek. Per direction from NMFS, this exposure zone extends up to 6,560 feet (2 kilometers [km]) from each diffuser and extends from the seabed to the top of the water surface. The combined extent of these mixing zones is approximately 1,833 acres, providing a conservative surrogate for potential operational stormwater-related effects in the absence of stormwater pollutant data and a quantitative method to determine the spatial extent of effects.

4.0 ENVIRONMENTAL SETTING/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.

4.1 Terrestrial Habitat

SEA property is a fully developed international airport facility where terrestrial habitats 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, stormwater ponds, wetlands, and wetland and riparian buffers. These habitats are managed for tree height and wildlife control to maintain aircraft safety. Many vegetated habitats around the outer edge of SEA were previously developed for residential uses. These properties were subsequently purchased, cleared for airport noise mitigation, and have revegetated over time. None of these open spaces provide suitable habitat for ESA-listed species.

4.2 Aquatic Habitat

The aquatic component of the action area comprises a 4.76-mile segment of Miller Creek extending from the upstream limit of measurable construction effects and stormwater discharge to the confluence with Puget Sound; 2.42 miles of Walker Creek from headwaters to the confluence with Puget Sound; 3.66 miles of Des Moines Creek and tributaries from the upstream limit of measurable construction and stormwater effects to the confluence with Puget Sound; nearshore and marine areas of Puget Sound in proximity to action area tributary confluences and within a 1.2-mile (2-km) radius of the IWTP outfall; and all wetlands impacted by construction and receiving stormwater runoff from the Proposed Action.

Parametrix (2024b) prepared an aquatic critical areas impact assessment memorandum for the Proposed Action based on wetland, pond, and stream delineations completed in 2019 and 2020 and field verified in 2024. The report identified 31 wetlands covering approximately 74.5 acres (Table 13).

Table 13. Wetlands in action area

Wetland	Area (acres)	USFWS Classification	Hydrogeomorphic Classification	Ecology Rating	Habitat Rating	Buffer Width (feet)
N3	18.97	PFO/PSS/PEM	Depressional	I	7	165
N4	1.22	PFO/PSS	Slope	IV	4	40
1	0.11	PSS	Slope	IV	3	40
2	0.84	PFO/PSS/PEM	Slope	III	5	105
A	0.11	PSS/PEM	Slope	III	4	60
4	4.71	PFO	Depressional	II	6	165
5	5.27	PFO	Depressional	II	6	165
6	0.91	PFO	Depressional	II	6	165
7	6.75	PFO	Depressional	II	6	165
8	4.57	PFO/PSS/PEM	Depressional	I	7	165
9	3.10	PFO/PSS/PEM	Depressional	II	6	165
10	0.41	PFO/PSS/PEM	Depressional	III	6	165
11	0.01	PFO	Depressional	III	4	60
39	2.60	PFO/PSS	Slope	III	6	165
R15	2.21	PFO	Depressional	II	6	165
A20	0.55	PFO/PSS/PEM	Depressional	III	5	105
A14a	0.21	PFO/PSS/PEM	Slope	III	6	165
A14b	0.12	PFO/PEM	Slope	III	6	165
44	3.12	PFO	Depressional	II	6	165
E1	0.21	PFO	Slope	III	4	60
52A	1.72	PFO	Slope	II	6	165
DMC1	<0.01	PSS/PEM	Slope	III	5	105
DMC2	0.05	PSS/PEM	Slope	III	5	105
52B	1.01	PFO/PSS	Slope	III	6	165
52C	0.82	PFO/PEM	Riverine	II	6	165
G12	2.41	PFO/PSS/PEM	Depressional/Slope	II	6	165
G1	<0.01	PFO/PSS	Slope	III	5	105
G4	0.01	PSS	Slope	III	5	105
G5	0.93	PSS/PEM	Slope	III	5	105
H	0.07	PSS/PEM	Slope	III	5	105
D	3.81	PFO/PSS	Riverine	II	6	165
PFO – Palustrine forested; PSS – Palustrine scrub-shrub; PEM – Palustrine emergent						

4.2.2 Des Moines Creek

The southern portion of SEA drains into the Des Moines Creek Drainage Basin. The headwaters of Des Moines Creek are located on the south side of SEA. There is an East Branch to the creek near the headwater. Des Moines Creek and the East Branch of the creek are associated with ponds and wetland systems. SEA outfalls drain into Des Moines Creek, the East Branch, and wetland/pond systems. The creek flows south and southwest for about 3.6 miles through wetlands, forested parks, and various developments beneath roads with culverts before flowing into Puget Sound.

WDFW identifies Des Moines Creek as gradient-accessible to fall Chinook salmon and winter steelhead within 0.9 miles downstream of SEA property, however, neither species has been documented in the system (WDFW 2024d). Chum salmon (*O. keta*) are documented in the lower 0.2 miles of the creek and coho salmon (*O. kisutch*) presence is documented from the mouth to within 0.2 miles downstream of SEA property (WDFW 2024d). Resident cutthroat trout (*O. clarkii*) presence is documented in the upstream reach of the creek and the East Branch (NWIFC 2024, WDFW 2024d, e).

4.2.3 Miller Creek

The north and western portions of SEA drain into the Miller Creek/Walker Creek Drainage Basin. The headwaters of Miller Creek are located on the north side of SEA. There is an East Branch to the creek near the headwater. The Miller Creek main channel originates north of SEA, north of SR 518, and the East Branch flows through wetlands, ponds, and Lake Reba on the north side of SEA. SEA outfalls drain into Miller Creek and Lake Reba. The creek flows for about 4.7 miles through wetlands, forested parks, and various developments beneath roads with culverts before flowing into Puget Sound. Walker Creek flows into Miller Creek a short distance from the creek outlet to Puget Sound.

WDFW (2024d) identifies Miller Creek as potentially accessible to fall Chinook salmon and winter steelhead based on modeled suitable habitat up to an existing barrier culvert at 1st Avenue S, approximately 0.65 mile downstream of SEA property. However, neither species is currently documented (WDFW 2024d). Chum salmon, coho salmon, and resident cutthroat trout are documented as known or potentially occurring in Miller Creek. Documented coho salmon potential presence and resident cutthroat trout presence in the upper reach (NWIFC 2024, WDFW 2024d, e).

The Miller and Walker Creek Executive Committee (2006) state that Chinook salmon did not occur naturally in Miller Creek and are not currently present, but the species has been occasionally observed in the system as recently as 2000. Chinook salmon do not occur in any independent tributaries adjacent to or in proximity to Miller Creek on the east side of Puget Sound, despite being equally accessible and providing similar habitat (WDFW 2024d). These sporadic observations were the result a failed attempt to introduce Chinook salmon to the Miller Creek system in the 1980s and 1990s. There are no recent records of Chinook salmon occurrence in Miller Creek and none of the documented observations are less than 20 years old. Therefore, it is reasonable to conclude that the Miller Creek system does not currently support Chinook and is unlikely to do so in the future.

4.2.4 Walker Creek

Walker Creek is within the Miller Creek/Walker Creek Drainage Basin on the north and western portions of SEA. SEA outfalls drain into Walker Creek and associated tributaries and ponds. The approximately 2.4-mile creek flows beneath SR 509 before flowing through wetlands, forested parks, residential areas, and beneath roads with culverts before flowing into Miller Creek a short distance from the Miller Creek outlet to Puget Sound.

WDFW identifies Walker Creek as gradient-accessible to fall Chinook salmon and winter steelhead up to the South Normandy Road crossing at Airport Park, approximately 0.2 mile downstream of SEA property. However, neither species has been documented in this system. Chum salmon, coho salmon, and resident cutthroat trout are documented in the system (NWIFC 2024, WDFW 2024d, e). As described above for Miller Creek, it is reasonable to conclude that the Walker Creek system does not currently support ESA-listed Chinook and is unlikely to do so in the future.

4.2.5 Puget Sound

The aquatic component of the action area includes nearshore areas of Puget Sound at the mouths of Miller, Walter, and Des Moines creeks, and an offshore area within approximately 6,560 feet (2 km) of paired diffusers at the existing stormwater outfall for the IWS, located approximately 1,600 feet waterward of the mouth of Des Moines Creek at a depth of -148 feet relative to MLLW. The nearshore portions of the action area are located on broad subtidal flats composed of predominantly sand and gravel substrate. Patchy beds of eelgrass (*Zostera marina*) and various species of marine algae are present (Ecology 2023). Kelp beds are absent, likely due to a lack of large-grained substrate material suitable for holdfast anchoring. Virtually the entire shoreline adjacent to the action area has been armored to protect development (Ecology 2023). Sparse clam populations and a sparce array of polychaete species are present. Geoduck clams (*Panopea generosa*) may be present in deeper waters (Dethier 2010). Upper shore areas, as in mixed-fine habitats, tend to be composed of depauperate steep gravel-sand sediments. All ESA-listed species covered in this evaluation may be present within the Puget Sound portion of the action area periodically throughout the year.

4.3 Water Quality

Ecology is responsible for monitoring water quality standards throughout the state of Washington. Ecology's Water Quality Atlas identifies 303(d) listed waterbodies, which are those with impaired water or sediment quality. Marine, estuarine, and freshwater aquatic habitats within the action area are listed as 303(d) impaired waters due to exceedances of a variety of parameters under Categories 1, 2, 4a, and 5 waters (Ecology 2024). Table 14 summarizes the water quality parameters with identified exceedances within the action area per aquatic habitat, as reported by Ecology.

Table 14. Water quality parameters in the action area

Water Quality Parameter	Category	Puget Sound	Des Moines Creek	Miller Creek	Walker Creek
4, 4'-DDD/DDE/DDT	5	No	No	No	No
Alpha-BHC	5	No	No	No	No
Arsenic, Inorganic	5	No	No	No	No
Bacteria – Enterococci	5	Yes	No	No	No
Bacteria – Fecal coliform	5	Yes	Yes	Yes	Yes
Benzo(a)anthracene	5	No	No	No	No
Benzo(a)pyrene	5	No	No	No	No
Benzo(b)flouranthene	5	No	No	No	No
Benzo(k)flouranthene	5	No	No	No	No
Bis(2-ethylhexyl)phthalate	5	No	No	No	No
Chrysene	5	No	No	No	No
Copper	5	No	Yes	No	No
Dibenzo(a,h)anthracene	5	No	No	No	No
Indeno(1,2,3-c,d)pyrene	5	No	No	No	No
Dissolved oxygen	5	No	Yes	Yes	Yes
Mercury	5	No	No	No	No
PCBs*	5	No	No	No	No
pH	5	No	No	No	No
Temperature	5	No	Yes	Yes	Yes
Temperature	4A	No	No	No	No
Bacteria – Escherichia coli	2	No	No	No	No
Bacteria – Fecal coliform	2	Yes	No	No	No
Benzo(a)anthracene	2	Yes	No	No	No
Benzo(a)pyrene	2	Yes	No	No	No
Benzo(b)flouranthene	2	Yes	No	No	No
Bis(2-ethylhexyl)phthalate	2	No	No	No	No
Copper	2	No	No	Yes	No
Dissolved oxygen	2	No	No	No	No
Mercury	2	No	No	No	No
Polychlorinated biphenyls	2	Yes	No	No	No
pH	2	No	No	Yes	Yes
Phosphorus	2	No	Yes	No	No
1,2-Dichlorobenzene	1	No	No	No	No
1,3-Dichlorobenzene	1	No	No	No	No
1,4-Dichlorobenzene	1	No	No	No	No
3,3-Dichlorobenzidine	1	No	No	No	No
2,4-Dichlorophenol	1	No	No	No	No

Water Quality Parameter	Category	Puget Sound	Des Moines Creek	Miller Creek	Walker Creek
2,4-Dinitrophenol	1	No	No	No	No
2,4-Dinitrotoluene	1	No	No	No	No
1,2-Diphenylhydrazine	1	No	No	No	No
2,4,6-Trichlorophenol	1	No	No	No	No
Anthracene	1	No	No	No	No
Antimony	1	No	No	No	No
Arsenic	1	No	No	No	No
Ammonia-N	1	No	Yes	Yes	Yes
Bis(2-chloroethyl) ether	1	No	No	No	No
Bis(2-chloroisopropyl) ether	1	No	No	No	No
Chlordane	1	No	No	No	No
Chloride	1	No	No	No	No
Di-n-butyl phthalate	1	No	No	No	No
Diethyl phthalate	1	No	No	No	No
Dimethyl phthalate	1	No	No	No	No
Fluoranthene	1	No	No	No	No
Fluorene	1	No	No	No	No
Hexachlororobutadiene	1	No	No	No	No
Hexachlororobenzene	1	No	No	No	No
Hexachlororocyclopentadiene	1	No	No	No	No
Hexachlororocyclohexane (Lindane)	1	No	No	No	No
Isophorone	1	No	No	No	No
Hexachloroethane	1	No	No	No	No
Mercury	1	No	No	No	No
N-Nitrosodiphenylamine	1	No	No	No	No
Nickel	1	No	No	No	No
Nitrobenzene	1	No	No	No	No
Pentachlorophenol	1	No	No	No	No
Phenol	1	No	No	No	No
PCBs*	1	No	No	No	No
pH	1	No	No	No	No
Pyrene	1	No	No	No	No
Selenium	1	No	No	No	No
Thalium	1	No	No	No	No
Zinc	1	No	Yes	Yes	No

Category 5 = polluted waters that require a water improvement project
Category 4 = Impaired waters with a USEPA-approved total Maximum Daily Load attainment plan in place
Category 2 = waters of concern
Category 1 = waters that meet tested water quality standards

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

The ESA-listed species covered in this BE that could occur within the action area are Chinook salmon, steelhead, bull trout, yelloweye rockfish, bocaccio rockfish, and SRKW. Species status and presence of designated critical habitat in the action area are identified in Table 15. Effects to designated critical habitat physical and biological features (PBFs) are also analyzed in this BE. This BE uses the preferred term PBFs, per 81 FR 7414, which replaces the older term, Primary Constituent Elements (PCEs). The older Federal Register documents identifying critical habitat use the term PCEs. See Appendix D for additional information about species' life histories.

Table 15. ESA-listed species and critical habitat in the action area

Species	Lead Agency	Federal Status	Critical Habitat in Action Area
Chinook salmon (Puget Sound ESU)	NMFS	Threatened	Yes
Steelhead (Puget Sound DPS)	NMFS	Threatened	No
Bull trout (Coastal-Puget Sound DPS)	USFWS	Threatened	Yes
Bocaccio rockfish (Puget Sound/Georgia Basin DPS)	NMFS	Endangered	Yes
Yelloweye rockfish (Puget Sound/Georgia Basin DPS)	NMFS	Threatened	Yes
Killer whale (Southern Resident DPS)	NMFS	Endangered	Yes

4.4.1 Puget Sound Chinook Salmon

4.4.1.1 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 (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).

4.4.1.2 Occurrence

The Puget Sound ESU 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 and industrial wastewater discharge to Puget Sound. WDFW (2024d) identifies Miller Creek, Walker Creek, and Des Moines Creek as potentially suitable habitat based on gradient, but the species is not currently documented in these systems. Chinook salmon are most likely to occur in the marine portion of the action area, specifically in offshore waters of Puget Sound around the IWTP outfall as pre-spawn migratory adults and in offshore and nearshore habitats as outmigrant juveniles. Adults are most likely to be returning migrants from the Puyallup River, White River, Nisqually River, and Green River populations (NMFS 2007; 2017a). Juveniles are also most likely to be members of these populations. However, juvenile Chinook range widely throughout Puget Sound and individuals occurring in the action area could come from any population in the ESU (Hayes et al. 2019).

Juvenile Chinook salmon rely on estuarine and nearshore habitats of Puget Sound for rearing and to make their transition from fresh to saltwater conditions (smoltification) before migrating out to the open ocean. They use these habitats for migration, foraging, refuge, and the osmoregulatory transition to salt water (City of Seattle 2015). Juveniles rely on shallow nearshore habitats such as

eelgrass beds, intertidal flats or marshes, and subtidal channels. The Puget Sound portion of the action area comprises intertidal and subtidal flats with some patchy eelgrass, indicating that the area has limited suitable habitat for and may be used by juvenile Chinook salmon. The frequency and time in this area may be limited by the patchy beds of eelgrass (*Zostera marina*) and armoring of virtually the entire shoreline adjacent to the action area (Ecology 2023).

The Chinook populations likely to occur in the action area are at abundance levels well below recovery objectives (GSRO 2022). 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 populations are below the planning ranges identified for recovery. 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 such as the Green/Duwamish as a key concern leading to the listing of Chinook salmon (West Coast Salmon Biological Review 2003).

4.4.1.3 ***Critical Habitat***

Critical habitat for Puget Sound Chinook salmon was designated on September 2, 2005 (70 FR 52630). The freshwater habitats in Miller Creek, Walker Creek and Des Moines Creek are not mapped as designated critical habitat (NOAA 2024). The mouths of these systems into Puget Sound contain estuarine and nearshore marine areas designated as critical habitat. Puget Sound contains both nearshore and offshore marine areas designated as critical habitat.

The PBFs relevant to the action area are as follows:

(4) Estuarine areas free of obstruction and excessive predation with:

i. Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater.

ii. Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and

iii. Juvenile and adult forage supporting growth and maturation.

(5) Nearshore marine areas free of obstruction and excessive predation with:

i. Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and

ii. Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

(6) Offshore marine areas with water quality conditions and forage supporting growth and maturation.

4.4.2 Puget Sound Steelhead

4.4.2.1 *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).

4.4.2.2 *Occurrence*

In 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.

Steelhead are most likely to occur in the marine portion of the action area, specifically the offshore waters of Puget Sound around the IWTP outfall, as pre-spawn migratory adults and outmigrant juveniles. There are currently 10 extant stocks of ESA-listed winter run steelhead that are likely to occur within this marine migratory corridor, three originating from the Puyallup/ White River system, one from the Nisqually, and five from independent tributaries to the South Puget Sound Basin (Scott and Gill 2008), all of which are part of the Puget Sound DPS (NMFS 2019). Outmigrant juveniles typically migrate rapidly through the offshore waters of Puget Sound, 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 NMFS 5-year review of the Puget Sound steelhead DPS, risks have not changed since the species' listing in 2007 and the DPS is at very low viability. Scott and Gill (2008) considered Puyallup/White and Nisqually winter-run steelhead populations to be at moderate/high risk of extinction by 2100 based on abundance trends through 2005, but abundance of each component stock has increased since 2005. The current abundance of all stocks potentially occurring in the action area remain well below recovery goals (NWFSC 2015; NMFS 2017a, 2019). Insufficient information is available to evaluate the status of south Puget Sound and east Kitsap stocks.

4.4.2.3 *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 Miller Creek, Walker Creek and Des Moines Creek are not included in Puget Sound steelhead critical habitat (NOAA 2024). Critical habitat for Puget Sound steelhead does not include marine habitats. Therefore, no designated critical habitat for Puget Sound steelhead is present in the action area.

4.4.3 Coastal-Puget Sound Bull Trout

4.4.3.1 *Federal Status*

Bull trout were listed as threatened species 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 (USFWS 2015).

4.4.3.2 *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 Puget Sound rivers 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 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 lifecycle in salt water, moving back and forth between mouths of rivers and streams (Pietsch and Orr 2015). Marine FMO habitat includes portions of Puget Sound, particularly the highly productive nearshore and estuarine areas that provide complex habitat structure and abundant prey, which is not present in the action area. Important prey species include juvenile salmonids, sandlances (*Ammodytes hexapterus*), surf smelts (*Hypomesus pretiosus*), Pacific herring (*Clupea pallasi*), and shiner perch (*Cymatogaster aggregata*).

The final bull trout recovery plan identifies the Puget Sound nearshore zone as FMO habitat (USFWS 2015) for the Skagit, Stillaguamish, Snohomish-Skykomish, and Puyallup River core areas. The action area lies between the Stillaguamish and Snohomish-Skykomish core areas to the north and the Puyallup River core area to the south, the latter being closest based on marine migration distance. Based on observed amphidromous behavior (Goetz et al. 2004, 2021), the nearshore zone of Puget Sound within the action area is well within the maximum migratory range of bull trout from each of these core areas. However, based on observed mean migration ranges reported by Goetz et al. (2021), most bull trout that occur in the action area are likely to originate from the Puyallup River.

Current Coastal-Puget Sound bull trout distribution is like probable historical distribution, but the abundance of contributing subpopulations has decreased over approximately 50 percent of their range (USFWS 2004). Bull trout in the Puget Sound region are stable overall, with the population neither increasing nor decreasing (USFWS 2015). Bull trout may occur in action area as adults or subadults foraging in or migrating through nearshore habitats, though the presence is likely limited by the limited habitat structure and armoring of virtually the entire shoreline adjacent to the action area (Ecology 2023). As stated, bull trout could occur in the action area at any time but are most likely to be present from March through July (Goetz et al. 2021). Bull trout are least likely to occur in the action area from October through February.

4.4.3.3 *Critical Habitat*

Critical habitat for bull trout was designated on October 26, 2005, and then revised on October 18, 2010 (75 FR 63898). Critical habitat comprises the following primary habitat types:

- Spawning and rearing
- FMO (marine nearshore areas used by bull trout for foraging and migration)

The revised critical habitat designation comprises 32 critical habitat units and support PBFs required for spawning, rearing, and FMO between suitable habitats. The Puget Sound critical habitat unit contains 1,144 miles of streams and 443 miles of marine shoreline, as well as lake areas.

The aquatic component of the action area overlaps the Marine Critical Habitat Subunit of Critical Habitat Unit 2: Puget Sound. Unit 2 includes the marine and tidally influenced estuarine shorelines of Puget Sound and contributing river systems from the mean higher high water (MHHW) line to the depth of 10 meters (33 feet) relative to the MLLW line.

The PBFs relevant to the action area (Puget Sound) are as follows (75 FR 63898):

(2) Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

(3) An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

(4) Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

(5) Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate refugia available for temperatures at the upper end of the range.

(8) Sufficient water quality and quantity to support normal reproduction, growth, and survival.

4.4.4 Puget Sound/Georgia Basin Boccacio Rockfish

4.4.4.1 *Federal Status*

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

4.4.4.2 *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; USACE 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 breeding within Puget Sound.

The bocaccio was once common on steep walls throughout Puget Sound, but this species is now much rarer (Love et al. 2002). Drake et al. (2010) report that in the Puget Sound most bocaccio occur in the southern sound and are rare north of Tacoma. Adult and juvenile bocaccio could potentially occur in the Puget Sound portion of the action area, particularly in the mixing zone of the industrial wastewater outfall in Puget Sound but may be limited due to by the patchy beds of eelgrass (*Zostera*

marina) and armoring of virtually the entire shoreline adjacent to the action area (Ecology 2023). Bocaccio eggs and larvae are likely to occur in nearshore marine habitats as well as this mixing zone.

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 were not identified in dockside surveys of several thousand rockfish caught between 1996 and 2007. This suggests a strong decline in bocaccio in these inland waters (Drake et al. 2010, NMFS 2017b).

4.4.4.3 *Critical Habitat*

The NMFS designated critical habitat for 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). Essential habitat features associated with rockfish are separated by life stage (NMFS 2013). The aquatic component of the action area overlaps bocaccio nearshore critical habitat for larval and juvenile bocaccio at the mouths of the Miller, Walker, and Des Moines Creeks, and deepwater critical habitat at the mixing zone of the industrial wastewater outfall.

Critical habitat attributes useful for analyzing project impacts in Section 7 consultations comprise the following (79 FR 68041):

1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and
2) Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.

4.4.5 Puget Sound/Georgia Basin Yelloweye Rockfish

4.4.5.1 *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).

4.4.5.2 *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 British Columbia (Love et al. 2002). Little is known about this species' breeding timing within Puget Sound but may occur in early spring to late summer in the Sound.

Of the two listed species, yelloweye rockfish appear to be more abundant with the widest distribution. Pietsch and Orr (2015) records indicate a range from the south end of Saratoga Passage 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 Puget Sound portion of the action area, particularly in the mixing zone of the industrial wastewater outfall.

The yelloweye rockfish is slowly recovering from a significant decrease in abundance across its range. 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).

4.4.5.3 *Critical Habitat*

The NMFS designated critical habitat for yelloweye rockfish within Puget Sound/Georgia Basin in 2014 (79 FR 68041). There is no nearshore critical habitat for yelloweye rockfish (79 FR 68041). Essential habitat features associated with rockfish are separated by life stage (NMFS 2013). The aquatic component of the action area overlaps yelloweye rockfish deepwater critical habitat at the mixing zone of the industrial wastewater outfall in Puget Sound.

Critical habitat attributes useful for analyzing project impacts in Section 7 consultations comprise the following (79 FR 68041):

1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and

2) Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.

4.4.6 Southern Resident Killer Whale

4.4.6.1 *Federal Status*

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

4.4.6.2 *Occurrence*

The SRKW comprises three distinct pods (J, K, and L), totaling 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. May and June are the months with the fewest sightings in the central Puget Sound region.

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 the 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.

SRKW have not been recorded within the freshwater portion of the action area and are not expected to enter freshwater. SRKW would likely pass through in the mixing zone of the industrial wastewater outfall discharging into Puget Sound. In addition, SRKWs may be affected via trophic link, as any impacts to Chinook salmon would affect prey availability for SRKWs.

The SRKW population is relatively stagnant at just 0.1 percent rate of increase in size per year, well below the target 2.3 percent increase needed for the species to be delisted (Wiles 2016). From 1995 to 2005, J pod grew, K pod stayed largely the same, and L pod decreased. Reproduction can be heavily affected by prey availability. Wasser et al. (2017) observed that low availability of Chinook

salmon was a substantial cause of late pregnancy failure. If Chinook salmon abundance remains constant or increases, J pod has the potential to double in size in the next 25 years (Wiles 2016).

A final recovery plan (NMFS 2008) stated that reduced prey availability and quality, high levels of contaminants, and disturbance from both vessels and sound were among the factors limiting the recovery of the species. NMFS (2011) has informed affected constituents about the importance of Chinook salmon to the diet of SRKWs and the potentially serious implications of the salmon fisheries and other activities affecting Chinook salmon on the survival and recovery of these whales. Mongillo et al. (2016) determined that the bioaccumulation of toxic and physiologically damaging chemicals through consumption of contaminated prey poses a significant ongoing risk to species recovery.

4.4.6.3 *Critical Habitat*

Critical habitat was originally designated on November 29, 2006 (71 FR 69054) and 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

Critical habitat for the SRKW includes all marine waters in the Puget Sound area waterward of 20 feet (6.1 meters) below extreme high water (86 FR 41668). The action area overlaps this critical habitat at one location: in the mixing zone of the industrial wastewater outfall discharge in Puget Sound.

PBFs associated with the SRKW are as follows:

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

5.0 ANALYSIS OF EFFECTS

Effects of the action are 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. In other words, potential or speculative consequences or worst-case scenarios or pessimistic assumptions are not considered a consequence of the action. 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 expected to result in take of species or designated critical habitat. “Take,” as defined by the ESA, includes such 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 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 demonstrated.

The effects of exposure range in severity from chronic sub-lethal effects to immediate lethality, depending on the type of pollutant or pollutants, exposure mechanisms (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).

Beneficial effects are those effects of an action that are wholly positive, without any adverse effects, on a listed species or designated critical habitat.

5.1 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.

5.1.1 Noise

Construction-related noise is a function of the types of equipment being used, the distance to potential receptors, and the duration of construction activities. Background or ambient sound levels can vary greatly depending on site-specific factors. Ambient sound levels can effectively mask construction noise. While most of the NTPs are located near SEA operation areas with high ambient noise levels, a few of the NTPs are located on the perimeter or outside the active airfield, such as at the north end of SEA, where background sound levels are more consistent with populated urban areas. The construction noise analysis concluded that most NTPs are in areas with an ambient sound level of 76.5 dBA, while the five NTPs located north of SR 518 (C02, C03, L05, L07, and S10) are in areas with ambient sound levels of 66 dBA (Landrum & Brown 2024). Noise from construction equipment may at times exceed ambient noise levels and be noticeable to nearby receivers for the five NTPs located north of SR 518. These increases in noise would be short-term, temporary increases only occurring during active construction. As described in Section 1.4, no potential suitable habitat for ESA-listed terrestrial species is located within miles of the action area. The Proposed Action does not include any activities that are likely to result in elevated in-air noise levels in potential terrestrial habitat for ESA-listed species during construction or long-term operations. Therefore, in-air noise effects are not considered further in this BA.

The Proposed Action does not include any activities that are likely to result in elevated in-water noise levels during construction or long-term operations. In addition, all in-water construction activities would take place at locations that are not accessible to ESA-listed species. Therefore, underwater noise effects are not considered further in this BA.

5.1.2 Habitat Modification

Construction would occur primarily in paved and developed areas of SEA property where no or limited landscape vegetation exists. Vegetation and tree removal would occur for five projects north of SR 518, in areas that were previously cleared and are currently comprised of trees, low shrubs, maintained and unmaintained fields, and paved residential roads. Construction of S07 would require clearing and regrading of approximately 18.6 acres of maintained grass, shrubs, and deciduous and coniferous trees typical of unmanaged urban green spaces. S07 also includes improvements to an existing culvert crossing that would impact streams (0.01 acre) and stream buffers (0.05 acre).

Construction activities within wetland and wetland buffers include a total of approximately 0.58 acre of wetland impacts and 2.65 acres of wetland buffer impacts. Compensatory mitigation is proposed for all wetland and wetland buffer impacts. As shown on Table 9, the Proposed Action would include 2.65 acres of mitigation for wetland buffer impacts and at least 1.17 acres and potentially up to 4.68 acres of compensatory mitigation for wetland impacts, depending on the type of mitigation provided.

5.1.2.1 *Effects of Habitat Modification on Listed Species*

Proposed wetland impacts would occur in habitats upstream of Miller Creek and Des Moines Creek, where no ESA-listed species occur and more than 2 miles upstream of where the potential presence of ESA-listed species is documented. There are no measurable potential impacts to ESA-listed species associated with wetland and wetland buffer impacts under the Proposed Action.

5.1.2.2 *Effects of Habitat Modification Critical Habitat*

Designated critical habitat is not present in the portion of the action area where impacts to wetlands and stream habitats would occur, nor in downstream habitats in Des Moines Creek, Walker Creek, and Miller Creek where temporary construction-related effects on water quality could occur. Proposed in-water work is limited to wetland fill, buffer impacts, stormwater pond development, and culvert improvements in headwater areas at least 2 miles upstream of Puget Sound. Construction BMPs would ensure that no delivery of suspended sediments and associated contaminants to designated critical habitat in nearshore areas of Puget Sound would occur. Therefore, habitat modifications resulting from the Proposed Action would have no measurable effects on designated critical habitat.

5.1.3 Stormwater

The Proposed Action includes construction of new, replaced, and retrofitted PGIS. As noted in Section 2.4.2, stormwater runoff on SEA property is collected in existing stormwater treatment systems. All stormwater and wastewater from new, replaced, and retrofitted PGIS that drains to the SDS would discharge through existing and proposed SEA stormwater outfalls to Miller Creek, Walker Creek, and Des Moines Creek. This drainage area represents about 7 percent of Miller Creek's and about 21 percent of Des Moines Creek's watersheds. The IWS discharges via the IWTP outfall to Puget Sound. Miller Creek and Des Moines Creek flow directly into Puget Sound, while Walker Creek flows into Miller Creek immediately upstream of its confluence with Puget Sound.

The Port's SDS and IWS comprise a combination of robust structural controls and OSC BMPs designed to intercept pollutants before they enter stormwater runoff and provide treatment to reduce contaminant concentrations to the greatest extent practicable. For example, current OSCs include dry sweeping of PGIS, runway rubber removal, and regular maintenance of vaults, detention basins, and filtration systems. These operational BMPs are consistent with Ecology (2022) recommendations for limiting contamination of surface waters by 6PPD-Q and other emerging contaminants of concern.

The Proposed Action includes improvements to existing and construction of new structural source controls and expansion of OSCs to all new impervious surfaces and PGIS. In combination, these measures are likely to be highly effective at minimizing adverse effects to listed species from stormwater and wastewater pollutants. SEA's SDS and IWS systems represent the currently practicable state of art treatment options that are fully compliant with state and federal regulations. These regulations protect beneficial uses, including for aquatic life. Therefore, by meeting these water quality standards, the Proposed Action results in discountable effects to threatened and endangered species in the action area.

5.1.3.1 *NPDES Related Testing*

Under the NPDES permit, SEA is required to conduct *in-situ* toxicity testing biannually and acute and sublethal testing the year prior to permit renewal. Acute toxicity tests are performed on stormwater samples collected from stormwater outfalls. Sublethal toxicity tests are performed on ambient receiving water samples collected downstream of stormwater outfalls. Finally, *in-situ* testing is conducted using a watershed approach.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent from seven representative outfalls discharging stormwater from SEA (SDS3/5, SDD06A, SDE4/S1, SDN1, SDN2/3/4, SDW1B, and SDW2). Acute testing is required once during the last winter and last summer prior to the submittal of the NPDES permit renewal application. Acute toxicity testing procedures follow guidelines provided by the USEPA (2002). The last acute toxicity test was completed in 2020. Survival in the 100 percent undiluted samples, and in both the unadjusted and hardness-adjusted samples, was equal to or greater than 90 percent for both species (Daphnia pulex and fathead minnows), indicating that no acute toxicity was demonstrated by any of the samples (Nautilus 2020).

Sublethal testing under the NPDES is part of Whole Effluent Toxicity (WET) testing. WET tests measure the aggregate toxic effect of an effluent (wastewater discharge) on aquatic organisms and are crucial for ensuring that water quality standards are met, and aquatic life is protected. Sublethal toxicity testing is required once during the last winter and last summer prior to the submittal of the NPDES permit renewal application. Stormwater outfalls at SEA discharge into five local receiving waters identified in the NPDES permit (Miller Creek, Des Moines Creek, Walker Creek, Northwest Ponds, and Lake Reba). Samples from six representative sites were tested for sublethal toxicity using the 7-day rainbow trout embryo test (Environment Canada 1998; modifications from Canaria et al 1999). Receiving water samples consistently showed no evidence of sublethal toxicity in the tests conducted from 2019 to 2020 (Nautilus 2020).

In addition, the NPDES permit requires rainbow trout (RBT) early life stages (ELS) *in situ* monitoring tests be conducted biannually in the fall and spring (Appendix E). The objective of the testing is to use salmonid ELS as an *in-situ* monitoring tool to assess the quality of receiving waters potentially affected by stormwater discharges from SEA, as well as a multitude of the other discharges from the surrounding urban environment. Results from the *in-situ* bioassays and supporting analytical data are intended to provide an indication of attainment of receiving water quality standards and associated beneficial uses related to salmonid spawning and rearing. The program was initiated in Fall 2010.

The exposure sites include Miller Creek, Des Moines Creek Downstream, and Des Moines Creek Upstream, with Walker Creek being added to the study beginning in Spring 2016. Monitoring points are generally located downstream of SEA inputs. However, one site is located upstream of SEA stormwater outfalls to monitor for potential impacts originating upstream of SEA (the Des Moines Creek basin upstream of SEA is heavily urbanized). Results are compared to a laboratory control conducted concurrently with the *in-situ* tests.

All test data were entered in CETIS (Comprehensive Environmental Toxicity Information System, Tidepool Scientific, McKinleyville, CA). Differences among the exposure sites and laboratory controls were evaluated using pair-wise multiple comparison tests according to the USEPA flow chart (USEPA 2002); significant differences were identified at $p \leq 0.05$.

One interim and five terminal endpoints were evaluated; the endpoints are described below:

1. Hatching success – an interim measure of the percentage of embryos hatched the day of the hatch inspection, or determined to have hatched based on the number of alevins present at the subsequent inspection, relative to the total number of embryos originally added.
2. Post-hatch survival - the percentage of organisms surviving at test termination relative to the number of embryos that hatched (these data help determine whether most mortalities occurred pre- or post-hatch or were distributed throughout the exposure period).
3. Cumulative survival - the percentage of surviving organisms at test termination relative to the number of embryos in each replicate at the beginning of the exposure.
4. Abnormality – the percentage of abnormal organisms at test termination relative to the number of surviving organisms.
5. Length – to the nearest 0.5 mm.
6. Weight – to the nearest 0.001 g.

The use of an upstream site demonstrates the quality of water prior to SEA discharge and the impact SEA discharge has on the water quality. Apart from Spring 2015, Spring 2018, and Spring 2020 testing events, Des Moines Creek Upstream has exhibited lower quality and reduced hatching/survival results since the testing program began in 2010. Typically, the Des Moines Creek Downstream location, which includes SEA discharges, shows better results than the upstream location. The addition of SEA's treated stormwater appears to dilute the contaminated water, thereby improving the water quality and improving hatching/survival rates (Charts 1 and 2).

Overall, the results of the acute, sublethal, and *in-situ* toxicity testing suggest that the Port has been largely successful in the design and implementation of their stormwater management program. There is no evidence of acute toxicity associated with the outfalls discharging stormwater runoffs and no toxicity in the sublethal tests performed on receiving water samples. In contrast, the result of the in-situ tests suggests the intermittent presence of impaired water quality, particularly in the Des Moines Creek basin upstream of SEA.

Chart 1. Average Temperature, Dissolved Oxygen, and pH

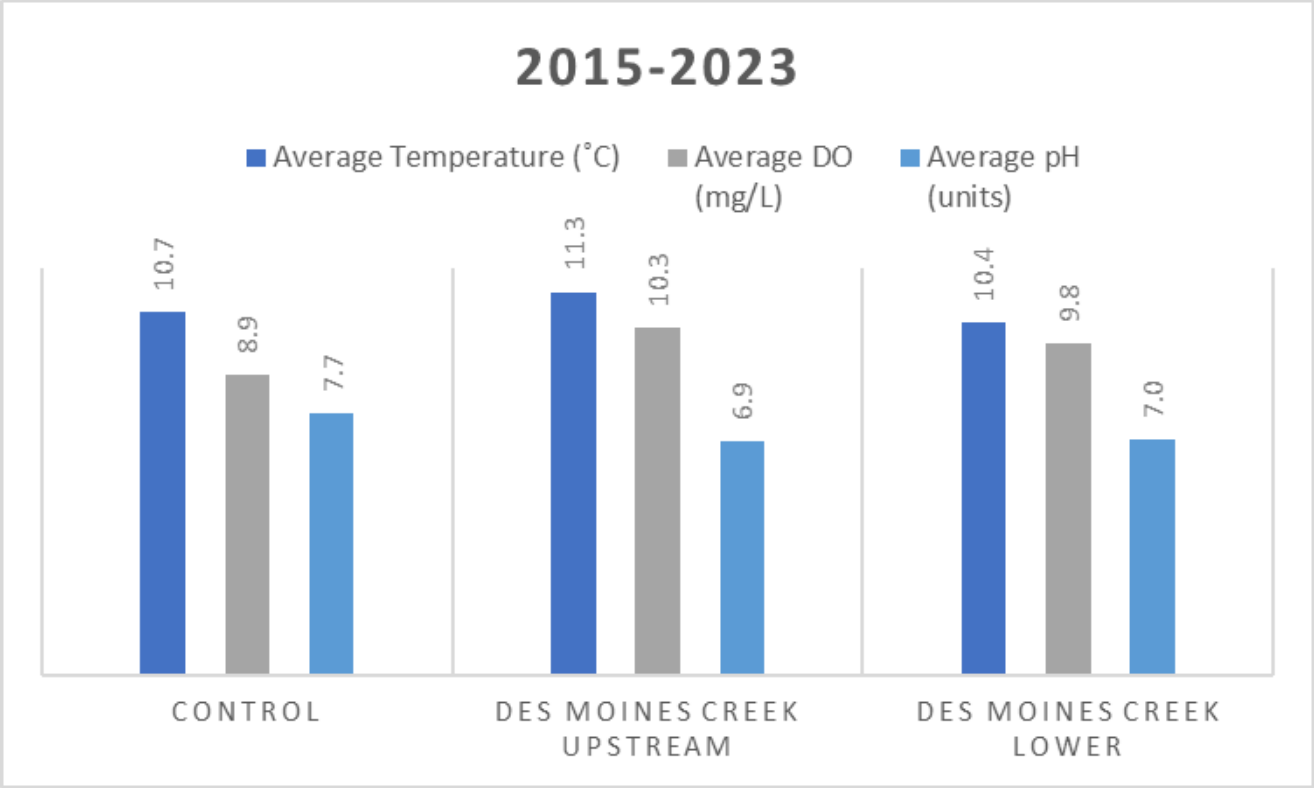
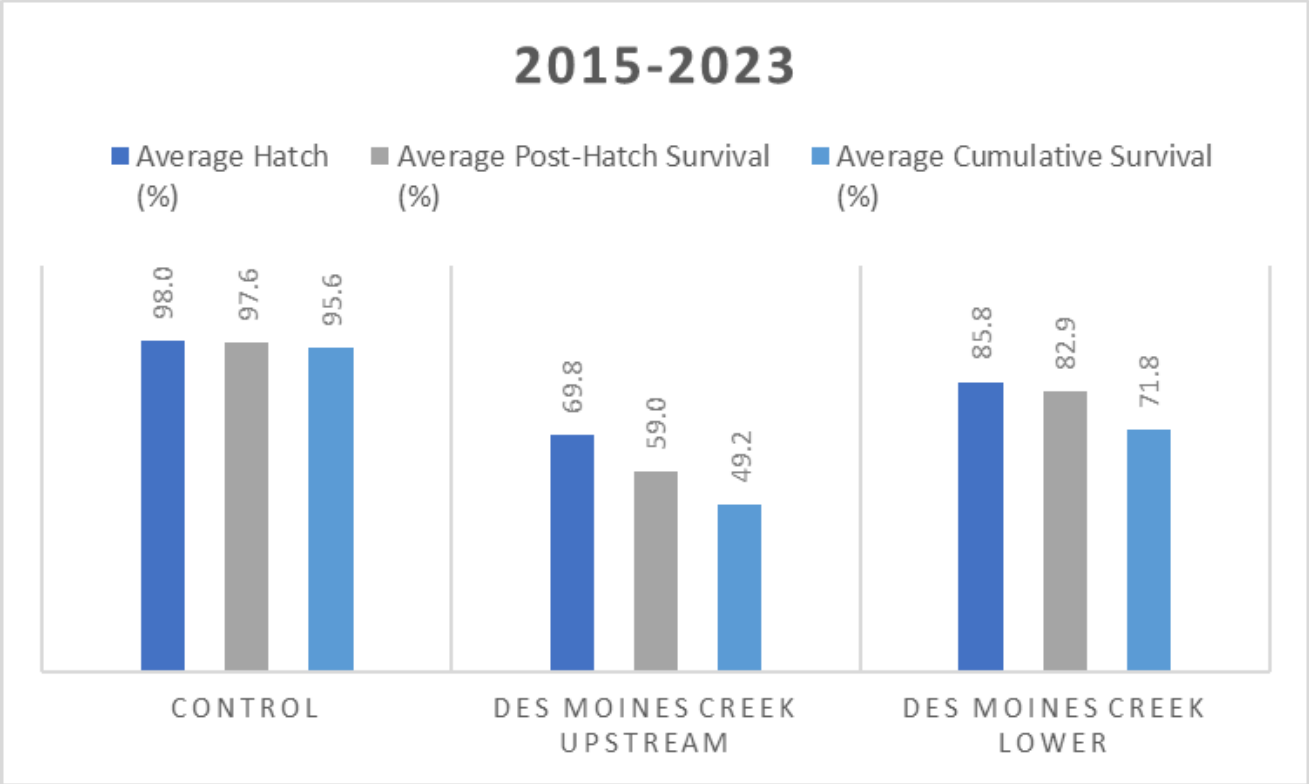


Chart 2. Average Hatch, Post-Hatch Survival, and Cumulative Survival



5.1.3.2 *Effects of Stormwater on Listed Species*

Current treatment technologies can reliably reduce the concentrations of known, commonly occurring stormwater contaminants like PAHs and metals. However, the regulated priority pollutants represent a fraction of the potentially thousands of chemical compounds found in stormwater and industrial wastewater. Some of these compounds are emerging contaminants of concern, for which the effectiveness of currently available treatment methods is not fully understood. It is unknown if treatment effectively removes non-regulated pollutants because neither testing methods nor thresholds have been established. In addition, there is insufficient information available to quantify potential biologically significant effects on listed species from exposure to chronic surface water pollutants generated by the Proposed Action.

The Proposed Action would result in construction of new, replaced, and retrofitted PGIS and associated stormwater and wastewater discharges (see Table 3). All stormwater generated by the Proposed Action would meet current Ecology (2019, 2021) stormwater detention and water quality requirements before being released into area streams. As described in Section 2.4.2, existing SEA stormwater facilities collect and detain stormwater for treatment. Flow control would be provided for PGIS surfaces added by the Proposed Action. As such, project-related stormwater discharge would maintain the existing regulatory requirement for receiving waters of pre-development forested baseline stream flows up to the 50-year storm event. During the infrequent storm events when flows exceed the 50-year storm event, FAA assumes there is likely to be elevated levels of pollutants associated with stormwater runoff, but it is unlikely that pollutant levels exceed water quality standards or reach levels that cause adverse effects based on results from monitoring.

In addition to flow control and water quality treatment, SEA implements a broad range of OSC BMPs to avoid and minimize the release of pollutants and intercept those pollutants before they enter the SDS and IWS (see Section 2.7.2). SEA is also actively involved in ongoing research into the fate and transport of 6PPD-Q and the effectiveness of available treatment technologies (see Section 2.8). Preliminary results from the Treatability Testing study are promising and demonstrate the effectiveness of commercially available filter media, indicating that there are options beyond 100% infiltration to treat 6PPD-Q.

Table 16. Preliminary Treatability Testing Results

Media	Average 6PPD-Q Removal Efficiency (%)	Number of Sampling Events
Biochar	82	1
HS250	94	1
SCU	91.1	1
VCC	97.6	1
CESF + Biochar	96	4
CESF + HS250	97.9	5
CESF + SCU	96.9	4
CESF + VCC	98.8	5

*Sampled between February 28, 2024 – June 2, 2024

While the Port's existing and proposed structural and operational pollution controls are robust, SDS and IWS treated discharges unavoidably contain low levels of contaminants even after treatment to. These residual contaminants could harm ESA-listed fish and their habitats through direct and indirect exposure through the food web. However, is insufficient information available to quantify potential biologically significant effects on listed species and the effects are not reasonably certain to occur.

Recent research has found 6PPD-Q, a contaminant found in rubber particles from automobile tire wear on roads, likely poses a significant risk to ESA-listed salmonids and potentially other aquatic life. However, it is unclear how or if aviation is a significant contributor of 6PPD-Q given the differences in the way aviation tires are produced and used. Lane et al. (2024) did not detect 6PPD-Q in Iowa surface water samples collected down-gradient of airports (N = 8).

Current studies indicate that fish sensitivity to 6PPD-Q varies among species.

- 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).
- Steelhead and Chinook salmon appear less sensitive. Brinkmann et al. (2022) and Lo et al. (2023) reported 24-hr LC50 of <2 and 67 ppb for steelhead and Chinook salmon, respectively.
- Sockeye salmon (*O. nerka*) and chum salmon (*O. keta*) 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 and rockfish sensitivity are not currently known.
- It is difficult to make inferences from available research because the findings vary widely within and between species groups. For example, Ackerly et al. (2024) found no evidence of acute toxicity or sublethal physiological or morphological effects on early life stages of red drum (*Sciaenops ocellatus*) 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.

5.1.3.3 *Effects of Stormwater on Critical Habitat*

The extent to which the Proposed Action would alter pollutant levels in habitats used by ESA-listed species is difficult to estimate. Broadly speaking, the Proposed Action would add new, replaced, and/or retrofitted PGIS to primarily developed areas within SEA property. These areas either currently have existing stormwater detention and treatment facilities that would be improved, or the Proposed Action includes construction of new facilities. While all existing and proposed new treatment facilities would meet current Ecology (2019, 2021) requirements, incorporate the relevant OSC BMPs described in Section 2.7.2, and treatment to remove 6PPD-Q, SDS and IWS discharges could deliver stormwater contaminants to surface waters. 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. The contribution of the Proposed Action to pollutant concentrations and the distance from the outfalls required to dilute concentrations below levels likely to cause detectable effects is unknown and likely to vary. Results

from the in-situ tests suggests that the treated stormwater discharge from SEA could help to improve water quality by diluting contaminant concentrations.

Discharge into the marine waters of Puget Sound further complicates the analysis, as salinity reduces the toxicity and bioavailability of contaminants such as metals. Runoff volumes 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. For example, the fate and transport of contaminants like PAHs and metals has received considerable study and is generally well understood. In contrast, while 6PPD-Q toxicity to certain salmonids has been clearly established in laboratory studies (see Section 5.1.3.1), the fate and transport of this pollutant is not fully understood (Ecology 2022). Currently available information indicates 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 existing SEA operations, management, and maintenance measures (see Section 2.7.2), are likely to reduce exposure risks for ESA-listed fish and other aquatic species (Ecology 2022).

The freshwater aquatic habitats Miller Creek, Walker Creek, and Des Moines Creek are not mapped as designated critical habitat for ESA-listed species. The Proposed Action would discharge runoff from PGIS to SEA's IWTP Puget Sound outfall. Per direction from NMFS, the Port conservatively assumes the action area would include 6,560-foot effect radii around the outfall discharge points and from the seabed (MLLW 148 feet) to the water surface. This area lies within designated critical habitat for Chinook salmon, bull trout, bocaccio and yelloweye rockfish, and SRKW. The Proposed Action would constitute a small percentage of total pollutant loading discharged from this outfall. This minimal loading could constitute an incremental effect on ESA-listed species. However, is insufficient information available to quantify potential biologically significant effects on listed species and the effects cannot currently be quantified with certainty.

5.2 Indirect Effects/Delayed Consequences

Indirect effects, also known as delayed consequences, 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 2023b). A consequence is caused by the Proposed Action if it would not occur but for the project and it is reasonably certain to occur. The term "reasonably certain to occur" was defined as: A conclusion of reasonably certain to occur must be based on clear and substantial information, using the best scientific and commercial data available (WSDOT 2023b).

The Proposed Action would expand the amount of PGIS and could contribute to the ongoing delivery of treated stormwater pollutants to the aquatic component of the action area over the life of the project. As stated in the previous section, while SEA's combined SDS and IWS systems and OSCs represent the currently practicable state of the art treatment options, treated discharges may result in a negligible contribution to chronic pollutant loading in the aquatic component of the action area. While SEA represents a miniscule fraction of pollutant loading from regional sources, the Proposed Action could contribute incrementally to these effects. As such, the Proposed Action could incrementally contribute to the indirect effects on ESA-listed species, but the extent and severity of those effects cannot currently be quantified.

The Proposed Action is being developed in response to strong current and projected growth in demand for air passenger and cargo services at SEA. Implementation of the NTPs would neither induce regional macro-economic growth nor demand for air services. However, the NTPs would increase SEA's ability to accommodate increased aircraft operations and passenger activity. As a result, it is assumed that after implementation, the number of aircraft operations and passengers will increase. However, the Port does not anticipate that the Proposed Action would fully accommodate the future needs for aircraft and passenger service projected in the unconstrained 2023 Updated Forecast (Leigh-Fisher 2023). Once the additional capacity provided by the NTPs is reached, the available airfield and airspace capacity at SEA will become the primary constraints on continued growth in air passenger services. The Proposed Action would have no measurable effect on regional development patterns and would not contribute to induced growth.

Therefore, the delayed consequences of the Proposed Action are limited to the incremental effects of the low concentrations of pollutants that would result from the related increase in PGIS and ongoing discharge of treated stormwater and wastewater from these new as well as existing impervious surfaces in the action area. However, it should be noted that the extent and severity of those effects cannot currently be quantified.

5.2.1 Indirect Effects on ESA-listed Salmonids

As discussed in Section 5.1.3.1, ESA-listed salmonids could be exposed to treated 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. However, SEA is not a probable source of the studied contaminants. The extent and severity of the effects of the low levels of stormwater pollutants that could be discharged cannot currently be quantified.

Emerging research demonstrates that 6PPD-Q and other chemical compounds used in automobile tires could contribute to chronic adverse effects on the salmonid food web. The broader implications for species at higher trophic levels, such as ESA-listed salmonids, are

not currently quantifiable. Treatment for 6PPD-Q based on the results of the Treatability Testing study would be included, reducing any potential impact on ESA-listed salmonids.

Based on the findings presented here and in Section 5.1.3, there is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could result in delayed consequences for ESA-listed salmonids and their critical habitats. The effects cannot currently be quantified with certainty given insufficient information available.

5.2.2 Indirect Effects on ESA-listed Rockfish

Eggs, larva, post-settlement juvenile, and adult bocaccio and yelloweye rockfish that occur in the aquatic component of the action area (Puget Sound) could be directly exposed to pollutants in treated operational stormwater discharge, and indirectly exposed to pollutants through the consumption of contaminated prey organisms. It cannot currently be determined with certainty if this could result in adverse effects on survival and fitness of individuals over the life of the project (see Section 5.1.3.1). 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 delayed consequences for individual survival or reproductive fitness. However, there is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated discharges produced by the Proposed Action could result in delayed consequences for ESA-listed bocaccio and yelloweye rockfish and their critical habitats.

5.2.3 Indirect Effects on Southern Resident Killer Whale

SRKW are likely to occur in the Puget Sound portion of the action area, but 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. This long-lived species is 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 PAHs and certain persistent organic pollutants (POPs)[6] are a significant factor contributing to SRKW extinction risk. SRKW carry several of these contaminants at very high body burdens, the result of bioaccumulation through consumption of contaminated prey. Many of these contaminants are known or likely immune and endocrine system disruptors, so the bioaccumulation of these compounds is likely having a profound negative effect on both survival and reproductive fitness (Mongillo et al. 2016).

[6] Notably polychlorinated biphenyls, polybrominated diphenyl ethers, and dichlorodiphenyltrichloroethane (DDT) and its metabolites.

The final recovery plan for the SRKW identifies quantity and quality of prey as a factor that may limit recovery of the species (NMFS 2008). As SRKWs in Puget Sound have a strong preference for Chinook salmon prey, stormwater impacts that affect Chinook abundance and 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: prey quantity and quality.

5.2.3.1 *Prey Quality*

Projects with potential contamination of waters used by Chinook salmon may represent a possible effect to SRKW through contamination of their prey. Proposed in-water work is limited to bridge construction and culvert replacement in Miller Creek more than 4 miles upstream of Puget Sound. Construction BMPs would ensure that no delivery of suspended sediments and associated contaminants would occur. As such, no measurable effects on contaminant levels in Chinook salmon or other SRKW prey species are likely to occur because of project construction.

As discussed in Section 5.1.3, the Proposed Action would minimally increase the quantity of treated operational stormwater pollutants relative to existing conditions at points of discharge. However, the difference between the Proposed Action and No Action is negligible. The Proposed Action could contribute to ongoing exposure of Chinook salmon and other SRKW prey species to treated stormwater pollutants, and the ongoing bioaccumulation of certain contaminants through dietary exposure. There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could contribute to indirect effects to SRKW from impacts on prey quality.

5.2.3.2 *Prey Quantity*

Projects that result in impacts to Chinook 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. This determination applies to construction impacts, which implies this threshold applies on a per-year basis. As described in Section 5.1.3, Proposed Action construction is unlikely to result in any measurable direct or indirect effects on the abundance or quantity of Chinook salmon and other prey organisms available to SRKW.

Proposed Action operations would generate treated stormwater discharges that could result in indirect adverse effects on Chinook salmon and therefore on SRKWs. These effects cannot be quantified with currently available information. There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could contribute to the reduction of the quantity and quality of prey resources available to SRKW.

5.3 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 Proposed Action is part of the SAMP, a long-term master plan for improvements to SEA needed to support continuing operations and meet future needs for air travel and cargo transport. The Proposed Action is comprised of stand-alone projects (NTPs) that have independent utility, and no other projects depend upon the Proposed Action for their utility.

5.4 Cumulative Effects

Cumulative effects are those effects of future 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 the Services in making jeopardy determinations, in preparing biological opinions, and in tracking the environmental conditions throughout the vicinity.

Future state, tribal, local, or private actions considered in this BE are unlikely to occur in the terrestrial component of the action area. The aquatic component of the action area is surrounded by and receives stormwater runoff from several local jurisdictions. Each jurisdiction has developed a comprehensive plan to guide future development and redevelopment, none of which includes elements that are contingent on the Proposed Action. However, each jurisdiction will continue to generate stormwater runoff and permitted wastewater discharges that will contribute to cumulative impacts in the action area. The Port anticipates that these jurisdictions will provide stormwater treatment and detention for retrofitted and new development consistent with the current or applicable future versions of the Ecology (2019) *Stormwater Management Manual for Western Washington* and/or the WSDOT (2019) *Highway Runoff Manual*. Similarly, existing and future wastewater discharges will comply with contemporary NPDES permit requirements. These design and compliance standards will minimize but not eliminate the delivery of pollutants to surface waters in the action area, resulting in ongoing chronic pollution effects on ESA-listed species like those described in Section 5.2. The Proposed Action would contribute incrementally to these ongoing cumulative effects.

Taken as a whole, foreseeable future state, local, Tribal, and private actions will continue to result in cumulative effects to listed species habitat and conditions in the aquatic portion of the action area. Although some of these actions are likely to improve habitat conditions for listed aquatic species, over time, ongoing impacts from stormwater are likely to further degrade water quality in the action area. The Proposed Action would contribute minimally to these ongoing cumulative effects. There is not enough information available to reasonably conclude the cumulative impacts of the Proposed Action.

6.0 CONCLUSIONS AND EFFECT DETERMINATIONS

The effects determination is the conclusion of the analysis of potential consequences of the Proposed Action on listed species and critical habitat. Regulatory guidance from the Final Section 7 Consultation Handbook (USFWS and NMFS 1998) was used to make the effects determination for the Proposed Action. A summary of the proposed effect determinations to species and critical habitat is presented in Table 17. The supporting rationale for each determination is provided in the following sections.

Table 17. Proposed action effects determinations for ESA-listed species and critical habitat

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

6.1 Puget Sound Chinook Salmon

The Proposed Action **may affect** Puget Sound Chinook salmon because of:

- Documented migration and foraging habitat (suboptimal) present in action area (Puget Sound).
- Gradient accessible but not documented in Miller Creek, Walker Creek, and Des Moines Creek in the action area.
- Construction of new, replaced, and retrofitted PGIS as part of the Proposed Action.

The Proposed Action is **not likely to adversely affect** Chinook salmon because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into the Proposed Action.
- Puget Sound in the action area is not suited for foraging due to extensive shoreline armoring, patchy beds of eelgrass, and other existing nearshore impacts (NMFS 2005a, 2005b, 2012c).
- Extent and severity of degraded water quality effects downstream cannot currently be quantified with certainty.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect Chinook salmon.

6.2 Chinook Salmon Critical Habitat

The Proposed Action **may affect** critical habitat for Chinook salmon because critical habitat is designated in Puget Sound within the action area, where PBFs 4, 5, and 6 occur.

The Proposed Action is **not likely to adversely affect** critical habitat for Chinook salmon because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into the Proposed Action.
- Though stormwater contaminants could remain in the treated discharge and degrade water quality within downstream designated critical habitat where rearing or migration could occur (PBFs 4, 5, and 6), the extent and severity of those effects cannot currently be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect Chinook salmon critical habitat.

6.3 Puget Sound Steelhead

The Proposed Action **may affect** Puget Sound steelhead because of:

- Documented migration and foraging habitat (suboptimal) present in the Puget Sound action area.
- Construction of new, replaced, and retrofitted PGIS as part of the Proposed Action.
- Proposed Action in-water work is located upstream of documented steelhead habitat/presence.

The Proposed Action is **not likely to adversely affect** steelhead because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Puget Sound in the action area is not suited for foraging due to extensive shoreline armoring, patchy beds of eelgrass, and other existing nearshore impacts (NMFS 2012, 2013).
- Though steelhead migrating adults could be directly exposed to degraded water quality and habitat quality could be degraded due to reduced water quality from Proposed Action stormwater pollutants, the extent and severity of those effects cannot be quantified with certainty.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect steelhead or its habitat.

6.4 Steelhead Critical Habitat

The Proposed Action would have **no effect** on critical habitat for steelhead because designated critical habitat is not located within the action area.

6.5 Coastal-Puget Sound Bull Trout

The Proposed Action **may affect** bull trout but is **not likely to adversely affect** bull trout because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Puget Sound in the action area is not suited for foraging, due to extensive shoreline armoring, patchy beds of eelgrass (*Zostera marina*), and other existing nearshore impacts (USFWS 2010b).
- Though bull trout could be directly exposed to degraded water quality and habitat quality could be degraded due to reduced water quality from Proposed Action treated stormwater pollutants, the extent and severity of those effects cannot be quantified with certainty.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect bull trout or its habitat.

6.6 Bull Trout Critical Habitat

The Proposed Action **may affect** critical habitat for bull trout because critical habitat for bull trout is designated in the Puget Sound portion of the action area, where PBFs 2, 3, 4, and 8 occur.

The Proposed Action are **not likely to adversely affect** critical habitat for bull trout because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Though stormwater contaminants could remain in the treated discharge and degrade water quality within downstream designated critical habitat where migration could occur (PBFs 2, 3, 4, and 8), the extent and severity of those effects cannot currently be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect bull trout critical habitat.

6.7 Puget Sound/Georgia Basin Bocaccio and Yelloweye Rockfish

The Proposed Action **may affect** bocaccio and yelloweye rockfish because planktonic eggs and larvae, post-settlement juvenile, and adult bocaccio and yelloweye rockfish could occur in the action area.

The Proposed Action is **not likely to adversely affect** bocaccio and yelloweye rockfish because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Though bocaccio and yelloweye rockfish could be directly exposed to degraded water quality and habitat quality could be degraded due to reduced water quality from Proposed Action stormwater pollutants, the extent and severity of those effects cannot be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect bocaccio and yelloweye rockfish or their habitat.

6.8 Bocaccio and Yelloweye Rockfish Critical Habitat

The Proposed Action **may affect** critical habitat for bocaccio and yelloweye rockfish because the following attributes are present in the offshore deepwater Puget Sound portion of the action area:

- Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding.
- Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding.

The Proposed Action is **not likely to adversely affect** critical habitat for bocaccio and yelloweye rockfish because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Though stormwater contaminants could remain in the treated discharge and result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure, the extent and severity of those effects cannot currently be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect bocaccio and yelloweye rockfish critical habitat.

6.9 Southern Resident Killer Whale

The Proposed Action **may affect** SRKW because migration and foraging habitat are present in Puget Sound in the action area. The Proposed Action is **not likely to adversely affect** SRKW because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Though SRKW could be exposed to degraded water quality and habitat quality due to the Proposed Action, the extent and severity of those effects cannot be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect SRKW or its habitat.

6.10 Southern Resident Killer Whale Critical Habitat

The Proposed Action **may affect** critical habitat for SRKW because the Puget Sound portion of the action area overlaps designated critical habitat. The Proposed Action is **not likely to adversely affect** critical habitat for SRKW because:

- Proposed structural and operational pollution controls, including 6PPD-Q treatment, are incorporated into Proposed Action.
- Though stormwater contaminants could remain in the treated discharge and result in an incremental degradation of water quality and potential indirect effects on prey resources from pollutant exposure, the extent and severity of those effects cannot currently be quantified.
- There is not enough information available to reasonably conclude that the ongoing discharge of low levels of contaminants in treated stormwater and wastewater discharges produced by the Proposed Action could adversely affect SRKW critical habitat.

7.0 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).

7.1 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 impact that reduces the quality or quantity of EFH. The objective of this EFH evaluation is to determine whether the project "may adversely affect" designated EFH for relevant commercially, federally managed fisheries species within the action area. It also references conservation measures to avoid, minimize, or offset potential adverse effects to designated EFH resulting from the project.

7.2 Location and Description of Proposed Action

The FAA is consulting on the Port's Proposed Action, as described in Chapters 1.0 and 2.0 of this BE. The 29 NTPs have been designed to meet forecasted rising passenger and cargo demand at SEA by improving efficiency, safety, access to the airport, and support facilities for the airlines and the airport. In addition, the Port would construct and operate associated PSPs that are necessary for the implementation of the NTPs and provide mitigation for unavoidable impacts to wetlands, streams and wetland and stream buffers resulting from project construction.

The construction and operation of the Proposed Action would occur primarily on currently developed land at SEA, with some development requiring clearing of vegetated parcels adjacent to these currently developed areas. Stormwater and industrial wastewater discharges from the new NTP facilities would discharge to the following waterbodies: Miller Creek and Des Moines Creek, which flow directly into Puget Sound; Walker Creek, which drains into Miller Creek; and Puget Sound, which receives effluent from SEA's IWTP via an NPDES-permitted outfall that discharges approximately 1,600 feet waterward of the mouth of Des Moines Creek at a depth of -148 feet relative to MLLW. Changes in impervious surface area and PGIS resulting from the NTPs, and proposed SDS and IWS improvements are detailed in Section 2.4.2.

7.3 Conservation Measures and Best Management Practices

Conservation measures and BMPs are included for Proposed Action activities and are described in Chapter 2 of this BE. Conservation measures would avoid or minimize potential effects to existing habitat conditions, including EFH, in the action area. Mitigation would be provided to compensate for impacts to wetlands and to wetland and stream buffer.

7.4 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 Puget Sound portions of the action area including project-related stormwater discharges are listed in Table 18. Salmonid fish species that have designated EFH in the Miller Creek, Walker Creek, and Des Moines Creek portion of the action area are listed in Table 19. Evaluation 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 18. Species of fish with designated EFH that may be present in the Puget Sound 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	
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	
Sources: Pietsch and Orr 2015, Port 2016b, Windward 2010, NMFS 2024b.					

Table 19. Pacific salmon species with designated EFH that may be present in the freshwater aquatic component of the action area.

EFH Species	Eggs	Larvae	Juvenile	Adult	Spawning
Chinook salmon, *Oncorhynchus tshawytscha*[a]				x	
Coho salmon, *O. kisutch*				x	
Puget Sound pink salmon, *O. gorbuscha*[b]				x	

Sources: Pietsch and Orr 2015, Port 2016b, Windward 2010, NMFS 2024b.

[a] Chinook salmon presence in Miller Creek, Walker Creek, and Des Moines Creek is documented as gradient accessible with no documented spawning history (NWIFC 2024, WDFW 2024d, e).

[b] Miller Creek, Walker Creek, and Des Moines Creek are accessible to pink salmon, but the species is not known to use the creeks (NWIFC 2024, WDFW 2024d, e).

7.4.1 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 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 (NMFS 2024b):

- **Puget Sound**: Groundfish EFH is designated in the Puget Sound portion of the action area at the offshore NPDES stormwater outfall.
- **Miller Creek, Walker Creek, and Des Moines Creek:** Groundfish EFH is not present in these aquatic areas.

7.4.2 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 stormwater discharges (NMFS 2024b):

- **Puget Sound**: Coastal pelagic EFH for finfish, market squid, and coastal pelagic krill is designated in the Puget Sound portion of the action area at the offshore NPDES stormwater outfall.
- **Miller Creek, Walker Creek, and Des Moines Creek:** Coastal pelagic EFH is not present in these aquatic areas.

7.4.3 Pacific Salmon

The Pacific salmon management unit includes Chinook salmon, coho salmon (*O. kisutch*), and pink salmon (*O. gorbuscha*). The EFH designation for the Pacific salmon fishery is divided into two groups:

- 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).
- 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:

- **Puget Sound:** Pacific salmon EFH is designated in the Puget Sound portion of the action area at the offshore NPDES stormwater outfall. Chinook salmon, coho salmon, and pink salmon all may use the nearshore habitat in Puget Sound near this outfall at some point in their life histories, particularly during juvenile outmigration and adult spawning migration.
- **Miller Creek, Walker Creek, and Des Moines Creek:** Pacific salmon EFH is present in all these aquatic areas. All three are considered gradient accessible to Chinook salmon. Coho salmon have been documented in each of these listed waterways. Miller Creek, Walker Creek, and Des Moines Creek are considered gradient accessible to pink salmon.

7.5 Potential Adverse Effects of Proposed Action

Chapter 6, Analysis of Effects, describes in detail the potential impacts to habitat constituents important to ESA-listed fish species, which are like those for EFH species. Analyses presented address potential elements specific to EFH, which for this Proposed Action is primarily stormwater. Those elements of the analysis are reiterated or cross referenced in the following sections. There are no potential construction impacts to EFH species in the action area. The specific stormwater drainages, as well as the associated changes in new NPGIS and PGIS, and changes in source control BMPs and treatment levels are summarized in Table 3.

7.5.1 Puget Sound

All new PGIS surfaces draining to Puget Sound, and freshwater habitats that drain to Puget Sound, would meet the airport flow and water quality requirements before being released. In addition, SEA implements a variety of operations and management BMPs that include pollutant prevention, interception, and maintenance measures to prevent and collect pollutants prior to entering the stormwater facilities (see Sections 2.7 and 2.8). The Proposed Action would include expanded pond and bioretention swale capacity to treat new PGIS.

Recent research has found 6PPD-Q, a contaminant found in rubber particles from automobile tire wear on roads, to be a major contributor to pre-spawning mortality in coho salmon (Tian et al. 2021; 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 parts per billion (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 may be warranted but cannot be determined with certainty.

While the types of contaminants likely to be generated by the project are generally understood, the extent to which the project might affect ambient pollutant levels in stormwater is difficult to predict. The proposed action would increase the current amount of treated PGIS draining to Puget Sound and freshwater habitats that drain to Puget Sound. Runoff from these surfaces would flow through improved and expanded treatment and retention facilities that would drain to the same points of discharge currently permitted by Ecology (2021). As such, the contribution of the project to effluent pollutant concentrations and the distance from the outfall required to dilute concentrations below levels likely to cause detectable effects is unknown. Runoff volumes 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 roadways during long periods of dry weather. Such events are most common in early and mid-autumn. The project would constitute only a small proportion of the overall pollutant loading discharged into the Puget Sound. Discharge into the marine waters of Puget Sound is also a variable factor of pollutant concentrations, as salinity reduces the toxicity and bioavailability of contaminants such as metals.

7.5.2 Miller Creek, Walker Creek, and Des Moines Creek

Potential operational stormwater impacts to EFH species in Miller Creek, Walker Creek, and Des Moines Creek are like what is described above for Puget Sound. The Proposed Action would result in a net increase in PGIS of approximately 50 acres draining to Puget Sound comprising a combination of new, replaced, and retrofitted impervious surfaces (see Table 3).

7.6 Conclusion and Effect Determinations

While the project would provide new, improved source control BMPs and treatment capacities (including methods to remove 6PPD-Q) that would minimize adverse impacts, the project would generate stormwater and wastewater discharge from new, replaced, and retrofitted PGIS. Stormwater and wastewater discharges would result in an incremental degradation of water quality from pollutant exposure, the extent and severity of those effects cannot currently be quantified.

7.6.1 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. However, these impacts cannot be quantified with certainty. Overall, based on the operational stormwater discharges of the project, the project is **not likely to adversely affect** groundfish EFH.

7.6.2 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. However, these impacts cannot be quantified with certainty. Overall, based on the operational stormwater discharges of the project, the project is **not likely to adversely affect** coastal pelagic EFH.

7.6.3 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. However, these impacts cannot be quantified with certainty. Overall, based on the operational stormwater discharges of the project, the project **is not likely to adversely affect** Pacific salmon EFH.

8.0 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.

Anchor QEA. 2019. Mitigation site opportunity assessment (Appendix B of the Land stewardship plan). Prepared for the Port of Seattle by Anchor QEA, Seattle, Washington.

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.

Calambokidis, J., and G. Steiger. 1990. Sightings and movements of humpback whales in Puget Sound, Washington. Northwestern Naturalist 71:45-49.

Calambokidis, J., K. Flynn, E. Dobson, J. Huggins, and A. Perez. 2018. Return of the giants of the Salish Sea: Increased occurrence of humpback and grey whales in inland waters. Conference proceedings. Presented April 6, 2018, at the Salish Sea Ecosystem Conference, Seattle, Washington.

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

Data Basin. 2024. Critical habitat units for northern spotted owl and marbled murrelet. https://databasin.org/maps/new/#datasets=d15113e3006042bc87714ba557364bc9. Accessed April 29, 2024

Des Moines Creek Basin Committee. 1997. Des Moines Creek Basin Plan. Prepared by the City of SeaTac, City of Des Moines, Port of Seattle, and King County.

Dethier, M.N. 2010. Overview of the ecology of Puget Sound beaches. In H. Shipman, M.N. Dethier, G. Gelfenbaum, K.L. Fresh, and R.S. Dinicola, eds. Puget Sound shorelines and the impacts of armoring—Proceedings of a state of the science workshop, May 2009. U.S. Geological Survey Scientific Investigations Report 2010-5254, 35-42.

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.

Ecology (Washington State Department of Ecology). 2019. 2019 stormwater management manual for western Washington. Publication No.19-10-021. Available at: https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm.

Ecology. 2021. National Pollutant Discharge Elimination System and State Waste Discharge Permit No. WA0024651. In compliance with the provisions of The State of Washington Water Pollution Control Law Chapter 90.48 Revised Code of Washington and The Federal Water Pollution Control Act (The Clean Water Act) Title 33 United States Code, Section 1342 et seq. Available at: https://apps.ecology.wa.gov/paris/FacilitySummary.aspx?FacilityId=85618771. Accessed: April 21, 2024.

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.

Ecology. 2023. Washington State coastal atlas. Available at: https://apps.ecology.wa.gov/coastalatlas/Default.aspx Accessed September 8, 2023.

Ecology. 2024. Water quality atlas. https://apps.ecology.wa.gov/waterqualityatlas/WQA/ProposedAssessmentApproved. Accessed: April 9, 2024.

Ecology, Corps Seattle District, and USEPA (U.S. Environmental Protection Agency) Region 10. 2006. Wetland mitigation in Washington State – Part 2: Developing mitigation plans (Version 1). Washington State Department of Ecology Publication #06-06-011b. Olympia, Washington.

Ecology, Corps Seattle District, and USEPA Region 10. 2021. Wetland mitigation in Washington State– Part 1: Agency policies and guidance (Version 2). Washington State Department of Ecology Publication #21-06-003.

Elliott Bay Trustees (National Oceanographic and Atmospheric Administration, U.S. Department of the Interior, State of Washington, Suquamish Tribe, and the Muckleshoot Tribe). 2019. Lower Duwamish River Natural Resource Damage Assessment: Injury Assessment Plan. Prepared by Industrial Economics, Inc.

Falxa, G., M.G. Raphael, J. Baldwin, D. Lynch, S.L. Miller, S.K. Nelson, S.F. Pearson, C. Strong, T. Bloxton,, M. Lance, and R. Young. 2013. Marbled murrelet effectiveness monitoring, Northwest Forest Plan: 2011 and 2012 summary report. 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.

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.

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.

Good, T. P., R.S. Waples, and P. Adams. 2005. Updated status of federally listed ESUs of west coast salmon and steelhead. NOAA Technical Memorandum NMFS-NWFSC-66.

GSRO (Governor's Salmon Recovery Office). 2022. 2022 State of Salmon in Watersheds. Prepared by the Washington State Recreation and Conservation Office. Available at: https://stateofsalmon.wa.gov/. Accessed: June 4, 2024.

Hayes, M.C., S. Hodgson, C.S. Ellings, W.D. Duvall, and S.P. Rubin. 2019. Seasonal use of a nonnatal marine basin by juvenile hatchery Chinook salmon. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 11:437–453.

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

Hruby, T., and A. Yahnke. 2023. Washington State wetland rating system for western Washington: 2014 Update (Version 2). Publication #23-06-009. Washington Department of Ecology.

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., 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.

Kerwin, J., and T. Nelson, editors. 2000. Habitat limiting factors and reconnaissance assessment report: Green/Duwamish and Central Puget Sound streams-data (Water Resource Inventory Area 9 and Vashon Island). Washington Conservation Commission and the King County Department of Natural Resources.

King County. 2011. Miller and Walker Creek Chronicle - Record of events shaping the ecology and fish populations of the streams. Summary of survey observations recorded in 2011.

King County and WRIA 9 (Water Resource Inventory Area 9 Steering Committee). 2005. Salmon habitat plan: Making our watershed fit for a king Green/Duwamish and Central Puget Sound Watershed (WRIA 9). Available at: https://www.govlink.org/watersheds/9/plan-implementation/HabitatPlan.aspx#download.

Lane, R.F, K.L. Smalling, P.M. Bradley, J.B. Greer, S.E. Gordon, J.D. Hansen, D.W. Kolpin, A.R. Spanjer, and J.R. Masoner. 2024. Tire-derived contaminants 6PPD and 6PPD-Q: Analysis, sample handling, and reconnaissance of United States stream exposures. Chemosphere 363.

Landrum & Brown. 2024. Construction noise analysis Seattle-Tacoma International Airport. Prepared for the Port of Seattle by Landrum & Brown, Seattle, Washington.

Leigh-Fisher. 2023. Aviation activity forecast update, Seattle-Tacoma International Airport. Prepared for the Port of Seattle, Washington.

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.

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.

Marks, E., R. Ladley, B. Smith, A. Berger, D. Campbell, J. Close and K. Williamson. 2022. Puyallup Tribal Fisheries annual salmon, steelhead and bull trout report: Puyallup/White River Watershed--Water Resource Inventory Area 10, 2021-2022. Puyallup Tribal Fisheries, Puyallup, Washington.

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.

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.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.

McIver, W.R., S.F. Pearson, C. Strong, M.M. Lance, J. Baldwin, D. Lynch, M.G. Raphael, R.D. Young, and N. Johnson. 2021. Status and trend of marbled murrelet populations in the Northwest Forest Plan area, 2000 to 2018. Gen. Tech. Rep. PNW-GTR-996. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

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 and Walker Creeks Basin Committee. 2006. Miller and Walker Creeks basin plan. Prepared by the City of Burien, City of Normandy Park, City of SeaTac, King County, Port of Seattle, and Washington Department of Transportation.

Miller and Walker Creek Executive Committee. 2006. Miller and Walker Creeks Basin Plan–Executive Proposed. February 2006.

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.)

Moser, M.L., K.S. Andrews, S. Corbett, B.E. Feist, and M.E. Moore. 2020. Occurrence of green sturgeon in Puget Sound and the Strait of Juan de Fuca: a review of detection data from 2002 to 2019. Report of the National Marine Fisheries Service to the U.S. Navy Pacific Fleet Environmental Readiness Division, Pearl Harbor, Hawaii.

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. 2011. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, Section 7(a)(2) "Not Likely to Adversely Affect" determination, Magnuson-Stevens Fishery Conservation and Management Act essential fish habitat (EFH) Consultation: SR 520 bridge replacement project. NMFS Consultation Number: 2010/05723.

NMFS. 2013. Endangered and threatened species; designation of critical habitat for yelloweye rockfish, canary rockfish and bocaccio of the Puget Sound/Georgia Basin. Proposed rule 78 FR 47635.

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. 2024a. Species Information. Available at: https://www.fisheries.noaa.gov/topic/endangered-species-conservation. Accessed: January 1, 2024.

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

NWIFC (Northwest Indian Fisheries Commission). 2024. Statewide Integrated Fish Distribution (SWIFD) web map. Available at: https://wdfw.maps.arcgis.com/home/webmap/viewer.html?webmap=19b8f74e2d41470cbd80b1af8dedd6b3&extent=-126.1368,45.6684,-119.6494,49.0781# Accessed: April 9, 2024.

NWFSC (Northwest Fisheries Science Center). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest.

NOAA (National Oceanic and Atmospheric Administration). 2024. NOAA Fisheries National ESA Critical Habitat Mapper. Available at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=68d8df16b39c48fe9f60640692d0e318. Accessed May 11, 2024.

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.

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.

Parametrix. 2024a. Sustainable Airport Master Plan (SAMP) impacts assessment for aquatic critical areas. Technical memorandum prepared for the Port of Seattle by Parametrix (project no: 553-2912-002), Seattle, Washington. May 22, 2024.

Parametrix. 2024b. Seattle-Tacoma International Airport Sustainable Airport Master Plan (SAMP) Near-Term Projects Wetlands and Streams Report. Prepared for Port of Seattle by Parametrix, Seattle, Washington, February 2024.

PFMC (Pacific Fishery Management Council). 1998. The coastal pelagic species fishery management plan: Amendment 8.

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 Seattle). 2016a. Standard operating procedure for construction water quality monitoring. Prepared for the Port of Seattle by Windward Environmental LLC.

Port. 2016b. Terminal 5 vessel traffic and navigation. Appendix G of the Terminal 5 cargo wharf rehabilitation, berth deepening and improvements environmental impact statement.

Port. 2020. Quality assurance program plan: Storm drainage system acute toxicity testing Seattle-Tacoma International Airport NPDES Permit No. WA0024651, Part 2 - Industrial Stormwater Monitoring. Prepared for the Port of Seattle by Aspect Consulting, LLC.

Port. 2021a. Municipal sanitary sewer sampling plan National Pollutant Discharge Elimination System Permit No. WA0024651 and King County Waste Discharge Permit. Prepared for the Port of Seattle by Aspect Consulting, LLC.

Port. 2021b. Quality assurance program plan: Seattle-Tacoma International Airport Industrial Stormwater Discharge Monitoring Program NPDES Permit No. WA0024651 (Part 2). Prepared for the Port of Seattle by Aspect Consulting, LLC.

Port. 2021c. Quality assurance program plan: Storm drainage system receiving water in-situ toxicity testing Seattle-Tacoma International Airport NPDES Permit No. WA0024651 Part 2 - Industrial Stormwater Monitoring. Prepared for the Port of Seattle by Aspect Consulting, LLC.

Port. 2021d. Quality assurance program plan: Storm drainage system receiving water sublethal toxicity testing Seattle-Tacoma International Airport NPDES Permit No. WA0024651 Part 2 - Industrial Stormwater Monitoring. Prepared for the Port of Seattle by Aspect Consulting, LLC.

Port. 2021e. Programmatic Construction Stormwater Pollution Prevention Plan: NPDES PERMIT WA0024651. Prepared for the Port of Seattle by Catchment Solutions LLC.

Port. 2022a. Seattle-Tacoma International Airport Utilities Master Plan - Sewer and Surface Water. December 30, 2022.

Port. 2022b. Seattle-Tacoma International Airport Stormwater Pollution Prevention Plan (SWPPP). Prepared in accordance with NPDES Permit No. WA-0024651.

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

Puget Sound Partnership. 2020. Waterways, watershed profile: Salmon and the Green/Duwamish Watershed. Available at: https://www.psp.wa.gov/shared-salmon-strategy/watersheds/watershed-green.htm#Waterways.

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.

SSPHAMST (Salish Sea Pacific Herring Assessment and Management Strategy Team). 2018. Assessment and management of Pacific herring in the Salish Sea: Conserving and recovering a culturally significant and ecologically critical component of the food web. Prepared for the SeaDoc Society by the University of Washington – Tacoma and Washington Department of Fish and Wildlife.

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.

Scott, J.B.J., and W.T. Gill. 2008. Oncorhynchus mykiss: Assessment of Washington State's steelhead populations and programs. Washington Department of Fish and Wildlife, Olympia, Washington.

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.

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.

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.

Topping, P.C., and J.H. Anderson. 2018. Green River juvenile salmonid production evaluation: 2017 annual report. Washington Department of Fish and Wildlife Fish Program, Science Division, Olympia, Washington.

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

USEPA (U.S. Environmental Protection Agency). 2010. National Pollutant Discharge Elimination System (NPDES) Permit Writers' Manual. EPA-833-K-10-001. Water Permits Division, Office of Wastewater Management Washington, DC 20460.

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

USFWS. 2014. Biological opinion: Washington State Ferries Seattle Multimodal Terminal at Colman Dock project, King County Washington. USFWS Reference 01EWFW00-2013-F-0262.

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

USFWS. 2020. Endangered Species Act (ESA) Section 7(a)(2) biological opinion for the issuance of 39 permits under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act for new, replacement, or repaired structures in the nearshore environment of Puget Sound.

USFWS. 2024a. Environmental Conservation Online System: USFWS Threatened and Endangered Species Active Critical Habitat Report Online Mapper. Available at: https://fws.maps.arcgis.com/home/pages/Account/accept_conditions.html#client_id=arcgisonline

&redirect_uri=https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77. Accessed: April 10, 2024.

USFWS, 2024b. Species profile for monarch butterfly. Available at: https://www.fws.gov/initiative/pollinators/monarchs. Accessed May 24, 2024.

USFWS. 2024c. Marbled Murrelet. https://ecos.fws.gov/ecp/species/4467. Accessed: April 10, 2024.

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.

USFWS. 1997. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Published by Region 1, U.S. Fish and Wildlife Service, Portland, Oregon.

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. 2022. 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.

Wasser S.K., J.I Lundin, K. Ayres, E. Seely, D. Giles, K. Balcomb, J. Hempelmann, K. Parsons, and R. Booth. 2017. Population growth is limited by nutritional impacts on pregnancy success in endangered Southern Resident killer whales (*Orcinus orca*). PLoS ONE 12(6):e0179824.

WDFW (Washington Department of Fish and Wildlife). 2004. Washington State salmonid stock inventory: Bull trout/Dolly Varden. WDFW, Olympia, Washington. Available at: https://wdfw.wa.gov/sites/default/files/publications/00193/wdfw00193.pdf.

WDFW. 2021. Commercial squid. https://wdfw.wa.gov/fishing/commercial/squid. Accessed March 2021.

WDFW (Washington Department of Fish and Wildlife). WDFW. 2024a. Species and Habitats: Species in Washington: Wolverine. Available at: https://wdfw.wa.gov/species-habitats/species/gulo-gulo-luscus. Accessed: April 10, 2024.

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

WDFW. 2024d. SalmonScape [Online Database]. Available at: https://apps.wdfw.wa.gov/salmonscape/. Accessed: April 9, 2024.

WDFW. 2024e. Species and Habitats: At-risk species: Priority Habitats and Species (PHS). Available at: https://wdfw.wa.gov/species-habitats/at-risk/phs. Accessed: April 9, 2024.

WDFW. 2024f. Salmon Conservation and Reporting Engine: Species: Steelhead. Accessed April 12, 2024.

WDFW. 2024g. Species and Habitats: Species in Washington: Marbled murrelet. Available at: https://wdfw.wa.gov/species-habitats/species/brachyramphus-marmoratus. Accessed: April 10, 2024.

WDFW and Western Washington Treaty Indian Tribes. 2002. Salmonid stock inventory (SaSI). Olympia, Washington.

WDFW and ODFW (Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife). 2023. Washington and Oregon eulachon management plan. Second Addition.

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.

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, 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.

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.

Windward (Windward Environmental LLC). 2010. Lower Duwamish Waterway remedial investigation report, final. For submittal to USEPA and Ecology.

WRIA 8 Salmon Recovery Council. 2017. Lake Washington/Sammamish Watershed (WRIA 8) Chinook salmon conservation plan, 10-year update. Available at: https://www.govlink.org/watersheds/8/reports/chinook-plan-update.aspx.

WSDOT. 2019. Highway Runoff Manual. Version M31-16.05. Prepared by the Engineering and Regional Operations Development Division, Design Office. Olympia, WA. Available at: https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/highway-runoff-manual.

WSDOT (Washington State Department of Transportation). 2023a. Bridge Design Manual (LRFD). Washington State Department of Transportation Design Manual M 23-50.22. Engineering and Regional Operations, Bridge and Structures Office. Olympia, Washington.

WSDOT. 2023b. 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.

Appendix A
Species Lists

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: 04/24/2024 21:21:40 UTC
Project Code: 2024-0081720
Project Name: Seattle-Tacoma International Airport: SAMP NTPs and PSPs

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".

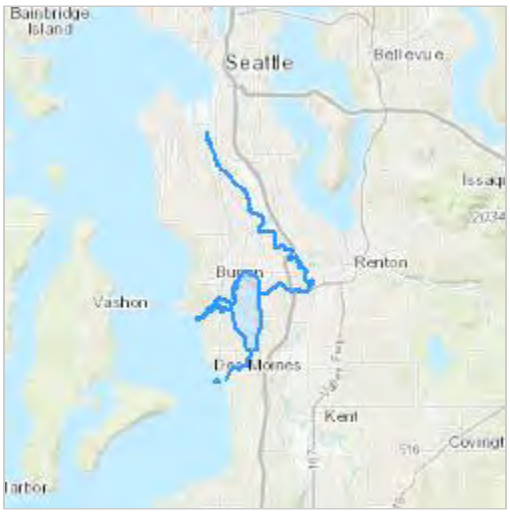
This species list is provided by:

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

PROJECT SUMMARY

Project Code: 2024-0081720
Project Name: Seattle-Tacoma International Airport: SAMP NTPs and PSPs
Project Type: Airport - Maintenance/Modification
Project Description: Species list request for updated 2024 SAMP NTP and PSP projects. Revised action area reflects expanded project list and potential for exposure to 6PPD-Q in stormwater and industrial wastewater discharge.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@47.40305635,-122.33736132583623,14z



Counties: King County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 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.

MAMMALS

NAME	STATUS
North American Wolverine *Gulo gulo luscus*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/5123

BIRDS

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus*	Threatened

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

Yellow-billed Cuckoo *Coccyzus americanus*	Threatened

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

REPTILES

NAME	STATUS
Northwestern Pond Turtle *Actinemys marmorata*	Proposed Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/1111

FISHES

NAME	STATUS
Bull Trout *Salvelinus confluentus*	Threatened

Population: U.S.A., coterminous, lower 48 states
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/8212

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

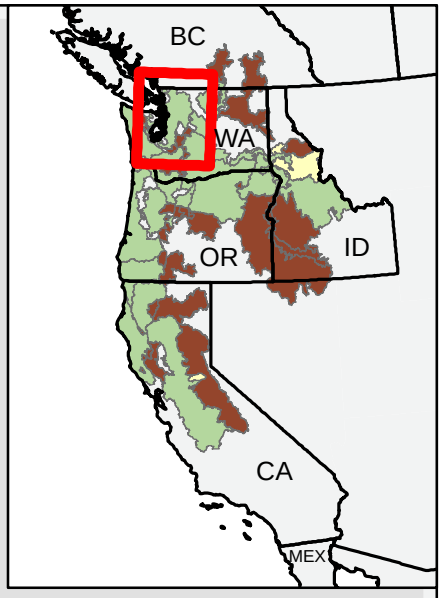
NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

IPAC USER CONTACT INFORMATION

Agency:	Federal Aviation Administration
Name:	Eric Doyle
Address:	146 N Canal St
Address Line 2:	Suite 111
City:	Seattle
State:	WA
Zip:	98103
Email	eric.doyle@confenv.com
Phone:	2063217314

Puget Sound Chinook Salmon Evolutionarily Significant Unit

Current as of January 2015



Nooksack River
North Fork Nooksack River
Bellingham
Skagit River
North Fork Stillaguamish River
South Fork Stillaguamish River
Port Angeles
Glines Canyon Dam
Dungeness River
Elwha River
Everett
Sultan River
Snohomish R.
North Fork Skykomish River
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

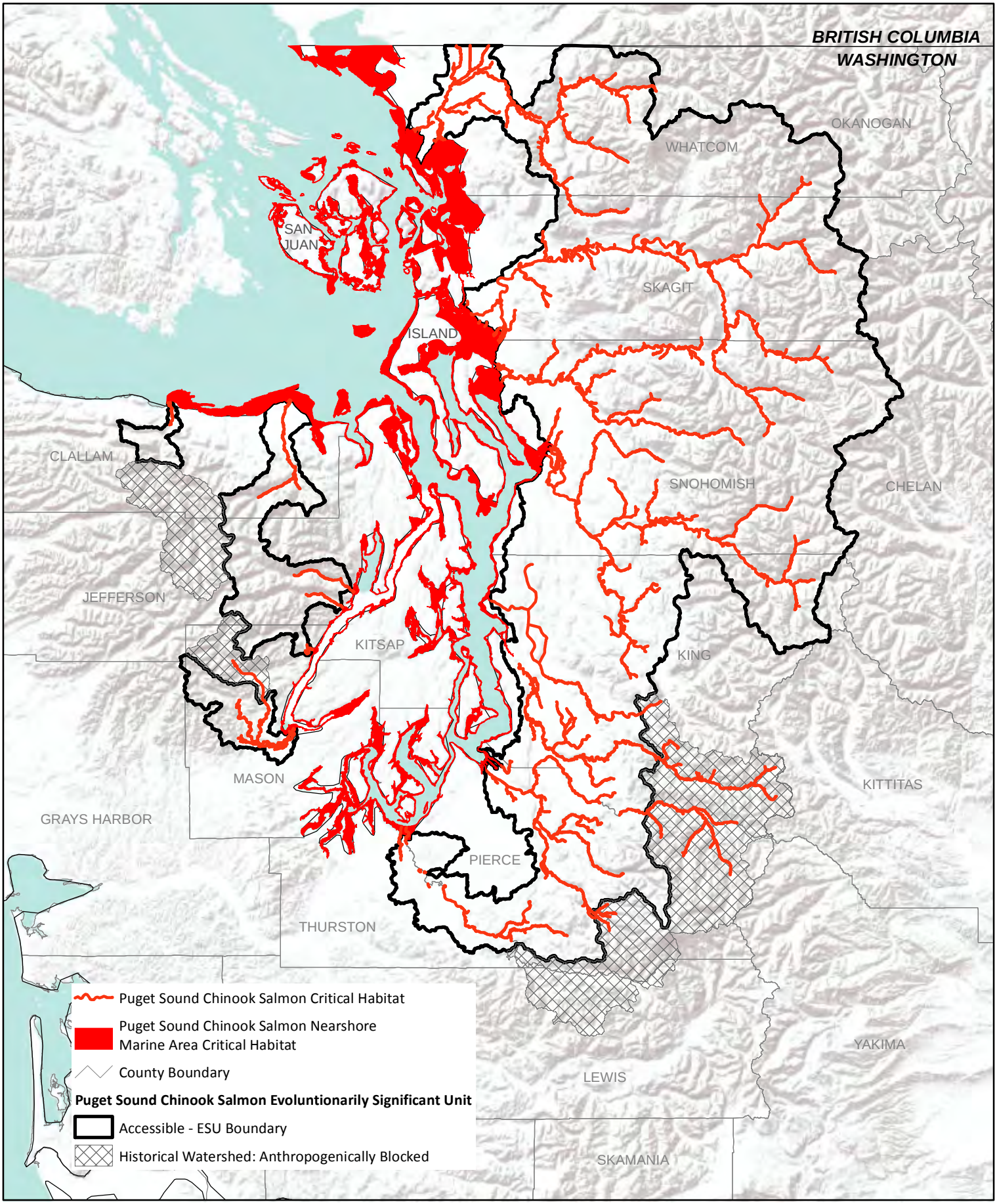
0 22.5 Miles

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

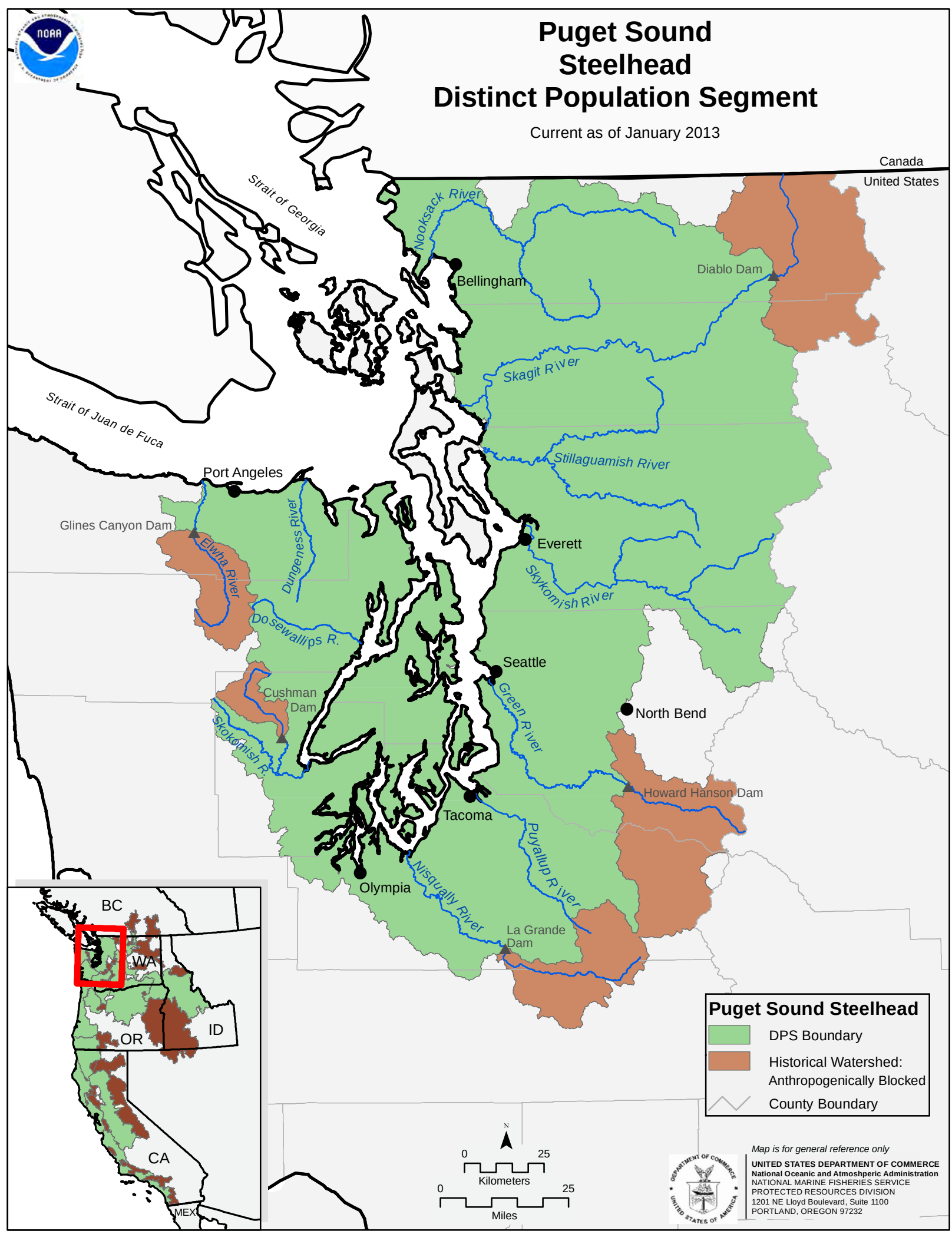
Critical Habitat
Puget Sound Chinook Salmon



0 50 Miles

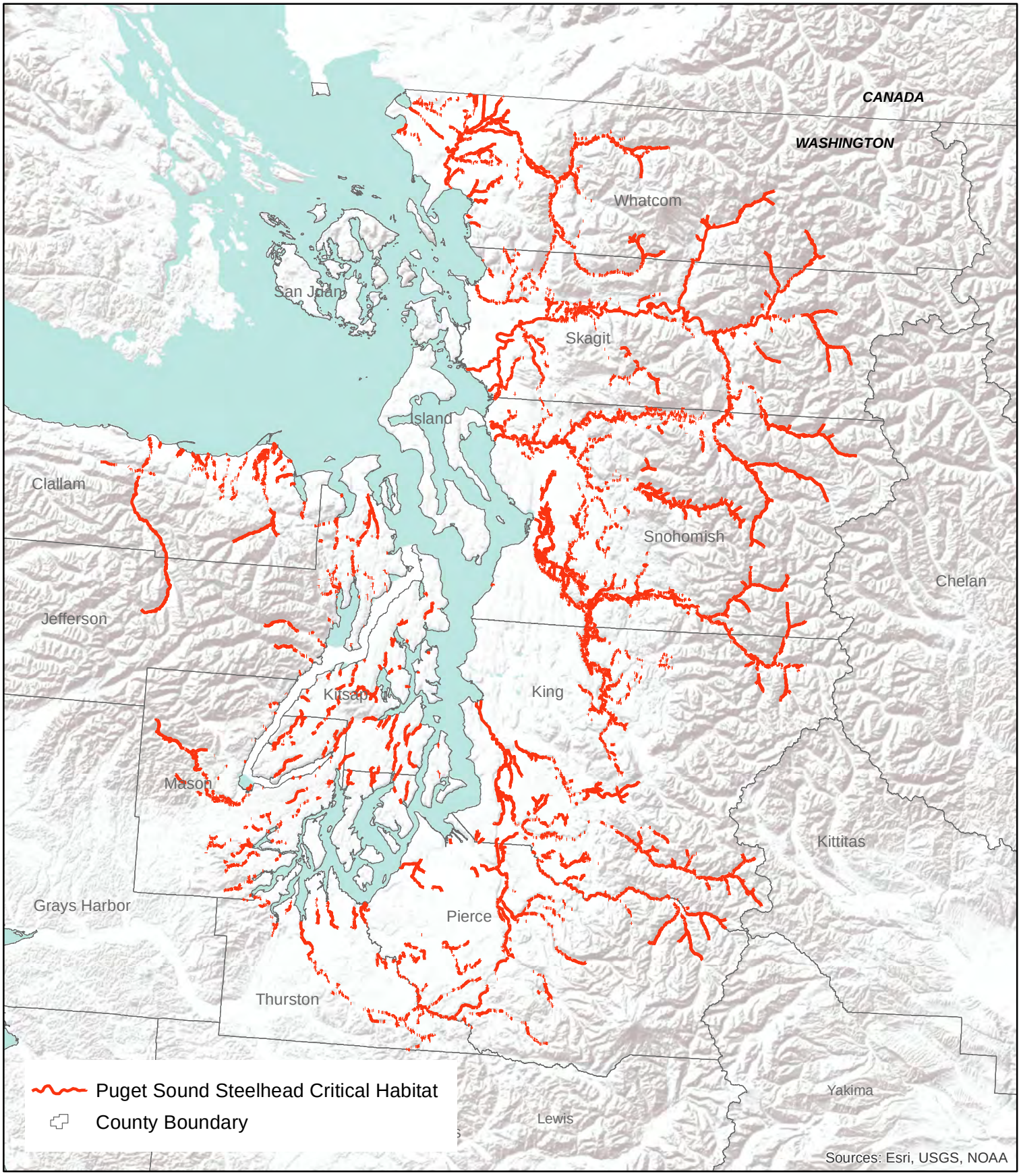
See Federal Register Notice for detailed description of critical habitat (70 FR 52630)

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
BC
WA
OR
ID
CA
MEX
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

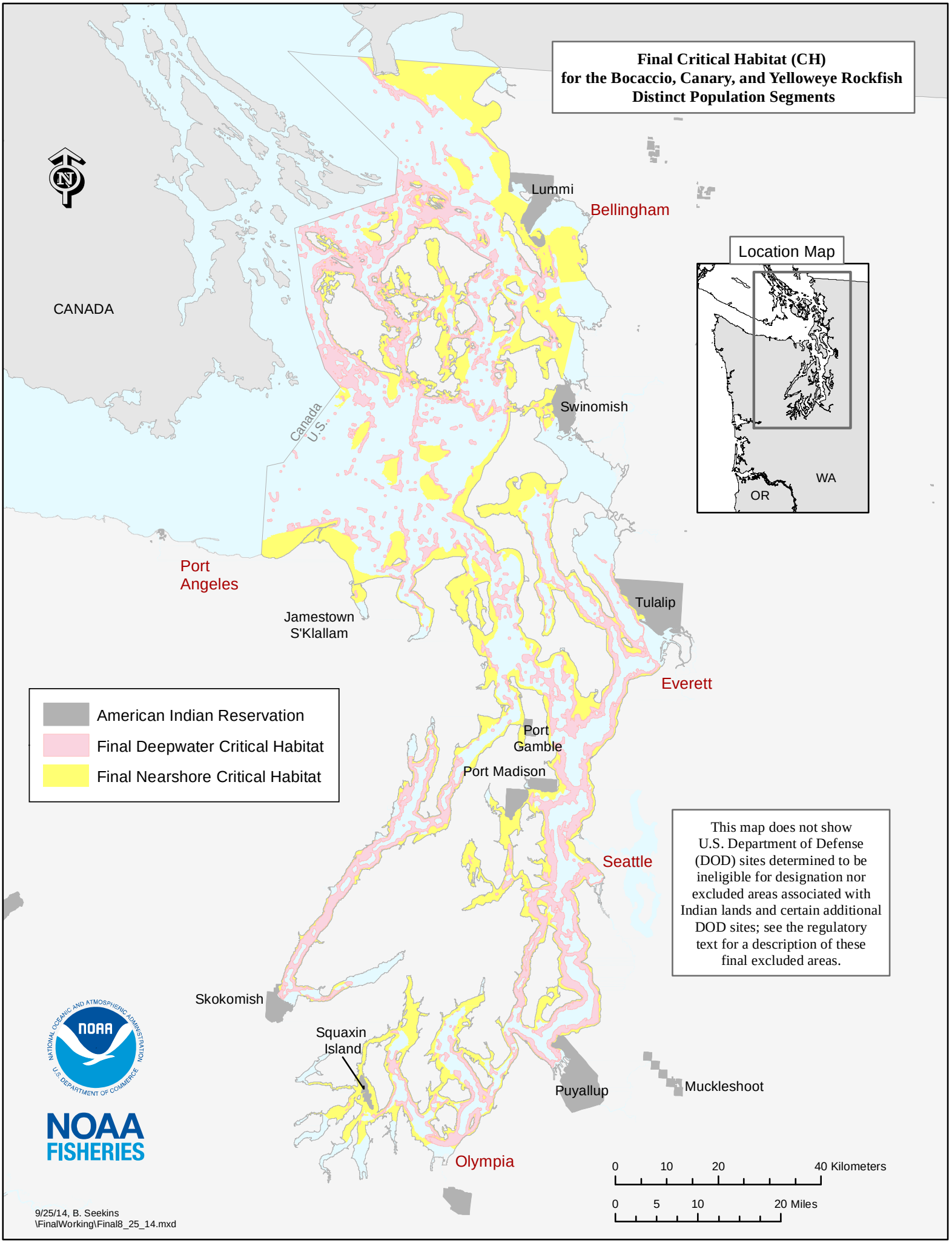
Final Critical Habitat
Puget Sound Steelhead



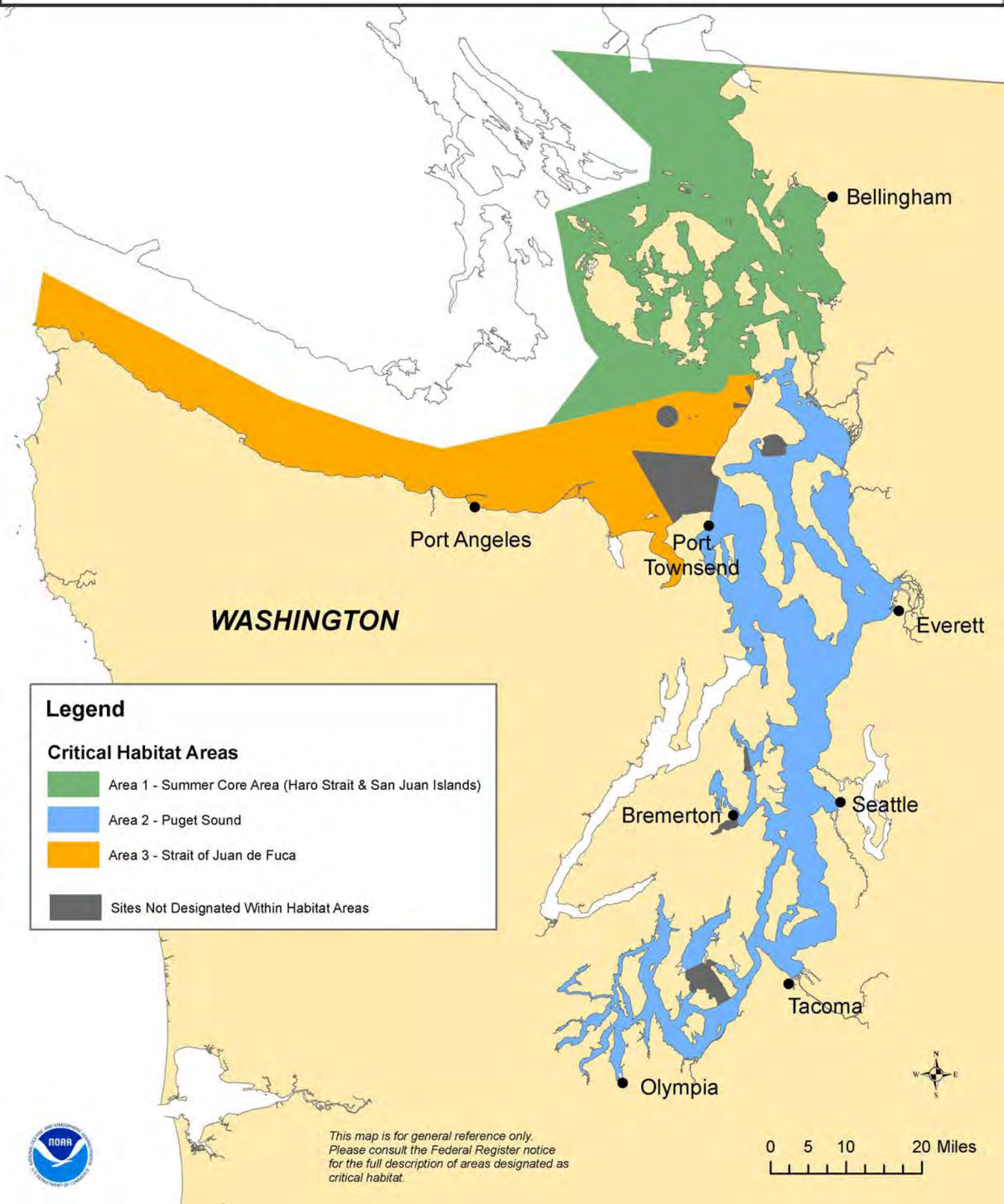
N

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


Final Critical Habitat (CH)
for the Bocaccio, Canary, and Yelloweye Rockfish
Distinct Population Segments
CANADA
Lummi
Bellingham
Location Map
WA
OR
Swinomish
Canada
U.S.
Port
Angeles
Jamestown
S'Klallam
Tulalip
Everett
American Indian Reservation
Final Deepwater Critical Habitat
Final Nearshore Critical Habitat
Port
Gamble
Port Madison
Seattle
This map does not show U.S. Department of Defense (DOD) sites determined to be ineligible for designation nor excluded areas associated with Indian lands and certain additional DOD sites; see the regulatory text for a description of these final excluded areas.
Skokomish
Squaxin
Island
Puyallup
Muckleshoot
Olympia
NOAA
FISHERIES
0 10 20 40 Kilometers
0 5 10 20 Miles
9/25/14, B. Seekins
\FinalWorking\Final8_25_14.mxd

Designated Critical Habitat for Southern Resident Killer Whales
November 2006
NOAA Fisheries, Northwest Region



This map is for general reference only. Please consult the Federal Register notice for the full description of areas designated as critical habitat.

Appendix B

SEA Water Quality Compliance Monitoring

IWS
PERMIT LIMITS

NPDES LIMITS

TABLE S1-1. IWS FLOW EFFLUENT LIMITS

OUTFALL 001 DISCHARGE TO PUGET SOUND		
Parameter	**Monthly Average**	**Maximum Daily**
Biochemical Oxygen Demand (BOD_5) November through March	45 mg/L	2665 lbs/day
Biochemical Oxygen Demand (BOD_5) April through October	25 mg/L	1480 lbs/day
Total Suspended Solids (TSS)	21 mg/L	33 mg/L
Oil and Grease as NWTPH-Dx	8 mg/L	15 mg/L
pH [b]	Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.	

Footnotes:

[a] The monthly average effluent limits is based on the arithmetic mean of the samples taken during a calendar month.

[b] Indicates the range of permitted values. When pH is continuously monitored, excursions between 5.0 and 6.0, or 9.0 and 10.0 shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 30 minutes per month. Any excursions below 5.0 and above 10.0 are violations. The instantaneous maximum and minimum pH must be reported monthly

S7. FACILITY LOADING

A. Design Criteria

Flows or waste loadings of the following design criteria for the permitted treatment facility must not be exceeded:

Daily Peak Flow @ Maximum Overflow Rate of 4.1 GPM/SF of Dissolved Air Flotation Surface Area	**7.1 MGD**

SANITARY SEWER
PERMIT LIMITS

Midway Sewer Discharge

TABLE S1-2: EFFLUENT LIMITS FOR MIDWAY SEWER DISCHARGE

Parameter	Average Monthly [a]	Maximum Daily [b]
Flow – GPD		
Boiler Blowdown - MBBD	1,000	15,000
Cooling Tower Blowdown - MTBD	18,000	250,000
Equipment Wash Rack Blowdown - EWBD	20,000	20,000
Bus Maintenance Facility Bus Wash & Chassis Blowdown - BWBD	4380	17,260
Oil and Grease – Equipment Wash Rack Blowdown, Bus Maintenance Facility Bus Wash & Chassis Blowdown	**N/A**	100 mg/L
pH – Equipment Wash Rack, Bus Maintenance Facility Bus Wash & Chassis Blowdown	Daily minimum is equal to or greater than 6, and the daily maximum is less than 9 standard units.	

[a] Daily flows averaged over a month.

[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day.

SDS
PERMIT LIMITS

TABLE 2S1-2: EFFLUENT LIMITS FOR INDUSTRIAL STORMWATER COMMON TO ALL OUTFALLS.

PARAMETER	DAILY MAXIMUM LIMITS - All Outfalls	SAMPLING FREQUENCY[1]		SAMPLING TYPE
		SDE4/S1, SDD05A, SDD05B	All Other Outfalls	
Turbidity[3]	25 NTU	2/Qtr	1/Qtr	Grab
pH	Between 6.5 - 8.5 S.U.	2/Qtr	1/Qtr	Grab
pH[4]	6.3 to 9.0 S.U. for outfalls SDN3A, SDW1A, SDW1B and SDW2	2/Qtr	1/Qtr	Grab
Oil and Grease (by NWTPH-Dx)	15 mg/L	2/Qtr	1/Qtr	Grab
Oil and Grease	No Visible Sheen	2/Qtr	1/Qtr	Visual
Ammonia[5]	14.7 mg/L	2/Qtr	1/Qtr	Comp[2]
Nitrate/Nitrite as N[5]	0.68 mg/L	2/Qtr	1/Qtr	Comp[2]
Priority Pollutants[6]	Report	2/year in year 3 of the permit		Comp[2]

TABLE 2S1-3: SITE SPECIFIC EFFLUENT LIMITS FOR INDUSTRIAL STORMWATER

PARAMETER	DAILY MAXIMUM LIMITS - Outfalls by Receiving Water						SAMPLING FREQUENCY[1]		SAMPLING TYPE
	Des Moines Creek - East Branch	Lake Reba	Northwest Ponds		Miller Creek	Walker Creek			
	SDE4/S1, SDD06A, SDD05A, SDD05B	SDN1, SDN2/3/4	SDS3/5, SDS6/7	SDS4	SDN3A, SDW1A, SDW1B	SDW2	SDE4/S1, SDD05A, SDD05B	All Other Outfalls	
Total Copper (µg/L)	25.6	28.5	32.2	32.2	59.2	47.9	2/Qtr	1/Qtr	Comp[2]
Total Zinc (µg/L)	117	117	117	71.4	117	117	2/Qtr	1/Qtr	Comp[2]

[1] Sampling frequency for new outfalls SDD05A and SDD05B (upon activation) is 2 storms/quarter, the second sample is required for a discharge at least 24 hours after the first. Sampling frequency for outfall SDE4/S1) is 2 storms/quarter for period (October – June) and 1 storm/quarter for period (July – September).

[2] Flow-weighted composite

[3] Turbidity effluent limits are at the end of the pipe. When this limit is exceeded, Permittee may conduct in-stream sampling (i.e., upstream and downstream) to assess turbidity and evaluate its compliance with water quality criteria.

[4] pH as low as 6.3 and as high as 9.0 shall not be considered a violation if results of concurrent sampling at the point of complete mix within the receiving water indicates pH range of 6.5 - 8.5 S.U.

[5] Required only if urea is applied. If urea is not applied, Permittee must certify it.

[6] See Appendix A to identify the specific pollutants in the priority pollutant groups listed. The Permittee must take samples twice per year, once during wet season and once during dry season in year 3 of the permit cycle, and submit the report to Ecology 180 days prior to permit expiration in conjunction with permit application.

CSW
PERMIT LIMITS

TABLE 2

EFFLUENT LIMITS	
Parameter	**Maximum Daily [a]**
Turbidity	**Turbidity in the** receiving water **must not exceed 5 nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.**[b]
Turbidity [c] (Batch or Continuous Treatment)	The maximum daily average must not exceed 5 NTU. [d]
Total Petroleum Hydrocarbons	5 mg/L - No visible sheen at any time [e]
pH (Batch or Continuous Treatment)	In the range of 6.5 to 8.5
pH [f]	In the range of 6.5 to 8.5 – With the human-caused variation within the above range of less than 0.2 units.

[a] The maximum daily effluent limitation is defined as the highest allowable daily discharge.

[b] In the **receiving water** here means at the point of complete mix to be determined by the Permittee.

[c] The treatment referred here is for batch or continuous treatment as specified by the DOE-SWMM, DOE Stormwater Treatment Technologies Approved through TAPE or CTAPE.

The average daily effluent limitation is based on the arithmetic mean of number of samples taken per day from the continuous discharge, or in case of batch treatment, based on the number of batch discharged per day.

[d] The maximum daily average is defined as maximum value of daily averages taken during a calendar month.

[e] TPH numerical limit must be applied and a sample must be taken only when visible sheen is observed. The numerical limit will not apply when there is no visible sheen observed.

[f] Indicates the range of permitted values. In the receiving water here means at the point of complete mix to be determined by the Permittee.

Footnotes:

(1) The method detection level (MDL) for turbidity is 1 NTU using a turbidimeter and Method Number 180.1 from 40 CFR Part 136 or *Standard Methods for the Examination of Water and Wastewater*, 18th Edition, 2130.

(2) The MDL for total petroleum hydrocarbons in 0.1 mg/L using Gas Chromatography and Flame Ionization Detector (FID) and method number Northwest Diesel (WTPH-D) from Washington State Department of Ecology Method WTPH-D. The quantitation level (QL) for TPH-D is 0.5 mg/L (5 x MDL).

Appendix C

Impacts Assessment for Aquatic Critical Areas

Parametrix
let's create tomorrow, together

Technical Memorandum

DATE:	May 22, 2024
TO:	Adele Pozzuto and Steve Rybolt, Port of Seattle
FROM:	Kaylee Moser, PWS and Josh Wozniak, PWS
SUBJECT:	Sustainable Airport Master Plan (SAMP) Impacts Assessment for Aquatic Critical Areas
CC:	Sarah Potter and Erik Schwenke, Landrum & Brown
PROJECT NUMBER:	553-2912-002
PROJECT NAME:	Sustainable Airport Master Plan (SAMP)

This memo describes estimated project impacts to aquatic critical areas based on the current designs for the Near-Term Projects (NTP). Impacts were calculated by overlaying the footprint of these NTPs and associated utility features provided by Landrum & Brown with mapped aquatic critical areas. Sources of mapped aquatic critical areas used in this analysis include:

- Wetland and streams delineated within the study areas (Parametrix 2024).
- Wetland and stream mapping provided by the Port for areas outside of the delineation study areas.
- Wetland and stream buffers created in compliance with SeaTac Municipal Code
- Wellhead protection areas and floodplains sourced from King County, City of SeaTac (SeaTac) and the Federal Emergency Management Agency (FEMA).

Impact assessments are based on the overlap between these GIS datasets and the NTP footprints. This memo provides only the spatial overlay of the projects with these features, pending further design refinement or technical studies. This memo and impact assessment provides information to the planning and design team, alerting them to potential aquatic critical area issues within certain portions of the NTP footprints.

Critical Areas Jurisdiction

The Port has its own jurisdiction over critical areas, and activities that affect critical areas at the Airport are not subject to municipal permit review. However, the Port substantially complies with local critical area codes to the extent practicable. The 2018 Port-SeaTac Interlocal Agreement (ILA) states that the City of SeaTac critical area regulations and standards shall apply to Port projects on Port property within the Airport Activity Area (AAA), with the exception of certain situations listed within the ILA (Port of Seattle 2018). The major exception is that if 401/404 or Hydraulic Project Act permitting is required for a project, the City's critical area regulations shall not apply. The Port administers permitting under these provisions for projects within the AAA as indicated by the 2018 Port-SeaTac ILA. The City implements critical area standards for Port projects on property outside the AAA. The Port will administer all of the critical areas permits except for projects in the North Study Area Zone, which is within City of SeaTac jurisdiction. This portion of the study area is directly north of State Route (SR) 518 (See Figure 1-1 Vicinity Map in Attachment A).

The City of SeaTac regulates the following aquatic critical areas under Chapter 15.700:

- Flood hazard areas
- Wetlands
- Stream
- Wellhead protection areas (WHPAs)
- Fish and wildlife habitat conservation areas

Overview of Project Impacts to Aquatic Critical Areas

The mapped aquatic critical areas within the study area include wetland, stream, floodways, WHPAs, and fish and wildlife habitat conservation areas. These layers were mapped by Parametrix or downloaded from the GIS data sites of government agencies, including the City of SeaTac, King County, and FEMA. The NTP footprints do not have any impacts on the mapped floodway or 100-year floodplain, nor are impacts to fish and wildlife habitat conservation areas anticipated to occur. The NTP footprints, utility lines, and stormwater ponds do have impacts to WHPAs, jurisdictional tributaries, wetlands, streams, and their associated buffers. Three WHPAs are mapped within the study area. The impacts to WHPAs were calculated based on a 10- year contaminant travel time. Wetlands and streams mapped within the study area were delineated between September and December 2019 and in March 2020, with a wetland and waters verification in January 2024. The mapped wetlands and streams within the study area drain into the Miller/Walker Creek, Gilliam Creek/Lower Green River, and Des Moines Creek drainage basins.

The NTPs are divided into five project groups: Airfield Operational Efficiency Projects, Airfield Safety/Standards Projects, Cargo Expansion Projects, North Terminal Projects, and Sustainable Aviation Fuel Projects. There is also associated utility infrastructure, including new stormwater ponds and 10 types of utility lines to be installed for the projects. Only the project elements that have impacts to aquatic critical areas are discussed in this memorandum. Permanent impacts to aquatic critical areas from utility line installation were calculated based on a 20- foot-wide buffer polygon applied to individual utility lines. Access roads are assumed to be 30 feet wide, with 5 feet of temporary disturbance on each side during construction, except in the vicinity of the Miller Creek crossing, where temporary disturbance extends to the limits of a covenant boundary that restricts impacts (20-50 feet). Temporary construction impact areas to critical areas were calculated based on a 50-foot buffer polygon applied to NTP footprints and stormwater ponds.

Impacts were specifically calculated so that there was no double counting for project elements that overlap spatially. In particular, for areas where permanent impacts from NTPs and utility lines overlapped, permanent “impact values” (acreages of impact) were assigned to the NTPs. As an example, consider a theoretical NTP served by an upgraded water line. The NTP would impact 0.5 acres of wetland. The new theoretical water line would impact 0.1 acre of the wetland inside the NTP footprint. Therefore, the water line impact would not be counted because it has already been included as an NTP impact. For areas where permanent impacts from new stormwater ponds and utility lines overlapped, permanent impact values were assigned to stormwater ponds. Where permanent and temporary buffer impacts overlapped, impact values were assigned to the project element that was permanent.

Table 1 summarizes the total permanent and temporary construction impacts for the NTP footprints, utility lines, and stormwater ponds within critical areas and associated buffers. Tables 2, 3, and 4 provide further details on permanent and temporary impacts for NTP footprints, utility lines, and stormwater ponds. In Tables 1 and 4 stream buffer impacts overlap wetland buffer impacts in some

areas but are accounted for separately. Also, all buffers have existing development such as buildings and impervious surfaces clipped out for the impact analysis.

See Attachment A for Figures 1-1 through 1-6d, displaying a vicinity map and the location of NTP footprints, utilities, stormwater ponds, and impacts to aquatic critical areas.

Table 1. Overview of Impacts to Aquatic Critical Areas and Buffers (acres)

Aquatic Critical Areas and Buffers	Permanent Impacts	Temporary Impacts
Stream/Jurisdictional Tributaries	0.02	0.08
Stream Buffer	0.12	0.20
Wetland	0.79	0.21
Wetland Buffer	2.66	3.43
Wetland, Stream and Buffer Total	**3.59**	**3.92**
Wellhead Protection Area	52.10	7.55

The current project design results in a total of 0.79 acres of permanent wetland impacts for all NTP footprints, utility lines, and stormwater ponds. Permanent stream/ jurisdictional tributary impacts—associated with the West Maintenance Campus access road—total 0.02 acre. Permanent wetland and stream buffer impacts total 2.66 acres and 0.12 acre, respectively. Temporary construction impacts, which would be restored after construction is complete, total 3.92 acres for wetland, stream, and buffer. Projects would protect WHPAs from groundwater contamination, as required by the State of Washington Department of Health. Based on the current spatial analysis, permanent WHPA impacts are estimated at 52.10 acres, with temporary construction impacts totaling 7.56 acres. Additional analysis of WHPA impacts will be conducted during design development for individual projects, and specific measures to protect WHPAs will be integrated into project designs as appropriate.

Permanent Impacts

Permanent project impacts are a result of excavation and fill to construct the NTPs, associated utility lines, and stormwater ponds. Permanent impacts for utility lines were calculated based on an assumption of a 20-foot-wide buffer polygon, as discussed with Landrum & Brown. Project impacts are a combination of impacts from the NTPs, as well as associated infrastructure. Impacts for NTP projects and associated infrastructure are broken down and described below.

The NTP footprints permanently impact a total of 0.23 acre of wetland and 2.31 acres of wetland buffer. Additionally, the NTP footprints permanently impact 0.01 acre of stream and impact 0.07 acre of stream buffer.

Associated infrastructure improvements (utility lines and stormwater ponds) permanently impact 0.56 acres of wetlands and 0.35 acres of wetland buffer. The infrastructure projects permanently impact 0.05 acre of stream buffer and 0.01 acre of streams/ jurisdictional tributaries. See Figure 1-4 for locations of permanent NTP impacts and Figure 1-5 for permanent utility/stormwater impacts.

Table 2 details the impacts to critical areas and buffers for individual project elements and sums up permanent impacts. Only the individual projects that have impacts to aquatic critical areas are listed.

Table 2. Permanent Impacts to Aquatic Critical Areas and Buffers (acres)

Project Element	Streams/ Jurisdictional Tributaries	Stream Buffer	Wetland	Wetland Buffer	WHPAs
Employee Parking Structure	--	--	0.02	0.60	--
Fuel Farm Expansion	--	--	0.21	0.01	--
North GT Holding Lot	--	--	--	--	5.02
Off-site Cargo PH 1 (L-Shape)	--	--	--	--	34.08
Off-site Cargo PH 2 (L-Shape)	--	--	--	--	3.17
Taxiway A/B Extension	--	--	--	--	6.12
Westside Maintenance Campus	0.01	0.07	<0.01	1.70	--
NTP Projects Subtotal	***0.01***	***0.07***	***0.23***	***2.31***	***48.39***
Stormwater Pond (Miller Creek detention pond)	--	--	0.55**	--	--
Stormwater Pond (Pond M)	--	--	--	0.11	--
Stormwater Pond (Pond F detention pond)	--	--	--	<0.01	--
Stormwater Pond (SDS4 pond)	--	--	--	<0.01	0.13
Sanitary Sewer Lines	--	--	--	0.01	2.24
Storm Lines	0.01	0.05	0.01	0.23	1.33
Water Lines	--	--	--	--	--
Infrastructure Improvements Subtotal	***0.01***	***0.05***	***0.56***	***0.35***	***3.71***
Grand Total*	***0.02***	***0.12***	***0.79***	***2.66***	***52.10***

Impacts values in the table are rounded from more detailed calculations. The grand total is rounded from the calculated grand total, not the sum of the individualrounded values presented in the table.
** Future design may include a vault, reducing or eliminating this impact.

Table 3 below summarizes all permanent wetland impacts by project element and Wetland ID (as identified in the Port wetland GIS layers and the 2024 Parametrix report).

Table 3. Permanently Impacted Wetlands

Project Element	Wetland Impact (acre)	Wetland ID	2014 Ecology Rating [a]
Employee Parking Structure	0.02	Wetland A	III
Westside Maintenance Campus	<0.01	Wetland 39	III
Stormwater Pond (Miller Creek detention pond)	0.55**	Wetland A20	III
Fuel Farm Expansion	0.21	Wetland E1	III
Storm (UMP Line)	<0.01	Wetland A14	III
	0.01	Wetland 44	II
	<0.01	Wetland A20	III
	<0.01	Wetland R13	II
	<0.01	Wetland R14a	II
Grand Total*	***0.79***		

[a] Hruby and Yahnke 2023
* Impacts values in the table are rounded from more detailed calculations. The grand total is rounded from the calculated grand total, not the sum of theindividual rounded values presented in the table.** Future design may include a vault, reducing or eliminating this impact.

Wetlands having the greatest permanent impact include Wetland E1, Wetland A20, and Wetland A. Wetland E1 is a Category III wetland permanently impacted by the Fuel Farm Expansion project within the Sustainable Aviation Fuel Project group (See Figure 1-6c in Attachment A). This wetland would be entirely impacted. Wetland A20 is a Category III wetland located near the WMC project and is fully permanently impacted by UMP projects including a stormwater pond (See Figure 1-6d in

Attachment A). Wetland A is a Category III wetland also located at the north end of the study area and is permanently impacted by the Employee Parking Structure (See Figure 1-6a in Attachment A).

More detailed information on these wetlands can be found within the Seattle-Tacoma International Airport Sustainable Airport Master Plan (SAMP) Near Term Projects Wetlands and Streams Report (Parametrix 2024).

Temporary Construction Impacts

Temporary construction impacts would occur where aquatic critical areas or buffers are affected by clearing and ground-disturbing work but are revegetated following construction. Temporary construction impacts were calculated based on the assumption of a 50-foot buffer polygon applied to NTP footprints and stormwater ponds, as discussed with Landrum & Brown. The temporary construction impacts for the WMC access road were calculated based on a 5- foot buffer from the edge of the road. At the Miller Creek stream crossing, the temporary construction impacts were extended to meet the boundaries of the restrictive covenant on either side of the road. The duration of temporary construction impacts is unknown at this time, and, therefore, temporary construction impacts are not further divided into short-term versus long-term.

The temporary construction impacts for wetlands are 0.21 acre for NTP footprints. The utility infrastructure projects would have 0.70 acre of temporary wetland buffer impacts. Additionally, 130 linear feet of jurisdictional tributaries would be permanently impacted for the WMC, Miller Creek detention pond, and some proposed utility lines.

Table 4 details the impacts to critical areas and buffers for individual project elements and sums up the temporary construction impacts. Only the individual projects that have temporary impacts to critical areas and/or associated buffers are listed in this table.

Table 4. Temporary NTP Construction Impacts to Aquatic Critical Areas and Buffers (acres)

Project Element	Stream	Stream Buffer	Wetland	Wetland Buffer	WHPAs
Employee Parking Structure	--	--	0.04	0.55	0.31
Fuel Farm Expansion	0.07	--	0.07	0.35	--
North GT Holding Lot	--	--	--	--	0.24
Off-site Cargo PH 1 (L-Shape)	--	--	--	--	1.79
Taxiway A/B Extension	--	--	--	0.42	4.58
Westside Maintenance Campus	0.01	0.20	0.10	1.41	--
NTP Projects Subtotal	*0.08*	*0.20*	*0.21*	*2.73*	*6.92*
Stormwater Pond (Miller Creek detention pond)	--	--		--	--
Stormwater Pond (Pond F detentionpond)	--	--	--	0.11	--
Stormwater Pond (SDS4 Pond)	--	--	--	0.06	0.63
Stormwater Pond buffer (Pond M)	--	--	--	0.53	--
Infrastructure Improvements Subtotal	*–*	*–*		*0.70*	*0.63*
Grand Total*	*0.08*	*0.20*	*0.21*	*3.43*	*7.55*

* Impact values in the table are rounded from more detailed calculations. The grand total is rounded from the calculated grand total, not the sum of the individual rounded values presented in the table.

Discussion of Impacts by Project Element

The following sections describe impacts for each NTP group and detail individual projects within each group that impact aquatic critical areas and/or buffers. Details on the use and purpose of these individual projects were extracted from the SAMP Facilities Implementation and Financial Feasibility

Technical Memorandum No. 7 and Environmental Overview Technical Memorandum No. 8 (Leigh-Fisher 2018a, 2018b). Utility line and stormwater pond project impacts are also discussed in this section.

Cargo Expansion Projects

The Cargo Expansion Projects group contains three individual projects with impacts to aquatic critical areas and/or associated buffers. Construction of these projects could permanently and temporarily impact WHPAs, wetlands, and wetland/stream buffers.

Land use conversion within a WHPA presents the potential for impact if construction or operation of new projects could result in a release of contaminants to groundwater. However, these impacts can be avoided by project design and operational measures that minimize the risk of contamination. During the project design and permitting phase, detailed geotechnical and hydrogeological assessments will be developed to characterize the potential for groundwater contamination from the proposed projects. The potential of the proposed uses to release contaminants will then be assessed, and appropriate measures applied to minimize any risk of contaminant release. The City of SeaTac requires non-residential developments within WHPAs to submit hazardous material inventory sheets to the respective water district at a minimum of once every two years. In addition, a critical area report may be required with details regarding geologic and hydrogeologic characteristics of the site, groundwater depth, and available historic water quality data. The Port will work with the relevant authorities to comply with all applicable requirements to avoid and/or minimize the potential for contamination.

- Off-site Cargo Phase 1 (L-Shape) – The building would provide warehouse and office space, truck terminals, and parking for visitors and employees. This NTP is located within the WHPA in the northern portion of the Port property. The project results in 34.08 acres of permanent land use conversion in the WHPA and 1.79 acres of temporary construction impacts to the WHPA.
- Off-site Cargo Phase 2 (L-Shape) – The building would provide warehouse and office space, truck terminals, and parking for visitors and employees. This NTP is located within the WHPA in the northern portion of the Airport. The project would result in 3.17 acres of permanent land use conversion in the WHPA.
- Westside Maintenance Campus – This project would relocate the Aviation Maintenance Facility from its current location in the North Cargo area to allow for construction of the Hardstand (north) project. This project would result in 0.01 acre of permanent wetland impact to Wetland 39 and 1.70 acre of permanent wetland buffer impact. The access road into the WMC crosses over Miller Creek and would result in 0.01 acre of permanent stream impact and 0.07 acre of permanent stream buffer impact. Temporary wetland impacts would be 0.1 acre, and temporary wetland buffer impacts would be 1.41 acre (See Figure 1-6d in Attachment A). Temporary stream impact would be 0.01 acre, and temporary stream buffer impact would be 0.20 acre.

North Terminal Projects

The North Terminal Projects group contains two individual projects with impacts to critical areas and/or associated buffers. Construction of these projects could permanently and temporarily impact WHPAs, wetland, and wetland/stream buffer.

- Employee Parking Structure – A large new parking structure would be constructed on Port property adjacent to and west of the North Employee Parking Lot, directly north of SR 518. Construction of this project would result in impacts to Wetland A. Permanent wetland

impacts are 0.02 acre and permanent wetland buffer impacts are 0.60 acre. Temporary construction impacts to the wetland are 0.04 acre and temporary wetland buffer impacts are 0.55 acre. This project is directly adjacent to the WHPA in the northern portion of the Port property and would result in 0.31 acre of temporary construction impacts to the WHPA.

- North Ground Holding (GT) Lot – A new GT lot is needed replace the current lot displaced by the Elevated Busway. This project is located within the WHPA in the northern portion of the Airport. The project results in 5.02 acres of permanent impacts and 0.24 acre of temporary construction impacts to the WHPA.

Fuel Farm Expansion Projects

The Fuel Farm Expansion Projects group includes the Fuel Farm Expansion project, which would have impacts to critical areas and/or associated buffers. Construction of this project would permanently and temporarily impact wetland, stream, and wetland/stream buffer.

Fuel Expansion of the fuel farm would include four new settling tanks, 10 million additional gallons of storage capacity, an approximately 500,000 gallon blending tank, an approximately 100,000-gallon Sustainable Aviation Fuel receipt tank, and infrastructure to support these improvements. The project is located in the southeast portion of the Airport, near the East Fork of Des Moines Creek. Construction would permanently impact the entirety of Wetland E1. Permanent impacts would include 0.21 acre of wetland and 0.01 acre of wetland buffer (See Figure 1-6c in Attachment A).

Taxiway A/B Projects

The Taxiway A/B Projects group contains the Taxiway A/B Extension project, which would have impacts to critical areas and/or associated buffers. Construction of this project would temporarily impact wetland buffers and would require protecting wellhead areas from impacts of contaminant discharge.

The extension of Taxiways A and B to provide access to the south end of Runway 16L/34R includes construction of parallel taxiway connectors from Taxiway B to Runway 16L/34R and the relocation of Taxiway S by 310 feet southward. The project would also include glideslope modifications the construction of a new vehicle service road bridge over S 188th St. Construction would result in 6.12 acres of permanent land use conversion within WHPAs. Temporary impacts would include 0.42 acre of wetland buffer associated with Wetland G12 and 4.58 acres of WHPA.

Utility Lines

As currently designed, the project would result in 0.01 acre of permanent wetland impacts and 0.01 acre of permanent stream impacts associated with stormwater utility lines. Wetlands impacted would include Wetland 44, Wetland A14a, and Wetland A20, all located on the west side of the airport. Additionally, utility lines would result in 0.24 acre of permanent wetland buffer impact for storm and water lines, and 3.57 acres of permanent land use conversion within WHPAs for sanitary sewer and storm lines (See Figure 1-6d in Attachment A).

Stormwater Ponds

The current design for stormwater ponds would result in 0.55 acre of permanent wetland impact. Wetland A20 near the WMC footprint would be entirely impacted by the Miller Creek detention pond (See Figure 1-6d in Attachment A). As the design evolves, it is possible that a vault rather than a stormwater pond will be proposed, reducing or eliminating this impact. New stormwater ponds would result in 0.70 acre of temporary wetland buffer impacts. Stormwater ponds would result in 0.13 acre of permanent land use conversion within WHPAs and would temporarily impact 0.63 acres.

Indirect Impacts

Indirect impacts from construction of the NTPs listed previously may result in long-term wetland degradation from stormwater discharges and alteration in wetland hydrology; however, stormwater detention and treatment activities would minimize long-term indirect water quality impacts on wetlands. Indirect impacts from stormwater ponds may also result in minimal wetland hydrology alteration. For aquatic habitat, indirect impacts would be minimal given the surrounding areas near project impacts are heavily developed.

Mitigation, Avoidance, And Minimization Measures

The avoidance and minimization of impacts to wetlands, streams and buffers was a guiding principle for the preliminary project design. Additional avoidance and minimization measures would be implemented, as practical, as the project design continues to develop. The Port is exploring options to reduce permanent wetland and stream impacts associated with utility lines and to minimize buffer impacts. Additional strategies include minimizing vegetation clearing and restoring temporarily affected areas as soon after the initial impact as possible.

The Port would comply with standard specifications, best management practices (BMPs),[1] and applicable federal and state mitigation requirements during design, construction, and post-construction activities. The Port would meet all regulatory requirements and continue to meet or exceed avoidance and minimization measures related to these BMPs in adherence with federal and state regulations.

[1] BMPs include various methods and devices to control, remove, or reduce pollution, and are listed in the Airport's Stormwater Pollution Prevention Plan (https://www.portseattle.org/file-documents/sea-tac-stormwater-pollution-prevention-plan). BMPs include operational practices (e.g. training and spill prevention), structural controls (e.g. stormwater ponds and oil/water separators), and erosion and sediment controls (e.g. silt fence and filter strips).

For unavoidable permanent impacts to wetlands, streams, temporary impacts to wetlands lasting more than one year, and permanent impacts to associated buffers, the Port would develop a compensatory mitigation plan during the permitting phase in accordance with applicable federal and state requirements and guidelines. These guidelines are listed in the U.S. Army Corps of Engineers and EPA's Compensatory Mitigation for Losses of Aquatic Resources[2], and Ecology's interagency guidance contained in Wetland Mitigation in Washington State: Parts 1 and 2[3]. The Port anticipates that it is has capacity on its current property to construct all or most of the mitigation, while acknowledging that other mechanisms, such as purchasing mitigation credits from banks or in-lieu fee programs, ensure capacity is available to provide the required quantity of mitigation.

The mitigation plan would be developed following a mitigation sequencing approach based on a hierarchy of avoiding and minimizing adverse impacts through careful design, rectifying temporary impacts, and compensating for unavoidable adverse impacts. The specific portfolio of mitigation, including location, design, and timing of permitting and construction, would be developed concurrent with the progression of NTP construction designs, which would be required to adhere to mitigation sequencing guidelines.

In cooperation with resource agencies and tribes, the Port would develop plans to mitigate unavoidable effects of the project on wetlands, streams, and regulatory buffers on a watershed basis. To the extent possible, compensatory mitigation sites would be identified and compensated for lost values in kind. It may be necessary to use several sites and mitigation approaches, given the project size, complexity of identifying mitigation opportunities, and mitigation requirements. The project would adhere to the mitigation requirements, including replacement ratios, specified by federal regulators, state resource agencies, and local critical area codes. Stream impacts are included in the wetland mitigation calculations below.

The Port has seven sites within its ownership identified as being suitable for compensatory mitigation. Proposed mitigation approaches have been evaluated and described based on each sites' opportunities and potential (Anchor 2019). Six sites are within the airport and one site is located along the Green River in Auburn. They encompass over 150 acres and include potential for greater than 40 acres of wetland re-establishment, 11 acres of wetland enhancement, almost 8 acres of preservation, and 80 acres of buffer enhancement (Anchor QEA 2019).

The area needed for compensatory mitigation is dictated by federal and state guidance, with a minimum 1:1 compensation ratio required by the Corps. Some agencies use the credit/debit system (Hruby 2012) to evaluate mitigation is some situations. Table 5 provides a summary of the compensatory mitigation ratios recommended by an interagency review committee composed of the Corps, EPA, and Ecology (Ecology, et al 2021).

Table 5. Interagency Recommended Compensatory Mitigation Ratios for Wetland Impacts

Category and Type of Wetland	Creation or Reestablishment	Rehabilitation	Enhancement
Category I: Mature Forested	6:1	12:1	24:1
Category I: Based on Functions	4:1	8:1	16:1
Category II	3:1	6:1	12:1
Category III	2:1	4:1	8:1
Category IV	1.5:1	3:1	6:1

[2] 33 CFR Parts 325 and 332/ 40 CFR Part 230

[3] *Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance (2021),* and *Part 2: Developing Mitigation Plans* (2006)

Table 6 provides a summary of the compensatory wetland mitigation area calculation anticipated to be requiredby the current preliminary design, based on the unavoidable, permanent impacts to wetlands and the required mitigation ratios. Buffer impacts are mitigated at a 1:1 ratio and would require 2.66 acres.

Table 6. Compensatory Wetland Mitigation Area Calculations

Project Element	Wetland Impact (acre/Rating)	Re-establishment Area Needed (acres)	Rehabilitation Area Needed (acres)	Enhancement Area Needed (acres)
Facilities	0.23/III	0.46	0.92	1.84
UMP Line	0.01/III	0.02	0.04	0.08
Utility Lines	0.01/II	0.03	0.06	0.12
StormwaterPonds	0.55/III	1.10	2.75	4.40
	Total Areas	**1.61**	**3.77**	**6.44**

Based on these calculations, the mitigation areas identified by the Port have sufficient capacity to provide theneeded compensatory mitigation for the anticipated impacts of the proposed action.

References

Anchor QEA. 2019. Mitigation Site Opportunity Assessment (Appendix B of the Land Stewardship Plan). Preparedfor the Port of Seattle by Anchor QEA, Seattle, WA. May 2019.

City of SeaTac. 2021. SeaTac Comprehensive Plan Environment Element. Accessed on February 8, 2024. Available at: https://www.seatacwa.gov/home/showpublisheddocument/28301/637191073206100000.

City of SeaTac. 2024a. City of SeaTac, Washington's Data Hub. Accessed on February 8, 2024. Available at: https://data-cityofseatac.opendata.arcgis.com/search?tags=City%20of%20SeaTac.

City of SeaTac. 2024b. SeaTac Municipal Code Chapter 15.700 Critical Areas. Accessed on February 8, 2024. Available at: https://www.codepublishing.com/WA/SeaTac/#!/html/SeaTac15/SeaTac15700.html.

Ecology ((Washington State Department of Ecology), U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. (2021). Wetland Mitigation in Washington State–Part 1: Agency Policies and Guidance (Version 2). Washington State Department of Ecology Publication #21-06-003.

Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. March 2006. Wetland Mitigation in Washington State – Part 2:Developing Mitigation Plans (Version 1). Washington State Department of Ecology Publication #06-06-011b.Olympia, WA.

Hruby, T. 2012. Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington,Final Report, March 2012. Washington State Department of Ecology publication #10-06-11. FEMA (Federal Emergency Management Agency). 2017. National Flood Hazard Layer (NFHL). Accessed on August 15, 2020. Available at: https://catalog.data.gov/dataset/national-flood-hazard-layer-nfhl.

Hruby, T. & Yahnke, A. 2023. Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2). Publication #23-06-009. Washington Department of Ecology.

Leigh-Fisher. 2018a. Facilities Implementation and Financial Feasibility Seattle-Tacoma International AirportTechnical Memorandum No. 7. Prepared for the Port of Seattle by Leigh-Fisher, Seattle, WA. May 2018.

Leigh-Fisher. 2018b. Environmental Overview Seattle-Tacoma International Airport Technical Memorandum No. 8. Prepared for the Port of Seattle by Leigh-Fisher, Seattle, WA. May 2018.

Parametrix. 2024. Seattle-Tacoma International Airport Sustainable Airport Master Plan (SAMP) Near Term Projects Wetlands and Streams Report. Prepared for the Port of Seattle by Parametrix, Seattle, WA. February 2024.

Port of Seattle. 2018. 2018 Port of Seattle-City of SeaTac Interlocal Agreement. Seattle, Washington. March 2018. Available at: https://www.portseattle.org/file-documents/interlocal-agreement-city-seatac.

WDFW (Washington Department of Fish and Wildlife). 2024. Priority Habitats and Species Mapper. Accessed on January 29, 2024. Available at: https://geodataservices.wdfw.wa.gov/hp/phs/.

Attachment A

Figures

West Study Area Zone

Runway Study Area Zone

South RSA Study Area Zone

East Study Area Zone

North RSA Study Area Zone

North Study Area Zone

Des Moines Creek

Miller Creek/ Walker Creek

Gilliam Creek/ Lower Green River

509

518

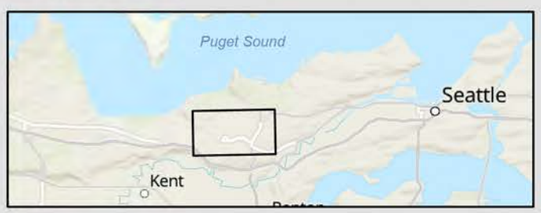
99

5

Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 0.13 0.25 0.38 0.5 Miles



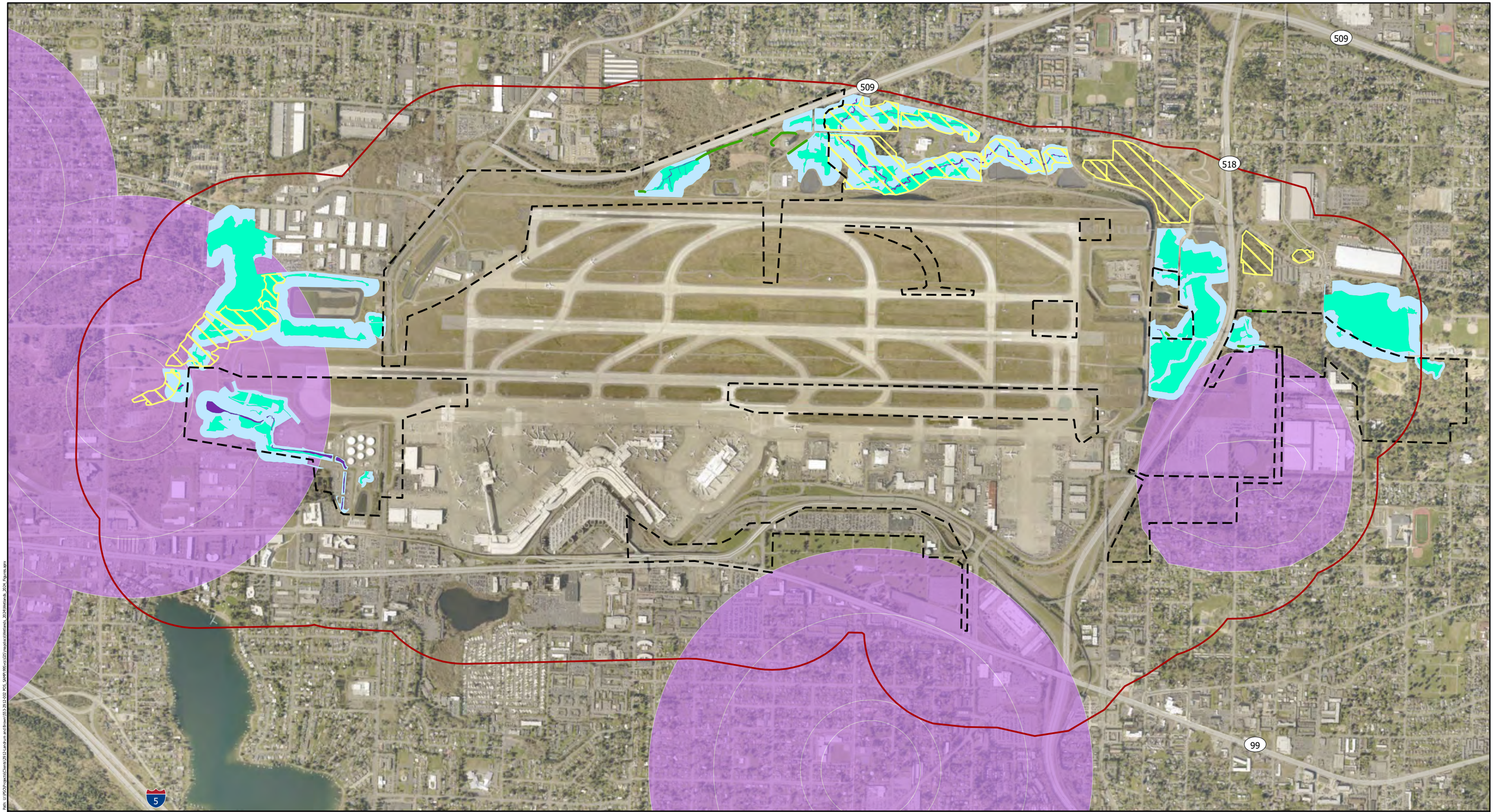
General Study Area
Field Survey Area

Drainage Basins
Des Moines Creek
Gilliam Creek/Lower Green River
Miller Creek/Walker Creek

Study Area Zones
East Zone
North RSA Zone
North Zone
Runway Zone
South RSA Zone
West Zone

Figure 1-1
Vicinity Map
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 0.13 0.25 0.38 0.5 Miles

- Tributaries
- General Study Area
- Field Survey Area
- Restrictive Covenant

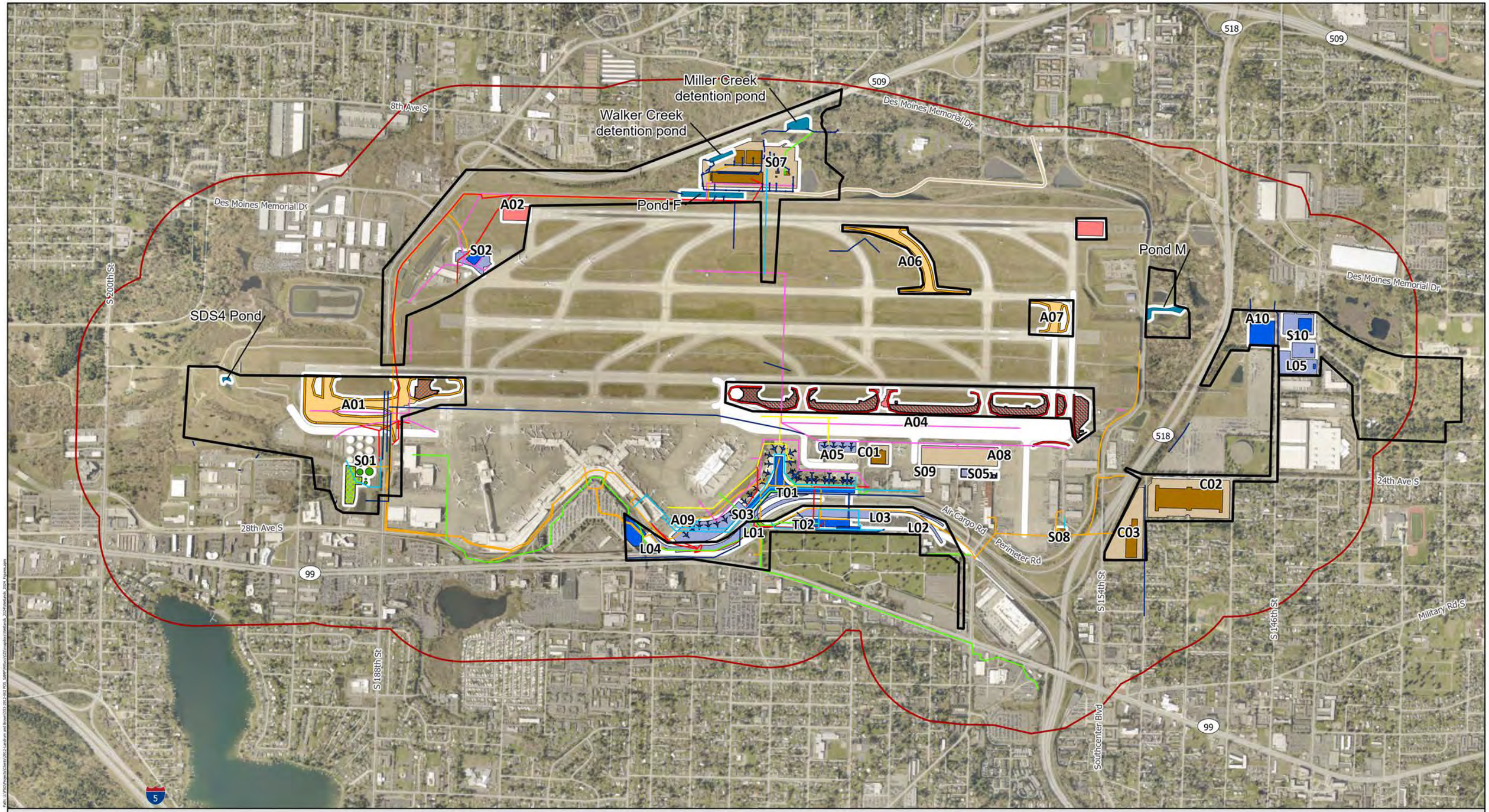
Critical Area Type

- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Figure 1-2
Aquatic Critical Areas within the Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA

Path: U:\POD\Projects\Clients\26121-landrum and Brown\053 26121002 POS_SAMP\995\GIS\mxds\Wetlands_2024\Wetlands_2024_Figure1.mxd



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 0.13 0.25 0.38 0.5 Miles

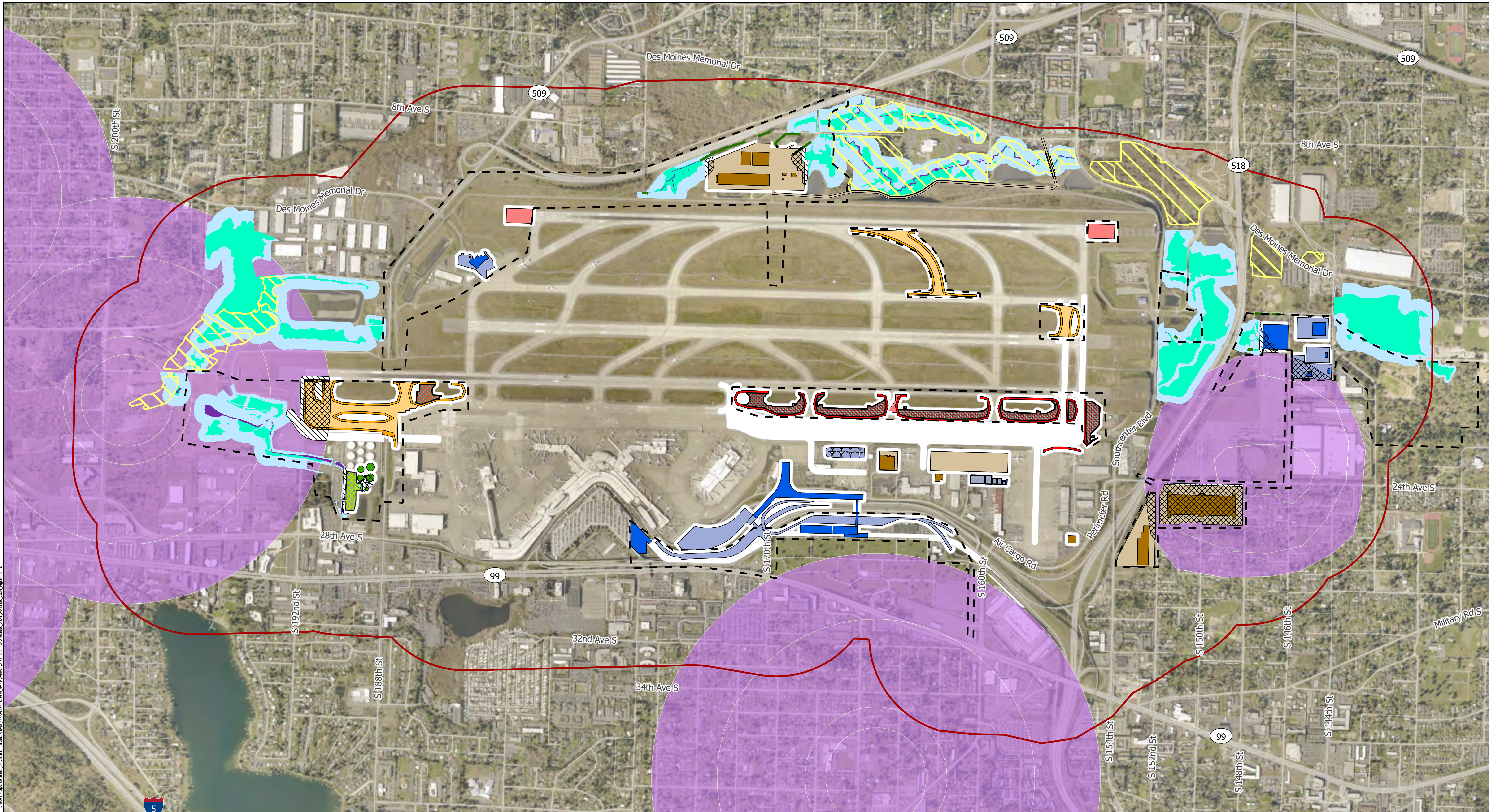
- Field Survey Area
- General Study Area
- Construction Area (50-ft buffer)
- Stormwater Pond (UMP Polygon)

Proposed Utilities (UMP Line)
- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Near Term Project (NTP) Type
- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-3
Project Elements within the Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 0.13 0.25 0.38 0.5 Miles

- Tributaries
- Tributaries Impact
- Permanent Impact Area
- Temporary Impact Area
- Construction Area (50-ft buffer)
- General Study Area
- Field Survey Area
- Restrictive Covenant

Critical Area Type

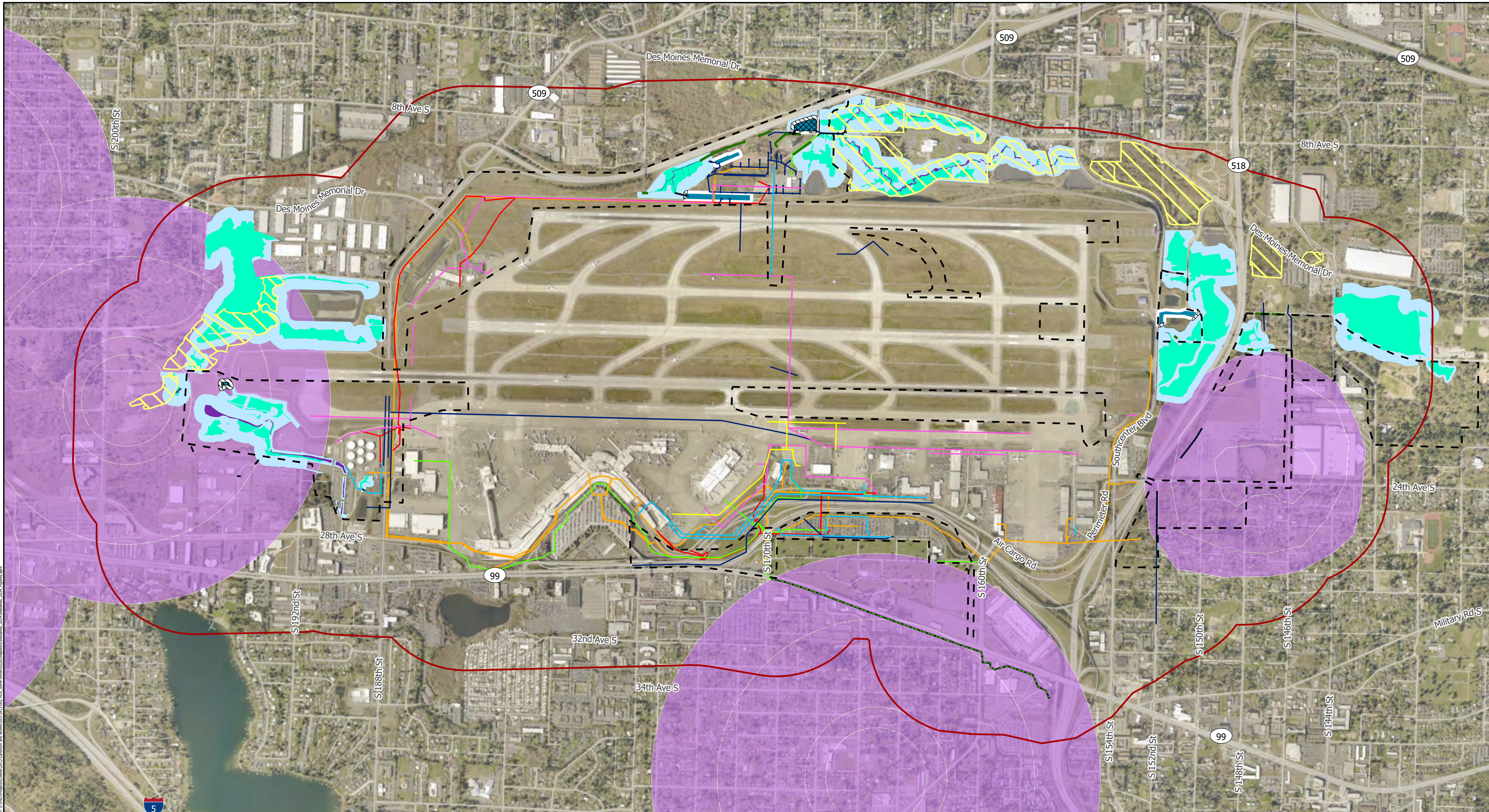
- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Near Term Project (NTP) Type

- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-4
NTP Impacts to Aquatic Critical Areas within the Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 0.13 0.25 0.38 0.5 Miles

- Tributaries
- Tributaries Impact
- Permanent Impact Area
- Temporary Impact Area
- Construction Area (50-ft buffer)
- Field Survey Area
- General Study Area
- Restrictive Covenant

Critical Area Type

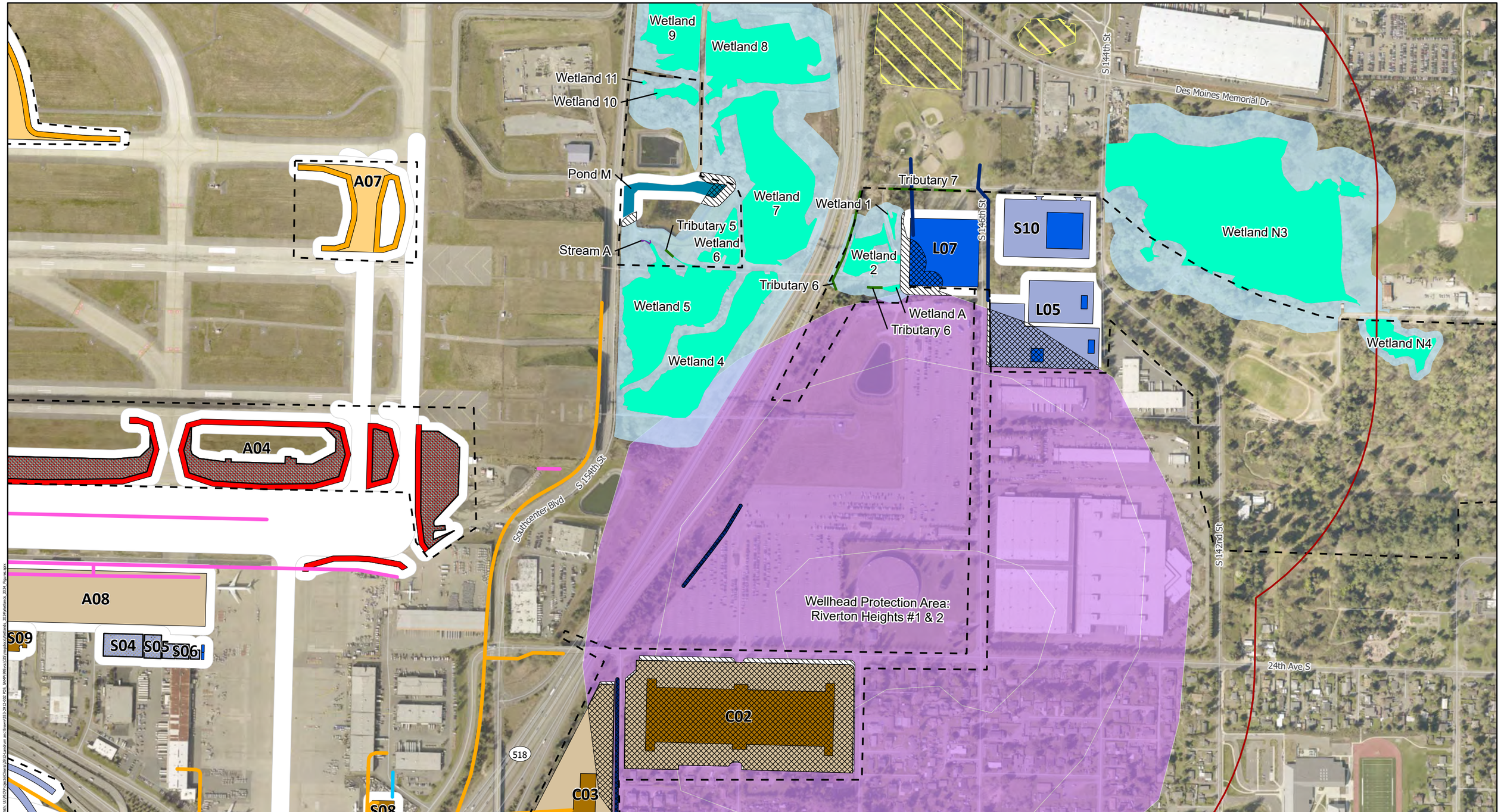
- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Utility Master Plan (UMP) Type

- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Figure 1-5
UMP Impacts to Aquatic Critical Areas within the Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 250 500 1,000 Feet

- Tributaries
- Tributaries Impact
- General Study Area
- Field Survey Area
- Permanent Impact Area
- Temporary Impact Area
- Stormwater Pond
- Construction Area (50-ft buffer)
- Restrictive Covenant

Critical Area Type

- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Utility Master Plan (UMP) Type

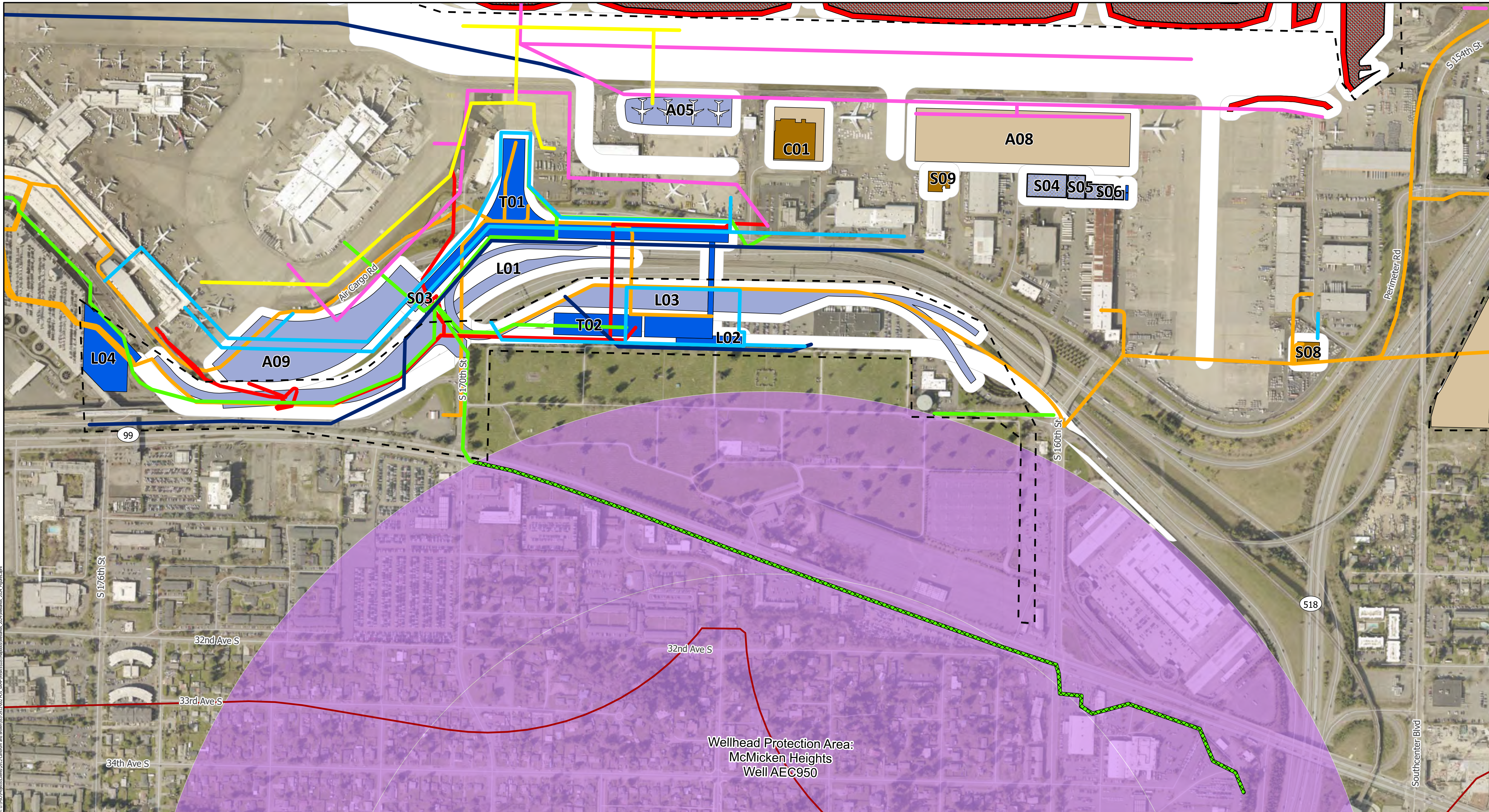
- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Near Term Project (NTP) Type

- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-6a
Project Impacts to Aquatic Critical Areas
in North Portion of Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 250 500 1,000 Feet

- Tributaries
- Tributaries Impact
- General Study Area
- Field Survey Area
- Permanent Impact Area
- Temporary Impact Area
- Stormwater Pond
- Construction Area (50-ft buffer)
- Restrictive Covenant

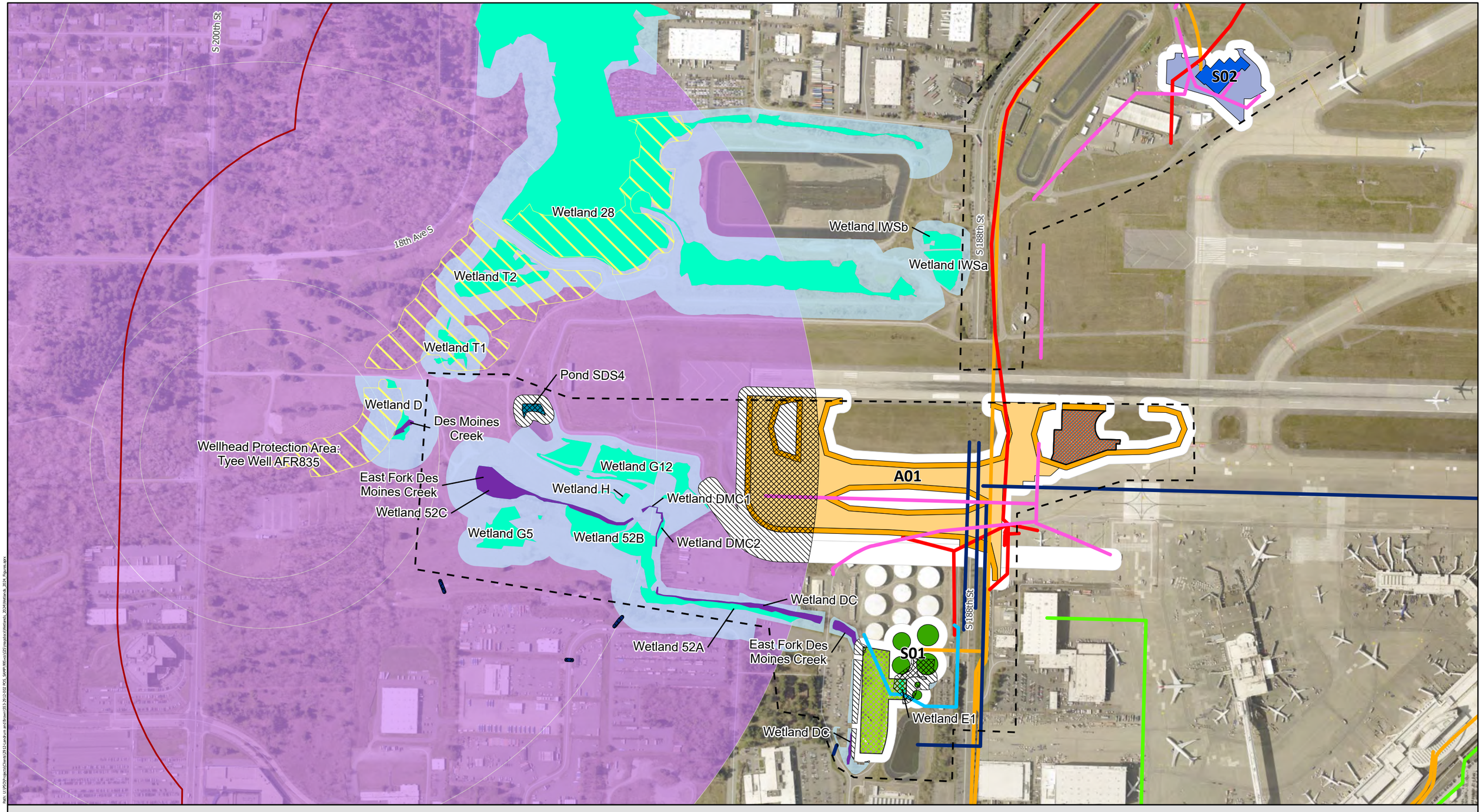
Critical Area Type
- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Utility Master Plan (UMP) Type
- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Near Term Project (NTP) Type
- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-6b
Project Impacts to Aquatic Critical Areas in North Portion of Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 250 500 1,000 Feet

- Tributaries
- Tributaries Impact
- General Study Area
- Field Survey Area
- Permanent Impact Area
- Temporary Impact Area
- Stormwater Pond
- Construction Area (50-ft buffer)
- Restrictive Covenant

Critical Area Type

- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Utility Master Plan (UMP) Type

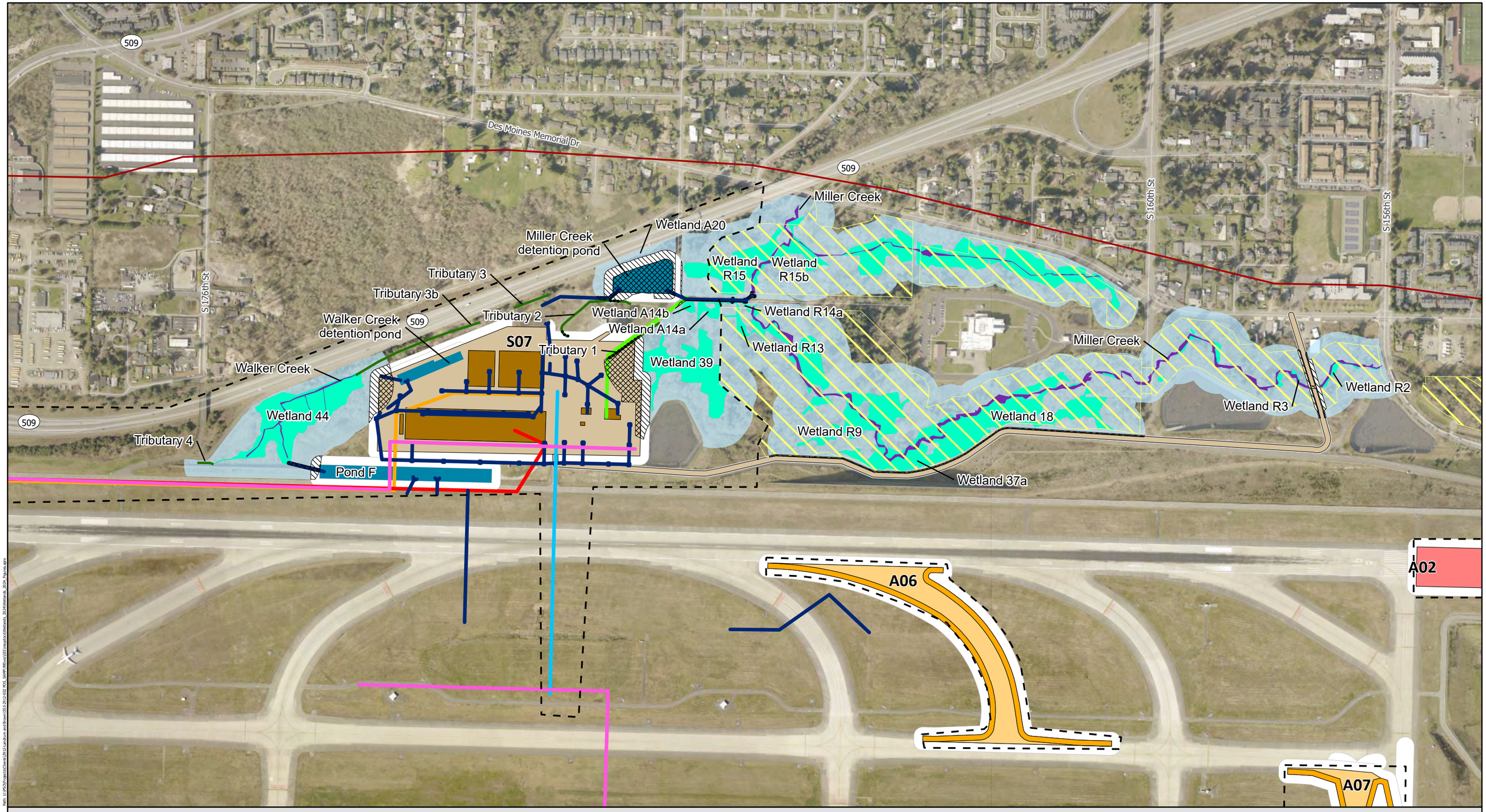
- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Near Term Project (NTP) Type

- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-6c
Project Impacts to Aquatic Critical Areas in North Portion of Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA



Parametrix

Date: 2/12/2024
Sources: King County, King County Aerial (2021)
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

0 250 500 1,000 Feet

- Tributaries
- Tributaries Impact
- General Study Area
- Field Survey Area
- Permanent Impact Area
- Temporary Impact Area
- Stormwater Pond
- Construction Area (50-ft buffer)
- Restrictive Covenant

Critical Area Type

- Stream
- Wetland
- Stream/Wetland Buffer
- Wellhead Protection Area

Utility Master Plan (UMP) Type

- ICT
- IWS
- Jet Fuel
- Power
- Sanitary Sewer
- Storm
- Water

Near Term Project (NTP) Type

- Airfield Operational Efficiency Projects
- Airfield Operational Efficiency Projects, Structure
- Airfield Operational Efficiency Projects, Surface
- Airfield Safety/Standards Projects
- Airfield Safety/Standards Projects, Structure
- Airfield Safety/Standards Projects, Surface
- Cargo Expansion Projects, Structure
- Cargo Expansion Projects, Surface
- North Terminal Projects
- North Terminal Projects, Structure
- North Terminal Projects, Surface
- Sustainable Aviation Fuel Projects
- Sustainable Aviation Fuel Projects, Structure

Figure 1-6d
Project Impacts to Aquatic Critical Areas
in North Portion of Survey Area
Impact Analysis Memorandum
Seattle-Tacoma International Airport
Sustainable Airport Master Plan (SAMP)

King County, WA

Appendix D
Species Life Histories

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PUGET SOUND CHINOOK SALMON 1
- 2.1 Life History and Population Trajectory 1
- 2.2 Regional and Local Abundance 2
- 2.3 Sensitivity to Environmental Stressors 3

3.0 PUGET SOUND STEELHEAD 4
- 3.1 Life History and Population Trajectory 4
- 3.2 Regional and Local Abundance 4
- 3.3 Sensitivity to Environmental Stressors 5

4.0 COASTAL-PUGET SOUND BULL TROUT 5
- 4.1 Life History and Population Trajectory 6
- 4.2 Regional and Local Abundance 6
- 4.3 Sensitivity to Environmental Stressors 7

5.0 ROCKFISH 8
- 5.1 Life History and Population Trajectory 8
- 5.2 Regional and Local Abundance 9
- 5.3 Sensitivity to Environmental Stressors 9

6.0 SOUTHERN RESIDENT KILLER WHALE 10
- 6.1 Life History and Population Trajectory 10
- 6.2 Regional and Local Abundance 11
- 6.3 Sensitivity to Environmental Stressors 12

7.0 HUMPBACK WHALE 13
- 7.1 Life History and Population Trajectory 13
- 7.2 Regional and Local Abundance 13
- 7.3 Sensitivity to Environmental Stressors 14

8.0 MARBLED MURRELET 14
- 8.1 Life History and Population Trajectory 14
- 8.2 Regional and Local Abundance 15
- 8.3 Sensitivity to Environmental Stressors 15

9.0 REFERENCES 17

1.0 INTRODUCTION

The information 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 *Seattle-Tacoma International Airport Sustainable Airport Master Plan Near Term 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-listed species addressed in the BA for the Proposed Action:

- Chinook salmon, Puget Sound Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha)*
- Steelhead, Puget Sound Distinct Population Segment (DPS) (*O. mykiss)*
- Bull trout, Coastal-Puget Sound DPS (*Salvelinus confluentus)*
- Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)
- Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*S. ruberrimus*)
- Killer whale, Southern Resident DPS (SRKW) (*Orcinus orca*)
- Humpback whale, Central America and Western North Pacific DPS (*Megaptera novaeangliae*)
- Marbled murrelet (*Brachyramphus marmoratus*)

2.0 PUGET SOUND CHINOOK SALMON

The Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) ESU was listed as threatened under the ESA on March 24, 1999 (64 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 Puget Sound.

2.1 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 (NOAA 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 Info 2023a). 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 Info 2023a).

2.2 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 Info 2023a). 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 (EPA 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 Info 2023a).

2.3 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 (NOAA 2024a). The diverse environmental stressors that impact Chinook salmon can be summarized in 4 main factors (EPA 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 (EPA 2021).

Impacts or effect mechanisms that Puget Sound Chinook 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

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.

3.0 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.

3.1 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 Info 2023b).

3.2 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).

3.3 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.

4.0 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.

4.1 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).

4.2 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).

4.3 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 (USFWS 2015):

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

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 (NOAA 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). 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 (NOAA 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 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).

6.1 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 NPS 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 (NOAA 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 (NOAA 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 (NOAA 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).

6.2 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 NPS.

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).

Table 1. Summary of monthly killer whale sightings in North Puget Sound from 1990-2013

Month	Sightings
January	160
February	136
March	71
April	105
May	634
June	1,479
July	1,705
August	1,096
September	982
October	408
November	266
December	328
Source: (Olson 2014)	

Based on a review of Whale Museum data from 1948 through 2017, SRKWs are most likely to occur within the Puget Sound during the months of August through January. The months of February through July have relatively fewer sightings (Olson 2018). Guidance from the NMFS Northwest Region office defines SRKWs as extremely unlikely to occur in a particular area during a particular month if the Whale Museum data set includes a total of fewer than 6 sightings in that area during that month. However, given the highly mobile nature of this species, the current 75 members of the SRKW DPS could be present within the NPS at any time of the year.

6.3 Sensitivity to Environmental Stressors

The Federal Register (70 FR 69908) has put forth 5 reasons for SRKW decline as justification for the 2005 ESA listing, including present destruction of habitat or range, overuse for human gain, disease or predation, inadequacy of existing regulatory mechanisms, and other natural or human-caused factors affecting their continued existence. SRKW habitat modification and destruction has occurred with increases in pollution, vessel traffic, and decreases in prey availability (i.e., Chinook salmon). Commercial shipping, whale watching, ferry, and recreational boat traffic have all increased within the Puget Sound in recent years, all of which impact SRKW short-term behaviors and provide additional in-water sound that may reduce SRKW foraging efficiency and communication, thereby increasing energy expenditures. Increases in pollution, urbanization, and fisheries have also drastically reduced Chinook salmon stocks, the main prey for SRKW.

Although a reduction in prey and behavioral disturbance from underwater sound are major environmental stressors for SRKW, contaminants and oil spills are also factors in their recent declines. Contaminants in sea water can range from increased sediments from upland or intertidal disturbance, pathogens and bacteria from water treatment plants and sewer outfalls, and chemicals from agricultural practices or industrial uses. As top predators, SRKW take in bioaccumulated contaminants in their diet. These toxins may accumulate in the bodies of SRKW in blubber and cause harm to immune and reproductive systems, thereby reducing individuals' viability and reproductive success. Additionally, oil spills such as the 1989 Exxon Valdez oil spill in Prince William Sound caused the direct death of individual SRKW, and oil spills can also indirectly impact SRKW by decreasing prey populations (NOAA 2024b).

The impact or effect mechanism that SRKW would be especially sensitive to is sound/noise.

7.0 HUMPBACK WHALE

The Central America and Mexico DPS's of humpback whales (*Megaptera novaeangliae*) were listed as endangered under the Endangered Species Conservation Act, the precursor to the Endangered Species Act, on December 2, 1970 (NOAA 2024c). In September 2016, the Central America was reaffirmed as endangered, and the Mexico DPS was listed as threatened (81 FR 62259). Critical habitat for both was designated on April 21, 2021 (86 FR 21082). The current designation includes marine habitat in the North Pacific Ocean, with approximately 48,521 nmi^2 designated for the Central America DPS and approximately 116,098 nmi^2 designated for the Mexico DPS of humpback whales.

7.1 Life History and Population Trajectory

Humpback whales are found through all the world's major oceans. During the summer months, they feed on krill and small fish to build up stores of blubber for the winter. They can consume up to 3,000 pounds of food per day. Humpbacks can live about 80 to 90 years, reaching sexual maturity between ages 4 and 10. Females typically produce a single calf every 2 to 3 years.

The 2016 revision to the original listing of humpback whales determined that 9 of the 14 populations have recovered enough that they do not warrant listing (NOAA 2024c). Thus, the global population of humpbacks is largely recovering and expanding. However, the Central America DPS is still listed as endangered, and the Mexico DPS is still listed as threatened. Aerial surveys of marine mammals in Alaska in 2018 recorded 53 sightings of 79 humpback whales, including 2 calves (Clarke et al. 2019).

7.2 Regional and Local Abundance

Humpback whales have not been known to typically inhabit inland and coastal waters, but sightings have become more common within the Puget Sound.

The Puget Sound is now experiencing what has been termed a "humpback comeback", as humpbacks are being spotted more frequently in the inland and coastal waters (Banse 2019). This is largely believed to be related to the overall population expansion, as well as potential shifts in oceanographic conditions and prey availability (Puget Sound Express 2019). Cascadia Research Collective estimates that about 1,600 whales feed off the west coast of North America, and about 500 off Washington and British Columbia specifically (Puget Sound Express 2019).

7.3 Sensitivity to Environmental Stressors

Humpback whale populations were largely decimated by commercial whaling practices, prior to the moratorium in 1985 (NOAA 2024c). Primary threats continue to be from human and boat disturbance, including vessel strikes, entanglements, and harassment by vessels. These threats are of rising concern within the Puget Sound as numbers have increased in recent years (Boiko-Weyrauch 2019; Banse 2019).

The impact or effect mechanism that humpback whales would be especially sensitive to is sound/noise.

8.0 MARBLED MURRELET

Marbled murrelet (*Brachyramphus marmoratus*) are listed as threatened at the federal level, with defined critical habitat in nesting locations along the west coast of the United States (USFWS 2024a). Marbled murrelet were initially listed on October 1, 1992 (57 FR 45328). Critical habitat for the marbled murrelet was originally designated on May 24, 1996 (61 FR 26256) and further revised on October 5, 2011 (76 FR 61599). The current designation includes approximately 3,698,100 acres in Washington, Oregon, and California.

8.1 Life History and Population Trajectory

Marbled murrelets spend most of their lives in the marine environment, but nest in old-growth forests within range of the coast. Both males and females have a sooty-brown upperpart with dark bars and light, mottled brown underparts. Their breeding range extends from Bristol Bay, Alaska in the north to Monterey Bay, California in the south (USFWS 2024a). They breed in the early spring, laying one egg per nest and usually only nesting once per year (DNR 2014). Nesting birds typically forage more closely to the nesting habitats than do non-nesters, with a range size of 240 km^2 compared to 655 km^2, as measured on radio marked murrelets in northern California (Hébert and Golightly 2008). However, home range size was found to vary more greatly by year in Washington: 2,098 km^2 in 2005 compared to 469 km^2 in 2004 (Bloxton and Raphael 2008). In the marine environment, their preferred habitats include sheltered, nearshore waters within 3 miles of the shore (USFWS 2024b).

These seabirds are primarily opportunistic feeders, relying on small schooling fish (e.g. Pacific sand lance (*Ammodytes hexapterus*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), rockfish, and marine invertebrates like squid and shrimp (DNR 2014). Feeding primarily occurs in shallow, nearshore water that is less than 100 feet deep (USFWS 2024b). Foraging murrelets do not typically form groups but may collect around schools of fish or other food resources (Speich and Wahl 1989).

General population models and trends suggest that the marbled murrelet population is on a long-term downward trajectory (WDFW 2024). Past demographic models suggest losses of about 3 to 7 percent per year (McShane et al. 2004). However, a USFWS's 2019 5-year status review found that "while there continue to be significant declines in the murrelet population in Washington State, there does not appear to be a trend (negative or positive) at the listed-range scale" (USFWS 2019a), which is a change from their 2009 5-year status review.

8.2 Regional and Local Abundance

The following sections outline the regional abundance of marbled murrelets at the scale of the entire Puget Sound and North Puget Sound.

Puget Sound is encompassed by Conservation Zone 1, as defined in the original Marbled Murrelet Recovery Plan (USFWS 1997). According to at-sea population surveys conducted for annual monitoring, murrelets are estimated to have had an annual rate of change of -4.9% between the years of 2001-2016 within Conservation Zone 1 (USFWS 2019a). Nonetheless, marbled murrelets are considered to be fairly common within the Puget Sound throughout the year (Seattle Audubon Society 2019a).

8.3 Sensitivity to Environmental Stressors

Because marbled murrelets rely on both marine and terrestrial environments, they are sensitive to a variety of stressors. Threats discussed in this section will be divided into factors specific to terrestrial, nesting habitats and those affecting marbled murrelets in general.

The primary stressor within the marbled murrelet terrestrial range is loss of nesting habitat. Nesting habitat is threatened by commercial logging and other human disturbance, and climate change is likely to exacerbate habitat loss and fragmentation (USFWS 2019a). For this reason, much of the existing old-growth forest suitable for marbled murrelet nesting has been designated as critical habitat to limit the allowable actions within these areas (61 FR 26256).

Other threats impact marbled murrelets during the portion of their lives when they are in the marine environment. These factors include the following ((USFWS 2019b):

- Loss of habitat
- Predation

- Gill-net fishing operations
- Oil spills
- Marine pollution
- Disease

Impacts or effect mechanisms that marbled murrelets would be especially sensitive to include:

- Sound/noise
- Physical disturbance of organisms
- Stranding

9.0 REFERENCES

Banse, T. 2019. Salish Sea's "humpback comeback" is a good sign, but concerns remain. Available at: https://crosscut.com/2019/08/salish-seas-humpback-comeback-good-sign-concerns-remain.

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.

Bloxton, T. D., and M. G. Raphael. 2008. Breeding ecology of the marbled murrelet in Washington state: project update 2004-2007. U.S. Fish and Wildlife Service.

Boiko-Weyrauch, A. 2019, May 30. Whale Strikes In Puget Sound Could Get More Common As Humpback Numbers Grow – Northwest Public Broadcasting. Northwest Public Broadcasting.

Busby, P., T. Wainwright, G. Bryant, L. Lierheimer, R. Waples, F. W. Waknitz, and I. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center, NOAA Technical Memorandum NMFS-NWFSC-27, Seattle, Washington.

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

Clarke, J. T., A. A. Brower, M. C. Ferguson, and A. L. Willoughby. 2019. Distribution and Relative Abundance of Marine Mammals in the Eastern Chukchi and Western Beaufort Seas, 2018 Annual Report. Marine Mammal Laboratory, Alaska Fisheries Science Center, OCS Study BOEM 2019-021, Seattle, Washington.

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

DNR (Washington Department of Natural Resources). 2014. Aquatic lands habitat conservation plan.

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.

Hébert, P. N., and R. T. Golightly. 2008. At-sea distribution and movements of nesting and non-nesting Marbled Murrelets Brachyramphus marmoratus in northern California. Marine Ornithology 36:99–105.

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.

Koehler, M. E., K. L. Fresh, D. A. Beauchamp, J. R. Cordell, C. A. Simenstad, and D. E. Seiler. 2006. Diet and Bioenergetics of Lake-Rearing Juvenile Chinook Salmon in Lake Washington. Transactions of the American Fisheries Society 135(6):1580–1591.

Krahn, M. M., M. J. Ford, W. F. Perrin, P. R. Wade, and R. P. Angliss. 2004. 2004 Status review of southern resident killer whales (Orcinus orca) under the Endangered Species Act. NOAA Technical Memorandum NMFS NWFSC No. 62.

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.

McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation Report for the 5-Year Status Review of the Marbled Murrelet in Washington, Oregon, and California. U.S. Fish and Wildlife Service, Region 1, Unpublished Report, Portland, Oregon.

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

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, Washington.

NOAA. 2023, May 17. Yelloweye Rockfish | NOAA Fisheries. https://www.fisheries.noaa.gov/species/yelloweye-rockfish.

NOAA. 2024a. Chinook Salmon - Protected [online resource]. https://www.fisheries.noaa.gov/species/chinook-salmon-protected.

NOAA. 2024b. Killer Whale [online resource]. https://www.fisheries.noaa.gov/species/killer-whale#overview.

NOAA. 2024c. Humpback Whale Species Directory. https://www.fisheries.noaa.gov/species/humpback-whale.

Olson, J. 2014. Southern Resident Killer Whale Sighting Compilation. 1948-2013. https://archive.fisheries.noaa.gov/wcr/publications/protected_species/marine_mammals/killer_whales/occurrencemap.pdf.

Olson, J. 2018. Final Program Report: SRKW Sighting Compilation 14th Edition. The Whale Museum, Contract No. RA133F-12-CQ-0057, Friday Harbor, Washington.

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

Puget Sound Express. 2019. We're Seeing Unprecedented Numbers of Humpbacks | Puget Sound Express.

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

Puget Sound Info. 2023a. Number of natural-origin Chinook salmon on spawning grounds. https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/4.

Puget Sound Info. 2023b. Number of natural-origin Puget Sound steelhead on spawning grounds. https://www.pugetsoundinfo.wa.gov/Indicator/Detail/124/VitalSigns.

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.

Seattle Audubon Society. 2019a. BirdWeb: Marbled Murrelet. http://birdweb.org/birdweb/bird/marbled_murrelet.

Seattle Audubon Society. 2019b. Puget Sound Seabird Survey: marbled murrelet results. http://seattleaudubon.org/seabirdsurvey/bird_detail.aspx?bird_id=224.

Speich, S. M., and T. R. Wahl. 1989. Catalog of Washington Seabird Colonies. Page 376. U.S. Fish and Wildlife Service, Biological Report 88(6), Washington, D.C.

Tabor, R. A., H. A. Gearns, C. M. McCoy III, and S. Camacho. 2006. Nearshore habitat use by juvenile Chinook salmon in lentic systems of the Lake Washington basin: Annual Report 2003 and 2004. U.S. Fish and Wildlife Service, Lacey, Washington.

USEPA (U.S. Environmental Protection Agency). 2021. Salish Sea, Chinook salmon. USEPA, Region 10. Available at: https://www.epa.gov/salish-sea/chinook-salmon

USFWS (U.S. Fish and Wildlife Service). 1997. Recovery plan for the threatened marbled murrelet (Brachyramphus marmoratus) in Washington, Oregon, and California. USFWS, Region 1, Portland, Oregon.

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

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, Oregon.

USFWS. 2019a. Marbled Murrelet 5-Year Status Review. U.S. Fish and Wildlife Service, Lacey, Washington.

USFWS. 2019b. Marbled Murrelet Species Profile. https://www.fws.gov/arcata/es/birds/MM/m_murrelet.html.

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

USFWS. 2024a. Species Profile for Marbled Murrelet(Brachyramphus marmoratus). https://ecos.fws.gov/ecp/species/4467.

USFWS. 2024b. Marbled Murrelet (Brachyramphus marmoratus). https://www.fws.gov/species/marbled-murrelet-brachyramphus-marmoratus.

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. WDFW, Olympia, Washington.

WDFW. 2024. Marbled murrelet (Brachyramphus marmoratus). https://wdfw.wa.gov/species-habitats/species/brachyramphus-marmoratus.

Wiles, G. J. 2004. Washington State status report for the killer whale. Washington Department of Fish and Wildlife, 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.

Appendix E

Rainbow Trout Early Stages *in Situ* Monitoring Summary Tables

Reports available by request

Fall 2015

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	99.2	98.3	97.5	1.7	26.4	141.4
Miller Creek	100.0	96.7	96.7	0.0	25.6	140.0
Walker Creek	-	-	-	-	-	-
Des Moines Creek Lower	98.3	72.5	71.7	0.0	25.7	138.7
Des Moines Creek Upstream	72.5	33.1	28.3	0.0	25.0	127.0

Spring 2016

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	100.0	96.7	96.7	0.8	25.2	113.4
Miller Creek	96.7	98.2	95.0	1.8	25.1	115.0
Walker Creek	89.2	100.0	89.2	0.0	25.6	115.9
Des Moines Creek Lower	96.7	96.7	94.2	2.0	25.3	115.5
Des Moines Creek Upstream	21.7	0.0	0.0	-	-	-

Fall 2017

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	97.5	100.0	97.5	1.8	22.9	144.7
Miller Creek	69.2	78.0	55.0	4.0	23.4	129.5
Walker Creek	76.7	54.1	42.5	1.4	25.2	143.2
Des Moines Creek Lower	48.3	44.0	30.0	3.8	23.1	129.2
Des Moines Creek Upstream	51.7	61.7	33.3	0.0	23.3	144.9

Spring 2018

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	98.3	93.2	91.7	2.7	24.2	153.2
Miller Creek	80.0	90.5	73.3	0.0	24.7	150.6
Walker Creek	86.7	88.7	77.5	2.7	24.9	153.9
Des Moines Creek Lower	85.8	86.3	82.5	2.0	24.7	154.8
Des Moines Creek Upstream	88.3	90.3	80.0	3.6	24.4	147.2

Fall 2018

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	91.7	100.0	91.7	1.9	23.1	230.6
Miller Creek	89.2	93.2	83.3	2.2	22.0	226.0
Walker Creek	85.8	84.0	71.7	1.2	24.9	252.2
Des Moines Creek Lower	77.5	65.4	50.8	3.0	22.8	292.5
Des Moines Creek Upstream	75.0	92.3	69.2	1.2	24.9	255.6

Spring 2019

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	98.3	100.0	98.3	2.5	14.4	154.2
Miller Creek	90.0	81.3	73.3	1.5	15.4	145.6
Walker Creek	89.2	91.3	81.7	2.9	15.4	149.4
Des Moines Creek Lower	89.2	88.1	78.3	5.2	14.8	148.5
Des Moines Creek Upstream	92.5	80.8	74.2	4.0	15.0	145.1

Fall 2019

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	97.5	99.1	96.7	0.8	22.9	149.4
Miller Creek	88.3	95.6	84.2	1.0	21.6	150.5
Walker Creek	95.8	92.2	88.3	0.0	24.0	170.0
Des Moines Creek Lower	91.8	89.2	81.8	4.0	20.8	128.9
Des Moines Creek Upstream	95.8	90.4	86.7	2.8	23.0	151.1

Spring 2020

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	99.2	91.6	90.8	0.9	25.4	125.0
Miller Creek	82.5	73.6	60.8	4.6	25.3	141.8
Walker Creek	80.8	76.8	65.0	1.1	25.5	125.1
Des Moines Creek Lower	90.0	80.0	71.7	1.1	25.6	123.6
Des Moines Creek Upstream	97.5	83.7	81.7	2.1	26.6	125.9

Fall 2020

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	100.0	100.0	100.0	0.0	23.2	103.5
Miller Creek	90.8	82.3	75.0	2.3	21.9	90.8
Walker Creek	93.3	94.0	87.8	1.2	23.9	107.9
Des Moines Creek Lower	95.8	87.8	84.2	1.1	22.2	93.0
Des Moines Creek Upstream	80.0	84.6	68.3	0.0	23.9	111.0

Spring 2021

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	99.2	99.1	98.3	0.8	24.2	104.5
Miller Creek	74.2	94.3	70.0	1.7	24.2	111.0
Walker Creek	94.2	93.0	87.5	0.9	26.0	121.7
Des Moines Creek Lower	83.3	80.5	67.8	1.0	23.3	102.7
Des Moines Creek Upstream	71.7	85.0	60.0	0.0	24.8	111.9

Fall 2021

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	100.0	100.0	100.0	0.0	24.1	89.3
Miller Creek	39.2	57.0	32.5	2.2	24.6	110.2
Walker Creek	92.5	88.5	82.5	0.0	25.7	108.8
Des Moines Creek Lower	87.5	91.9	80.0	2.5	25.4	106.5
Des Moines Creek Upstream	71.7	36.3	26.7	0.0	24.7	100.5

Spring 2022

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	97.5	99.2	96.7	2.6	23.7	101.9
Miller Creek	95.0	96.5	91.7	0.9	26.1	131.6
Walker Creek	93.3	96.4	90.0	0.0	27.4	140.9
Des Moines Creek Lower	99.2	95.8	95.0	0.9	26.4	134.7
Des Moines Creek Upstream	90.8	67.1	60.8	2.3	26.7	135.4

Fall 2022

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	99.2	98.3	97.5	0.0	21.7	63.0
Miller Creek	68.3	72.1	50.8	0.0	18.7	58.3
Walker Creek	89.2	95.2	85.0	0.0	23.6	90.7
Des Moines Creek Lower	62.5	57.2	35.8	0.0	19.6	54.4
Des Moines Creek Upstream	62.5	20.5	19.2	0.0	21.8	136.1

Spring 2023

Site	Hatch (%)	Post Hatch Survival (%)	Cumulative Survival (%)	Abnormality (%)	Length (mm)	Weight (mg)
Control	94.2	90.3	85.0	2.1	24.1	99.9
Miller Creek	74.2	75.6	58.3	1.2	23.7	93.9
Walker Creek	91.7	86.3	79.2	2.0	25.9	110.1
Des Moines Creek Lower	95.0	84.9	80.8	2.0	24.7	100.1
Des Moines Creek Upstream	5.8	0.0	0.0	-	-	-

APPENDIX D

Biological Resources

ESA & Sensitive Species Memorandum

CONFLUENCE
ENVIRONMENTAL COMPANY

To: Erik Schwenke, Landrum & Brown
cc: Steve Rybolt, Port of Seattle | Sea-Tac International Airport

From: Eric Doyle

Date: September 11, 2023

Re: 2023 Revised SAMP Endangered Species Act and sensitive species field assessment and existing conditions review

Enclosures: Attachment 1

This document is the 2023 updated version of a previous memorandum prepared by Confluence Environmental Company (Confluence) on behalf of Landrum & Brown and the Port of Seattle (the Port) to support the Sustainable Airport Master Plan (SAMP) Near Term Projects (NTPs) Environmental Review. This memorandum was developed to support evaluation of federal and state protected species concerns related to Near Term Project development to inform future compliance with Endangered Species Act (ESA), Washington State Environmental Policy Act (SEPA), and other regulatory requirements. The prior version was provided to the Port on September 29, 2021, with revisions by Landrum & Brown in January 2022. This revised memorandum has been updated to include current ESA-listed species status and sensitive species occurrence information for the study area, referred to hereafter as the general study area (GSA).

1.0 REGULATORY FRAMEWORK

The regulatory framework for this review includes:

- Section 7(a)(2) of the federal ESA of 1973, as amended
- The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712)
- The Bald and Golden Eagle Protection Act (BGPA) (16 U.S.C. 668; 50 CFR 22)
- The Washington State Environmental Policy Act (SEPA) RCW 43.21C
- Washington Threatened, Endangered, and Sensitive Species as defined under WAC 220-610-110

This review considers the documented or potential presence of federally and state-protected species and habitats, including ESA critical habitat, in the vicinity of the GSA defined for this review, and the potential for measurable effects on these species or habitats resulting from

SAMP NTP development. The GSA includes the development footprint of SAMP NTP development, also referred to as the study area, and the anticipated extent of measurable stormwater effects from this future development.

2.0 RESEARCH METHODS

Confluence developed this review using the GSA developed for the SAMP Environmental Assessment and assembling the best available science and information on ESA-listed species occurrence within the GSA and vicinity. The information review was supported by vehicle and foot reconnaissance of affected habitats within the GSA, supplemented by site-specific knowledge of parts of the GSA from past projects, including environmental compliance for Sound Transit light rail development and SR-518 improvements.

The Confluence staff assigned to this project are knowledgeable biologists with years of experience conducting ESA Section 7 consultations in the region. We relied on this experience and available information to define the GSA, assess the likelihood of protected species occurrence, and characterize potential effects on those species and protected habitats resulting from SAMP NTP development.

2.1 General Study Area

The GSA encompasses the extent of SAMP NTP study area and surrounding areas that could measurably impacted by project development. This includes the headwaters of tributary streams potentially affected by changes in stormwater runoff from existing and new impervious surfaces and industrial discharges resulting from the SAMP. These are the headwaters of the Miller/Walker Creek and Des Moines Creek drainages to Puget Sound, and the Gilliam Creek drainage to the Green River. The GSA comprises:

1. The development footprint for the proposed SAMP NTPs and immediate surroundings within or adjacent to Seattle-Tacoma International Airport (see Exhibit 1), and;
2. The reasonably foreseeable extent of measurable direct and indirect effects resulting from project construction and operation, including stormwater discharge (see Appendix J, Environmental Assessment).[1]

The GSA is composed of currently developed areas (buildings, paved surfaces), as well as managed vegetated habitats within and adjacent to the airport boundary. Vegetated habitats include managed strips adjacent to runways and taxiways, open fields and shrublands, forested

[1] The Port has evaluated stormwater

areas, stormwater ponds, and wetlands. These habitats are managed for tree height and wildlife control to maintain aircraft safety. Many vegetated habitats around the outer edge of the GSA were previously developed for residential and recreational uses (e.g., city park lands). These properties were subsequently purchased and cleared for airport noise mitigation and other purposes and have revegetated over time.

2.2 Information Sources

Confluence relied on the following information sources to determine potential ESA-listed species and critical habitat occurrence in the GSA:

- The SAMP NTP GSA (Exhibit 1)
- An October 9, 2019 reconnaissance survey of affected habitats within the study area guided by Port of Seattle staff
- Knowledge of the Gilliam Creek drainage from a prior foot survey conducted by Confluence staff in 2009
- The Washington Department of Fish and Wildlife (WDFW 2019a, 2021a, 2023a) Priority Habitats and Species (PHS) database
- The WDFW SalmonScape database (WDFW 2019b, 2021b, 2023b)
- The WDFW state sensitive species list (WDFW 2019c, 2021c, 2023c)
- The U.S. Fish and Wildlife Service (USFWS 2019, 2021, 2023) iPac list of threatened and endangered species and designated critical habitat known or likely to occur in the GSA and vicinity
- National Oceanographic and Atmospheric Administration (NOAA Fisheries 2019, 2021, 2023) lists of threatened and endangered species and designated critical habitat known or likely to occur in the GSA and vicinity
- A list of wildlife species observed within the GSA from periodic monitoring activities and studies conducted by the Port of Seattle (2019, 2023)
- A 2014 review of potential ESA compliance concerns prepared for the Port of Seattle (Anchor QEA 2014)
- The Miller and Walker Creeks Basin Plan (Miller and Walker Creek Executive Committee 2006)
- Gray literature on the Miller Creek and Walker Creek drainages (Batcho 2009; King County 2011)
- The City of Tukwila Surface Water Comprehensive Plan (CH2MHill 2013)

3.0 RESULTS

The results of this review include:

- Identification of ESA-listed and proposed species, and designated proposed critical habitat that the USFWS and NOAA Fisheries identify as known or potentially occurring in the project vicinity;
- Identification of other federally protected species known or potentially occurring in the project vicinity;
- Identification of state protected species known or potentially occurring in the project vicinity
- Analysis of the likelihood of those species occurring in the GSA;
- The potential effects of SAMP NTP implementation on those species and their habitats.

3.1 ESA-Listed Species and Critical Habitat in GSA Vicinity

The USFWS and NOAA Fisheries lists obtained for this review indicate that several ESA-listed animal species and designated critical habitat occur in the vicinity of the GSA. These species lists are broadly defined and consider species presence within approximately 50 miles of a designated point of interest or are simply maps of regional listed species distribution and critical habitat designations. As such, they include several species that are not likely to occur in the GSA for a variety of reasons, including unsuitable habitat conditions, regional extirpation, and/or documented lack of occurrence over several years. ESA-listed animal species and designated critical habitat occurrence in the general vicinity and documented or potential occurrence in the GSA are summarized in Table 1.

One ESA-listed plant species have been documented in King County, the federally endangered swamp sandwort (*Arenaria paludicola*) (58 FR 41378). The swamp sandwort historically occurred in swamps and freshwater marshes in proximity to marine shorelines in Puget Sound. This species no longer occurs in King County and has most likely been extirpated from Washington State (Washington Natural Heritage Program 2021; WDNR 2021). Golden paintbrush, a previously ESA-listed species, was formally delisted on July 19, 2023. USFWS determined that delisting was warranted because all remaining populations are protected on appropriately managed public lands and the species has been successfully reintroduced at several sites within its native range (88 FR 46088). Golden paintbrush historically occurred in King County but is now exceedingly rare. This species is associated with open meadow and prairie habitats on glacial outwash plains in the Puget Sound Lowlands at 10 to 300 feet elevation (Washington Natural Heritage Program 2021; WDNR 2021). The GSA lacks suitable habitat for this species and it has not been documented in the vicinity.

Table 1. ESA-listed animal species and designated critical habitat occurring in the vicinity of the Airport and likelihood of occurrence in the GSA.

Species	Listing Status	Critical Habitat	Known or Likely to Occur in GSA		Rationale
			Species	Critical Habitat	
North American Wolverine	Proposed Threatened 10/08/2016 81 FR 71670	Not designated	No	No	The developed Puget Sound lowlands do not provide suitable habitat for this species.
Marbled murrelet – Washington, Oregon, and California	Threatened 10/01/1992 57 FR 45328	Designated 08/04/2016 81 FR 51348	No	No	This species is primarily marine but nests in large coniferous trees in mature, predominantly old growth, forests. These habitats do not occur in the GSA.
Yellow-billed cuckoo – Western U.S.	Threatened 11/03/2014 79 FR 59991	Designated 12/02/2014 79 FR 71373	No	No	This species has been extirpated from Washington State and occurs only as a periodic migrant. The GSA does not provide suitable habitat.
Bull trout – Coastal-Puget Sound	Threatened 11/01/1999 64 FR 58910	Designated 10/18/2010 75 FR 63898	No	No	Foraging adult and subadult bull trout may occur in the Green River and nearshore marine habitats of Puget Sound. The GSA is inaccessible to and does not contain suitable habitat for bull trout and is outside of designated critical habitat for this species.
Chinook Salmon – Puget Sound	Threatened 06/28/2005 70 FR 37160	Designated 09/02/2005 70 FR 52685	No	No	Chinook occur in proximity to the GSA in nearshore areas of Puget Sound and in migratory and rearing habitats the Green River. The GSA is inaccessible to and does not contain suitable habitat for Chinook salmon and is outside of designated critical habitat for this species.
Steelhead – Puget Sound	Threatened 05/11/2006 72 FR 26722	Designated 09/08/2008 73 FR 55451	No	No	Migrating adult and juvenile steelhead may occur in proximity to the GSA in migratory habitats in the Green River. The GSA is inaccessible to and does not contain suitable habitat for steelhead and is outside of designated critical habitat for this species.
Yelloweye Rockfish – Puget Sound/Georgia Basin	Endangered 3/24/2017 82 FR 7711	Designated 11/3/2014 79 FR 68042	No	No	The GSA is comprised entirely of terrestrial upland and freshwater habitats unsuitable for obligate marine species.
Bocaccio Rockfish – Puget Sound/Georgia Basin	Threatened 4/28/2010 75 FR 22276	Designated 11/3/2014 79 FR 68042	No	No	

Species	Listing Status	Critical Habitat	Known or Likely to Occur in GSA		Rationale
			Species	Critical Habitat	
Southern Resident Killer Whale	Endangered 11/18/2005 70 FR 69903	Proposed 10/19/2019 84 FR 55530	No	No	
Humpback Whale – Mexico and Central America	Mexico DPS Threatened Central America DPS Endangered 12/21/2016 81 FR 93639	Proposed 10/19/2019 84 FR 55530	No	No	

3.1.1 *Likelihood of ESA-Listed Species Occurrence in the GSA*

The best available science and information indicates that no ESA-listed species or designated critical habitat are present within the SAMP NTP GSA. This conclusion is supported by the fact that the developed areas of the Seattle-Tacoma International Airport and immediate surroundings do not provide suitable habitat for any listed species, with the possible exception of the streaked horned lark. This species relies on short grass prairie habitats and is known to occur in managed grasslands between runways and taxiways at other airports elsewhere in the Puget Sound region. However, streaked horned lark has not been observed in annual wildlife surveys conducted by the Port of Seattle (2019, 2023) and the Seattle-Tacoma International Airport lies is outside the range of currently occupied habitat (USFWS 2019). This indicates that the streaked horned lark is unlikely to occur in the GSA in the near-term. While the species range could conceivably expand in the future, the North Puget Lowlands, including the GSA, are not included in current recovery objectives (USFWS 2019). Therefore, the GSA should not be considered potential habitat for the purpose of ESA consultation.

The GSA does not overlap habitats known or potentially used by any ESA-listed fish species or designated critical habitats (NMFS 2021; USFWS 2021). While several listed species are known to occur in the general proximity, they have not been documented within the GSA boundary, cannot currently access the habitats therein, and would be unlikely to do so for the foreseeable future because these habitats are unsuitable. As stated, the Port of Seattle has identified and/or committed to sufficient stormwater and industrial wastewater controls to fully offset water quantity and water quality impacts from SAMP Near-Term Project development. No measurable stormwater impacts would occur within the Gilliam Creek, Miller/Walker Creek and Des Moines Creek systems, the only potentially suitable freshwater habitats for ESA-listed salmonids are located downstream of the GSA.

3.1.2 *Potential SAMP Near Term Project Effects on ESA-Listed Species and Habitats*

Based on the best available science and information and the conservative GSA boundary used in this assessment, the SAMP NTPs do not appear to trigger formal consultation requirements under Section 7 of the ESA. No ESA-listed species are documented or likely to occur within the GSA and no designated critical habitat occurs within this boundary. Therefore, no measurable effects on listed species or their habitats are likely to occur.

3.2 Other Federally Protected Species Occurring in the GSA

The other relevant federal regulations considered in this review are the MBTA and BGPA, which afford various protections to a broad range of native bird species. All bird species in Washington State, except for non-native European starlings, rock doves (pigeons) and English

house sparrows, are protected under the MBTA. Table 2 provides a list of MBTA-protected species observed on Seattle-Tacoma International Airport property in annual surveys conducted by Port of Seattle staff and their contractors. The Port of Seattle has documented bald eagle occurrences within the GSA. There are no bald eagle nesting or roosting sites documented in the GSA or surrounding proximity in the PHS database (WDFW 2023a). The golden eagle does not commonly occur west of the Cascades and has not been observed in the GSA (Port of Seattle 2019, 2023; WDFW 2023a).

Table 2. Federally protected bird species documented within the GSA.

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
American bittern	●	●	MBTA
American coot	●	●	MBTA
American crow	●	●	MBTA
American goldfinch	●	●	MBTA
American kestrel	●	●	MBTA
American pipet	●	●	MBTA
American robin	●	●	MBTA
American tree sparrow	--	●	MBTA
American wigeon	●	●	MBTA
Anna's hummingbird	●	●	MBTA
Bald eagle	●	●	MBTA, BGPA
Band-tailed pigeon	--	●	MBTA
Bank swallow	--	●	MBTA
Barn own	●	●	MBTA
Barn swallow	●	●	MBTA
Barred owl	●	●	MBTA
Barrow's goldeneye	--	●	MBTA
Belted kingfisher	●	●	MBTA
Bewick's wren	●	●	MBTA
Black swift	--	●	MBTA
Black-capped chickadee	●	●	MBTA

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
Black-headed grosbeak	●	--	MBTA
Black-throated gray warbler	●	--	MBTA
Blue-winged teal	●	--	MBTA
Broad-winged hawk	--	●	MBTA
Brown creeper	●	--	MBTA
Brown-headed cowbird	●	●	MBTA
Bufflehead	●	●	MBTA
Bushtit	●	●	MBTA
Cackling goose	●	●	MBTA
California gull	--	●	MBTA
California quail	●	●	MBTA
Canada goose	●	●	MBTA
Canvasback	--	●	MBTA
Caspian tern	--	●	MBTA
Cedar waxwing	●	●	MBTA
Chestnut-backed chickadee	●	--	MBTA
Chipping sparrow	--	●	MBTA
Cliff swallow	●	●	MBTA
Common goldeneye	●	--	MBTA
Common merganser	●	●	MBTA
Common nighthawk	--	●	MBTA
Common raven	●	●	MBTA
Common yellowthroat	●	●	MBTA
Cooper's hawk	●	●	MBTA
Dark-eyed junco	●	●	MBTA
Dickcissel	--	●	MBTA
Double-crested cormorant	●	●	MBTA
Dowitcher	●	--	MBTA

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
Downy woodpecker	●	●	MBTA
Dunlin	--	●	MBTA
Eared grebe	●	●	MBTA
Evening grosbeak	●	--	MBTA
Fox sparrow	--	●	MBTA
Gadwall	●	●	MBTA
Glaucous-winged gull	●	●	MBTA
Golden-crowned kinglet	●	●	MBTA
Golden-crowned sparrow	●	--	MBTA
Gray-cheeked thrush	--	●	MBTA
Great blue heron	●	●	MBTA
Great horned owl	●	●	MBTA
Greater scaup	--	●	MBTA
Greater white-fronted goose	●	●	MBTA
Greater yellowlegs	--	●	MBTA
Green heron	●	●	MBTA
Green-winged teal	●	●	MBTA
Hammond's flycatcher		●	MBTA
Hairy woodpecker	●	--	MBTA
Hermit thrush	--	●	MBTA
Herring gull	--	●	MBTA
Hooded merganser	●	●	MBTA
Horned grebe	--	●	MBTA
Horned lark ssp.	●	●	MBTA
House finch	●	●	MBTA
House wren	●	●	MBTA
Killdeer	●	●	MBTA
Lazuli bunting	●	●	MBTA

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
Least sandpiper	--	●	MBTA
Lesser nighthawk	--	●	MBTA
Lesser scaup	●	●	MBTA
Lincoln's sparrow	--	●	MBTA
Long-eared owl	--	●	MBTA
Macgillivray's warbler	--	●	MBTA
Mallard	●	●	MBTA
Marsh wren	●	--	MBTA
Merlin	●	●	MBTA
Mountain bluebird	--	●	MBTA
Mourning dove	●	●	MBTA
Northern flicker	●	●	MBTA
Northern harrier	●	●	MBTA
Northern pintail	●	●	MBTA
Northern shoveler	●	●	MBTA
Northern shrike	●	●	MBTA
Northwestern crow	●	●	MBTA
Orange-crowned warbler	--	●	MBTA
Osprey	●	●	MBTA
Ovenbird	--	●	MBTA
Pacific golden plover	--	●	MBTA
Pacific slope flycatcher	--	●	MBTA
Palm warbler	--	●	MBTA
Pectoral sandpiper	--	●	MBTA
Peregrine falcon	●	●	MBTA
Pied-billed grebe	●	●	MBTA
Pileated woodpecker	●	●	MBTA
Pine siskin	●	●	MBTA

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
Purple martin	--	●	MBTA
Red-breasted merganser	●	●	MBTA
Red-breasted nuthatch	●	--	MBTA
Red-breasted sapsucker	●	●	MBTA
Red-necked grebe	--	●	MBTA
Red-necked phalarope	--	●	MBTA
Red-shouldered hawk	●	--	MBTA
Red-tailed hawk	●	●	MBTA
Red-winged blackbird	●	●	MBTA
Ring-billed gull	--	●	MBTA
Ring-necked duck	●	●	MBTA
Rough-legged hawk		●	MBTA
Ruby-crowned kinglet	●	●	MBTA
Ruddy duck	●	●	MBTA
Rufous hummingbird	●	●	MBTA
Savannah sparrow	●	●	MBTA
Sharp-shinned hawk	●	●	MBTA
Short-eared owl	●	●	MBTA
Snow bunting	●	●	MBTA
Snow goose	●	●	MBTA
Snowy owl	--	●	MBTA
Song sparrow	●	●	MBTA
Sora	--	●	MBTA
Spotted sandpiper	●	--	MBTA
Spotted towhee	●	●	MBTA
Swainson's hawk	●	●	MBTA
Swainson's thrush	●	●	MBTA
Townsend's warbler	●	●	MBTA

Species	Observed in 2019	Observed 2020-2023	Federal Protection Status
Tree swallow	●	●	MBTA
Tundra swan	--	●	MBTA
Turkey vulture	●	●	MBTA
Varied thrush	●	●	MBTA
Vaux swift	--	●	MBTA
Violet-green swallow	●	●	MBTA
Warbling vireo	--	●	MBTA
Western grebe	--	●	MBTA
Western gull	--	●	MBTA
Western meadowlark	●	●	MBTA
Western sandpiper	●	●	MBTA
Western screech owl	--	●	MBTA
Western tanager	--	●	MBTA
Western wood pewee	●	--	MBTA
Whimbrel	●	●	MBTA
White-crowned sparrow	●	●	MBTA
White-throated sparrow	--	●	MBTA
White-throated swift	--	●	MBTA
Willow flycatcher	●	--	MBTA
Wilson's snipe	--	●	MBTA
Wilson's warbler	●	●	MBTA
Winter wren	●	●	MBTA
Wood duck	●	●	MBTA
Yellow warbler	●	●	MBTA
Yellow-headed blackbird	●	●	MBTA
Yellow-rumped warbler	●	●	MBTA

Notes: -- = No, ● = Yes

Based on the documented presence, the bird species listed in Table 2 and their habitats are likely to be affected by SAMP NTPs development. These effects would include temporary disturbance and disruption during construction activities, and the permanent alteration and loss of suitable habitat in currently undeveloped areas within the proposed development footprint. These likely include nesting, foraging, mating, and juvenile rearing habitats.

3.3 State Protected Species Occurring in the GSA

The Washington Threatened, Endangered, and Sensitive Species list includes species listed under the federal ESA, and other species that are state listed as endangered, threatened, or sensitive that require additional protection and/or management to ensure their survival. ESA-listed species known or likely to occur in the GSA are addressed in Section 3.1. This section addresses other state listed and sensitive species commonly found in terrestrial and freshwater habitats. These species and their likelihood of occurrence in the GSA are identified in Table 3. None of the state-protected species are likely to occur in the GSA based on their current known distribution and/or habitat associations.

Table 3. Washington state protected species not listed under the ESA and likelihood of occurrence in the GSA.

Species	State Status	Likely to Occur in GSA	Basis[a]
Birds			
Sandhill crane	Endangered	No	Seasonal distribution in Washington restricted to specific areas in Yakima and Klickitat counties
Upland sandpiper	Endangered	No	Historical distribution limited to eastern Washington, likely extirpated from state
Tufted puffin	Endangered	No	Distribution limited to coastal marine habitats with rocky outcrops on Washington coast and Strait of Juan de Fuca
Columbian sharp-tailed grouse	Endangered	No	Distribution restricted to eastern Washington
American white pelican	Threatened	No	Distribution restricted to eastern Washington
Ferruginous hawk	Threatened	No	Distribution restricted to southeastern Washington
Common loon	Sensitive	No	Found in association with protected marine waters and large inland waterbodies. These habitats do not occur within the GSA.
Oregon vesper sparrow	Endangered	No	Status review in progress, ESA listing is probable. Two breeding populations are currently documented in

Species	State Status	Likely to Occur in GSA	Basis[a]
			Washington State, one each in Pierce and Thurston Counties.
Mammals			
Western gray squirrel	Threatened	No	Current distribution limited to oak and mixed conifer woodlands in southern Puget Sound lowlands and eastern slopes of the Cascade Range. These habitats do not occur within the GSA.
Fisher	Endangered	No	Species distribution limited to mature/old growth coniferous forest. GSA does not provide suitable habitat.
Reptiles			
Northwestern pond turtle	Endangered	No	Current distribution in western Washington limited to two sites outside of the GSA (Hallock et al. 2017)
Amphibians			
Northern leopard frog	Endangered	No	Distribution restricted to eastern Washington.
Larch mountain salamander	Sensitive	No	Distribution limited to alpine habitats in Cascade Range.
Fish			
Pygmy whitefish	Sensitive	No	Found only in cold alpine streams and deep cold lakes. Suitable habitat does not occur in GSA.
Margined sculpin	Sensitive	No	Current distribution in Washington restricted to cold water streams in southeast corner of state.
Olympic mudminnow	Sensitive	No	GSA is outside of known species range and documented observations.
Invertebrates			
Mardon skipper	Endangered	No	Distribution limited to native grass meadows in southern Washington Cascade Range.
Plants			
Triangular-lobed moonwort	Sensitive	No	Occurs in King County. Distribution limited to elevations above 2,100 feet.
Western moonwort	Sensitive	No	Occurs in King County. Distribution limited to elevations above 2,500 feet.
Alaska harebell	Sensitive	No	Occurs in King County. Distribution limited to elevations above 2,000 feet.
Few-flowered sedge	Sensitive	No	Occurs in King County. Suitable habitat present in GSA (Tub Lake) but species has not been documented.
Long-styled sedge	Sensitive	No	Occurs in King County. Distribution limited to elevations above 2,700 feet.
Clubmoss cassiope	Threatened	No	One documented occurrence in WA at elevations above 1,900 feet.

Species	State Status	Likely to Occur in GSA	Basis[a]
Golden chinquapin	Sensitive	No	Rare in WA. Has not been documented in the GSA or vicinity.
Spleenwort-leaved goldthread	Sensitive	No	Old-growth forest obligate. Suitable habitat does not occur in GSA or vicinity.
Treelike clubmoss	Sensitive	No	Occurs in King County. Distribution limited to elevations above 800 feet.
Black lily	Threatened	No	Occurs in King County in moist, open meadow habitat. Suitable habitat does not occur in GSA or vicinity.
Oregon golden aster	Sensitive	No	Occurs in King County. Habitat limited to gravel bars adjacent to larger rivers. Suitable habitat does not occur in GSA or vicinity.
Canadian St. John's-wort	Sensitive	Possible	Occurs in King County. Wetland obligate species. Species has not been documented in GSA or vicinity but suitable habitat is present.
Pacific pea	Endangered	No	Occurs in King County. Associated with prairie habitat. Suitable habitat does not occur in GSA or vicinity.
One-cone clubmoss	Sensitive	No	Habitat in WA is limited to North Cascades.
Choris' bog-orchid	Threatened	No	Occurs in King County. Distribution in WA limited to elevations above 2,500 feet.
Flat-leaved bladderwort	Sensitive	Possible	Occurs in King County. Wetland obligate species. Species has not been documented in GSA or vicinity but suitable habitat is present.

a Information obtained from WDFW (2021b) and WDNR (2011, 2020) unless otherwise cited.

4.0 REFERENCES

Anchor QEA. 2014. Endangered Species Review: Seattle-Tacoma International Airport. Prepared for the Port of Seattle by Anchor QEA LLC. 52 p + appendices.

Batcho, A. 2009. Miller Creek Fish/Habitat Relationships Measures, Analysis and Report Using the U. S. Forest Service Scientific Method of Stream Survey. White paper prepared by Trout Unlimited volunteer. 22 p.

CH2MHill. 2013. City of Tukwila 2013 Surface Water Comprehensive Plan. Prepared for the City of Tukwila by CH2MHill. February 2013. 191 p.

Hallock, L. A., A. McMillan, and G. J. Wiles. 2017. Periodic status review for the Western Pond Turtle in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 19+v pp.

Miller and Walker Creek Executive Committee. 2006. Miller and Walker Creeks Basin Plan – Executive Proposed. February 2006. 48 p.

King County. 2011. Miller and Walker Creek Chronicle Record of Events Shaping the Ecology and Fish Populations of the Streams. Available at: https://www.kingcounty.gov/services/environment/watersheds/central-puget-sound/miller-walker-creeks.aspx. 36 p.

NOAA Fisheries (National Oceanographic and Atmospheric Administration Fisheries). 2019. Maps and descriptions of ESA-listed species and designated critical habitat in Western Washington. Available at: https://www.fisheries.noaa.gov/science-and-data. Accessed September 4, 2019.

NOAA Fisheries (National Oceanographic and Atmospheric Administration Fisheries). 2021. Maps and descriptions of ESA-listed species and designated critical habitat in Western Washington. Available at: https://www.fisheries.noaa.gov/science-and-data. Accessed September 23, 2021.

NOAA Fisheries (National Oceanographic and Atmospheric Administration Fisheries). 2023. Maps and descriptions of ESA-listed species and designated critical habitat in Western Washington. Available at: https://www.fisheries.noaa.gov/science-and-data. Accessed August 29, 2023.

Port of Seattle. 2019. Unpublished list of wildlife species observed in periodic wildlife surveys of the Seattle-Tacoma International Airport. Excel spreadsheet provided by Chipper Maney, October 10, 2019.

Port of Seattle. 2023. Unpublished list of wildlife species observed in periodic wildlife surveys of the Seattle-Tacoma International Airport. Excel spreadsheet provided by Michael Middleton, September 7, 2023.

USFWS and NMFS (U.S. Fish and Wildlife Service and National Marine Fisheries Service). 1998. Endangered Species Consultation Handbook, Procedures for Conducting Consultation and Conference Under Section 7 of the Endangered Species Act. 282 p.

USFWS (U.S. Fish and Wildlife Service). 2019. Seattle-Tacoma International Airport - SAMP Near-Term Projects Environmental Review. iPac species list. Project code 2023-0118376. Generated September 4, 2019.

USFWS (U.S. Fish and Wildlife Service). 2021. Seattle-Tacoma International Airport – SAMP Near-Term Projects Environmental Review. iPac species list. Project code 2023-0118376. Generated September 23, 2021.

USFWS (U.S. Fish and Wildlife Service). 2023. Seattle-Tacoma International Airport - SAMP Near-Term Projects Environmental Review. iPac species list. Project code 2023-0118376. Generated August 17, 2023.

WDFW (Washington Department of Fish and Wildlife). 2019a. Priority Habitats and Species Database. Available at: https://geodataservices.wdfw.wa.gov/hp/phs/. Accessed: September 4, 2019.

WDFW. 2019b. SalmonScape database. Online database of known and anticipated salmon and steelhead distribution in Washington State. Available at: https://apps.wdfw.wa.gov/salmonscape/. Accessed: September 4, 2019.

WDFW. 2019c. Species in Washington. Online database of state listed and sensitive species information. Available at: https://wdfw.wa.gov/species-habitats/species. Accessed: September 4, 2019.

WDFW (Washington Department of Fish and Wildlife). 2021a. Priority Habitats and Species Database. Available at: https://geodataservices.wdfw.wa.gov/hp/phs/. Accessed: September 23, 2021.

WDFW. 2021b. SalmonScape database. Online database of known and anticipated salmon and steelhead distribution in Washington State. Available at: https://apps.wdfw.wa.gov/salmonscape/. Accessed: September 23, 2021.

WDFW. 2021c. Species in Washington. Online database of state listed and sensitive species information. Available at: https://wdfw.wa.gov/species-habitats/species. Accessed: September 23, 2021.

WDFW (Washington Department of Fish and Wildlife). 2023a. Priority Habitats and Species Database. Available at: https://geodataservices.wdfw.wa.gov/hp/phs/. Accessed: August 16, 2023.

WDFW. 2023b. SalmonScape database. Online database of known and anticipated salmon and steelhead distribution in Washington State. Available at: https://apps.wdfw.wa.gov/salmonscape/. Accessed: August 17, 2023.

WDFW. 2023c. Species in Washington. Online database of state listed and sensitive species information. Available at: https://wdfw.wa.gov/species-habitats/species. Accessed: August 16, 2023.

WDNR. 2021. Washington Natural Heritage Information System. List of Known Occurrences of Rare Plants, Mosses and Lichens in Washington. Compiled on August 31, 2021. Available at: https://www.dnr.wa.gov/NHPlists. Accessed: August 17, 2023.

Washington Natural Heritage Program. 2021. Field Guide to the Rare Plants of Washington. Washington Department of Natural Resources, Natural Heritage Program. Available at: https://www.dnr.wa.gov/NHPfieldguide. Accessed: August 17, 2023.

J:\Landrum & Brown_001162\001162.004_SEA SAMP_SD13

CONFLUENCE
ENVIRONMENTAL COMPANY

EXHIBITS

Exhibit 1.
General Study Area

APPENDIX D

Biological Resources

Species Lists

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: August 17, 2023
Project Code: 2023-0118376
Project Name: Port of Seattle - Sustainable Airport Master Plan

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: 2023-0118376
Project Name: Port of Seattle - Sustainable Airport Master Plan
Project Type: Airport - Maintenance/Modification
Project Description: This iPac project updates the project description and analysis area for the previous Sustainable Airport Master Plan species list request. The project includes a net increase of 75 acres of impervious surface area, with stormwater detention and treatment system improvements as needed to achieve no measurable change in water quality and quantity at points of discharge.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@47.449925500000006,-122.30843349657927,14z

Counties: King County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 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.

MAMMALS

NAME	STATUS
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

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

FISHES

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, 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

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

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:	Federal Aviation Administration
Name:	Eric Doyle
Address:	146 N Canal St
Address Line 2:	Suite 111
City:	Seattle
State:	WA
Zip:	98103
Email	eric.doyle@confenv.com
Phone:	2063217314

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
http://www.fws.gov/wafwo/

In Reply Refer To: September 23, 2021
Consultation Code: 01EWFW00-2021-SLI-1776
Event Code: 01EWFW00-2021-E-03785
Project Name: Port of Seattle - Sustainable Airport Master Plan

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, and proposed species, designated and proposed critical habitat, and candidate species 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. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. 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 ECOS-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 ECOS-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 or not 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:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

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 Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

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

Consultation Code: 01EWFW00-2021-SLI-1776
Event Code: Some(01EWFW00-2021-E-03785)
Project Name: Port of Seattle - Sustainable Airport Master Plan
Project Type: TRANSPORTATION
Project Description: This iPac project updates the project description and analysis area for the previous Sustainable Airport Master Plan species list request. The project includes a net increase of 75 acres of impervious surface area, with stormwater detention and treatment system improvements as needed to achieve no measurable change in water quality and quantity at points of discharge.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@47.449925500000006,-122.30843349657927,14z

Counties: King County, Washington

Endangered Species Act Species

There is a total of 6 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.

Mammals

NAME	STATUS
Gray Wolf *Canis lupus* Population: Western Distinct Population Segment No critical habitat has been designated for this species.	Proposed Endangered

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus*	Threatened

Population: U.S.A., conterminous, lower 48 states
There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/8212

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

Critical habitats

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

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
http://www.fws.gov/wafwo/

In Reply Refer To: November 05, 2019
Consultation Code: 01EWFW00-2020-SLI-0150
Event Code: 01EWFW00-2020-E-00315
Project Name: Seattle-Tacoma International Airport - SAMP Near-Term Projects Environmental Review

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

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species 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. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. 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 ECOS-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 ECOS-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 or not 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:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

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 Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

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

Consultation Code: 01EWFW00-2020-SLI-0150

Event Code: 01EWFW00-2020-E-00315

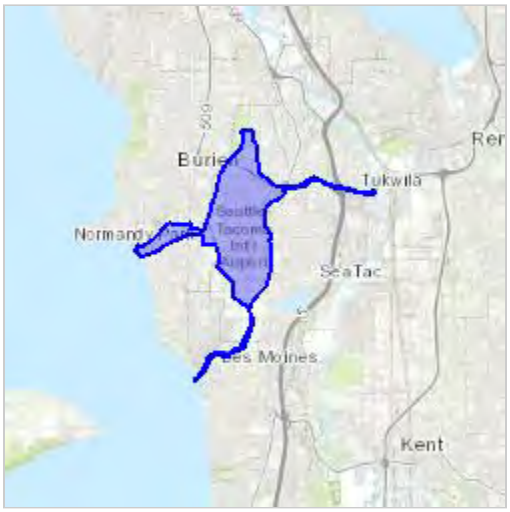
Project Name: Seattle-Tacoma International Airport - SAMP Near-Term Projects Environmental Review

Project Type: TRANSPORTATION

Project Description: The project includes development of new facilities on Port of Seattle property within and adjacent to Seattle-Tacoma International Airport to support capacity expansion. The project footprint considers the potential extent of stormwater-related effects on streams draining the affected areas and their receiving waters.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/47.442064956500076N122.30887862068647W



Counties: King, WA

Endangered Species Act Species

There is a total of 6 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.

Mammals

NAME	STATUS
Gray Wolf *Canis lupus* Population: Western Distinct Population Segment No critical habitat has been designated for this species.	Proposed Endangered
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

STATE LISTED SPECIES

Revised February 2022

Washington Department of FISH and WILDLIFE

The Washington Fish and Wildlife Commission has classified the following 46 species as Endangered, Threatened, or Sensitive. The federal status of species under the Endangered Species Act differs in some cases from state status; federal status is indicated by: Federal Endangered (FE), Threatened (FT), Candidate (FC), USFWS has made a 90-day finding that listing may be warranted (90d), or a NOAA Species of Concern (FSC).

STATE ENDANGERED

A species native to the State of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

The 35 State Endangered species listed below are designated in Washington Administrative Code 220-610-010

MAMMALS (14)

Fin Whale	FE
Sei Whale	FE
Blue Whale	FE
Humpback Whale	FT/FE[#]
[#]Mexico DPS=T; Central America DPS=E	
North Pacific Right Whale	FE
Sperm Whale	FE
Killer Whale	FE[#]
[#]Southern Residents only	
Gray Wolf	FE
Grizzly Bear	FT
Lynx	FT
Fisher	-
Columbian White-tailed Deer	FT
Woodland Caribou[x]	FE
Pygmy Rabbit	FE

BIRDS (12)

Sandhill Crane	-
Snowy Plover	FT
Upland Sandpiper[x]	-
Marbled Murrelet	FT
Tufted Puffin	-
Columbian Sharp-tailed Grouse	-
Greater Sage-Grouse	-
Ferruginous Hawk	-
Northern Spotted Owl	FT
Yellow-billed Cuckoo[x]	FT
Streaked Horned Lark	FT
Oregon Vesper Sparrow	90d

REPTILES (3)

Western Pond Turtle	90d
Leatherback Sea Turtle	FE
Loggerhead Sea Turtle	FE

AMPHIBIANS (2)

Oregon Spotted Frog	FT
Northern Leopard Frog	-

INVERTEBRATES (4)

Oregon Silverspot Butterfly[x]	FT
Taylor's Checkerspot	FE
Mardon Skipper	-
Pinto Abalone	-

STATE THREATENED

A species native to the state of Washington that is likely to become endangered within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

The 5 State Threatened species are designated in Washington Administrative Code 220-200-100

MAMMALS (3)

Sea Otter	-
Western Gray Squirrel	-
Mazama Pocket Gopher	
subsp. *glacialis, pugetensis, tumuli, yelmensis*	FT
...subsp. *couchi, louiei[x], melanops*	-

BIRDS (1)

American White Pelican	-

REPTILES (1)

Green Sea Turtle	FT

[x]These species are, or may be, extirpated from all of their historical range in Washington

For more information, check our website:
https://wdfw.wa.gov/species-habitats/species

Or contact us at:
wildthing@dfw.wa.gov
or
Wildlife Program (360) 902-2515
Fish Program (360) 902-2700

For more information on federal status, check the US Fish and Wildlife Service or the NOAA National Marine Fisheries Service

STATE SENSITIVE

A species native to the state …that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

The 6 State Sensitive species are designated in Washington Administrative Code 220-200-100

MAMMALS (1)

Gray Whale	FE[#]
[#]Western North Pacific Stock	

BIRDS (1)

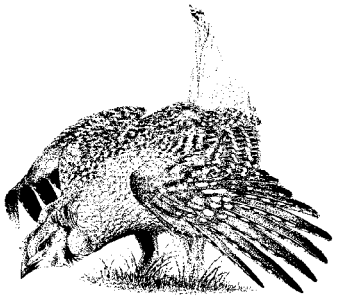
Common Loon	-

FISH (3)

Pygmy Whitefish	-
Margined Sculpin	-
Olympic Mudminnow	-

AMPHIBIAN (1)

Larch Mountain Salamander	-



STATE CANDIDATE SPECIES

Revised February 2022

Washington Department of FISH and WILDLIFE

The Washington Department of Fish and Wildlife has designated the following 71 species as Candidates for listing in Washington as State Endangered, Threatened, or Sensitive. The Department reviews species for listing following procedures in Washington Administrative Code 220-610-110. The federal status of species under the Endangered Species Act differs in some cases from state status; federal status is indicated by: Federal Endangered (FE), Threatened (FT), Candidate (FC), USFWS has made a 90-day finding that listing may be warranted (90d), or a NOAA Fisheries Species of Concern (FSC).

MAMMALS (10)

Townsend's Big-eared Bat	-
Keen's Myotis Bat	-
White-tailed Jackrabbit	-
Black-tailed Jackrabbit	-
Washington Ground Squirrel	-
Townsend's Ground Squirrel	
South of the Yakima River	-
Olympic Marmot	-
Cascade Red Fox	-
Wolverine	FC
Pacific Harbor Porpoise	-

BIRDS (14)

Western Grebe	-
Clark's Grebe	-
Short-tailed Albatross	FE
Northern Goshawk	-
Golden Eagle	-
Cassin's Auklet	-
Flammulated Owl	-
Burrowing Owl	-
White-headed Woodpecker	-
Black-backed Woodpecker	-
Loggerhead Shrike	-
Slender-billed White-breasted Nuthatch	-
Sage Thrasher	-
Sagebrush Sparrow	-

REPTILES and AMPHIBIANS (10)

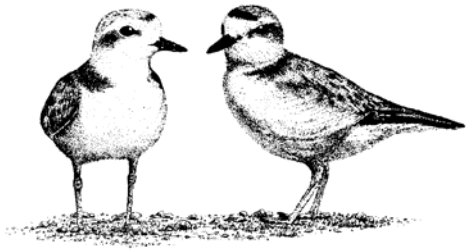
Sagebrush Lizard	-
Common Sharp-tailed Snake	-
California Mountain Kingsnake	-
Striped Whipsnake	-
Dunn's Salamander	-
Van Dyke's Salamander	-
Cascade Torrent Salamander	90d
Western Toad	-
Columbia Spotted Frog	-
Rocky Mountain Tailed Frog	-

FISH (10)

Mountain Sucker	-
Lake Chub	-
Leopard Dace	-
Umatilla Dace	-
River Lamprey	-
Steelhead	
Snake River	FT
Upper Columbia	FT
Middle Columbia	FT
Lower Columbia	FT
Bull Trout	FT

MOLLUSKS (7)

Shortface Lanx	-
Ashy (Columbia) Pebblesnail	-
California Floater	-
Columbia Oregonian (snail)	90d
Poplar Oregonian (snail)	-
Dalles Sideband (snail)	90d
Blue-gray Taildropper (slug)	-



Many species of uncertain conservation need are listed in our State Wildlife Action Plan:
https://wdfw.wa.gov/species-habitats/at-risk/swap

INSECTS (18)

Beller's Ground Beetle	-
Mann's Mollusk-eating Ground Beetle	
Columbia River Tiger Beetle	-
Hatch's Click Beetle	-
Columbia Clubtail (dragonfly)	-
Pacific Clubtail	-
Sand-verbena Moth	-
Yuma Skipper	-
Makah Copper	-
Chinquapin Hairstreak	-
Johnson's Hairstreak	-
Juniper Hairstreak	-
Puget Blue	-
Valley Silverspot	-
Silver-bordered Fritillary	-
Great Arctic	-
Island Marble	FE
Western Bumble Bee	90d

OTHER INVERTEBRATES (2)

Giant Palouse Earthworm	-
Leschi's Millipede	-

For more information, check our website:
https://wdfw.wa.gov/species-habitats/species
Or contact us:
Wildlife Program (360) 902-2515
Fish Program (360) 902-2700

APPENDIX D

Biological Resources

References

Nationwide Standard Conservation Measures
Title 21A.24

NATIONWIDE STANDARD CONSERVATION MEASURES

Listed below are effective measures that should be employed at all project development sites nationwide with the goal of reducing impacts to birds and their habitats. These measures are grouped into three categories: General, Habitat Protection, and Stressor Management. These measures may be updated through time. We recommend checking the Conservation Measures website regularly for the most up-to-date list.

1. General Measures

a. Educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service webpage on Regulations and Policies for more information on regulations that protect migratory birds.

b. Prior to removal of an inactive nest, ensure that the nest is not protected under the Endangered Species Act (ESA) or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA cannot be removed without a valid permit.
   i. See the Service Nest Destruction Policy

c. Do not collect birds (live or dead) or their parts (e.g., feathers) or nests without a valid permit. Please visit the Service permits page for more information on permits and permit applications.

d. Provide enclosed solid waste receptacles at all project areas. Non-hazardous solid waste (trash) would be collected and deposited in the on-site receptacles. Solid waste would be collected and disposed of by a local waste disposal contractor. For more information about solid waste and how to properly dispose of it, see the EPA Non-Hazardous Waste website.

e. Report any incidental take of a migratory bird, to the local Service Office of Law Enforcement.

f. Consult and follow applicable Service industry guidance.

2. Habitat Protection

a. Minimize project creep by clearly delineating and maintaining project boundaries (including staging areas).

b. Consult all local, State, and Federal regulations for the development of an appropriate buffer distance between development site and any wetland or waterway. For more information on wetland protection regulations see the Clean Water Act sections 401 and 404.

c. Maximize use of disturbed land for all project activities (i.e., siting, lay-down areas, and construction).

d. Implement standard soil erosion and dust control measures. For example:
   i. Establish vegetation cover to stabilize soil
   ii. Use erosion blankets to prevent soil loss
   iii. Water bare soil to prevent wind erosion and dust issues

3. Stressor Management

Stressor: Vegetation Removal

Conservation Goal: Avoid direct take of adults, chicks, or eggs.

Conservation Measure 1: Schedule all vegetation removal, trimming, and grading of vegetated areas outside of the peak bird breeding season to the maximum extent practicable. Use available resources, such as internet-based tools (e.g., the FWS's Information, Planning and Conservation system and Avian Knowledge Network) to identify peak breeding months for local bird species; or, contact local Service Migratory Bird Program Office for breeding bird information.

Conservation Measure 2: When project activities cannot occur outside the bird nesting season, conduct surveys prior to scheduled activity to determine if active nests are present within the area of impact and buffer any nesting locations found during surveys.

1) Generally, the surveys should be conducted no more than five days prior to scheduled activity.
2) Timing and dimensions of the area to be surveyed vary and will depend on the nature of the project, location, and expected level of vegetation disturbance.
3) If active nests or breeding behavior (e.g., courtship, nest building, territorial defense, etc.) are detected during these surveys, no vegetation removal activities should be conducted until nestlings have fledged or the nest fails or breeding behaviors are no longer observed. If the activity must occur, establish a buffer zone around the nest and no activities will occur within that zone until nestlings have fledged and left the nest area. The dimension of the buffer zone will depend on the proposed activity, habitat type, and species present and should be coordinated with the local or regional Service office.
4) When establishing a buffer zone, construct a barrier (e.g., plastic fencing) to protect the area. If the fence is knocked down or destroyed, work will suspend wholly, or in part, until the fence is satisfactorily repaired.
5) When establishing a buffer zone, a qualified biologist will be present onsite to serve as a biological monitor during vegetation clearing and grading activities to ensure no take of migratory birds occurs. Prior to vegetation clearing, the monitor will ensure that the limits of construction have been properly staked and are readily identifiable. Any associated project activities that are inconsistent with the applicable conservation measures, and activities that may result in the take of migratory birds will be immediately halted and reported to the appropriate Service office within 24 hours.
6) If establishing a buffer zone is not feasible, contact the Service for guidance to minimize impacts to migratory birds associated with the proposed project or removal of an active nest. Active nests may only be removed if you receive a permit from your local Migratory Bird Permit Office. A permit may authorize active nest removal by a qualified biologist with bird handling experience or by a permitted bird rehabilitator.

Conservation Measure 3: Prepare a vegetation maintenance plan that outlines vegetation maintenance activities and schedules so that direct bird impacts do not occur.

Stressor: Invasive Species Introduction
Conservation Goal: Prevent the introduction of invasive plants.

Conservation Measure 1: Prepare a weed abatement plan that outlines the areas where weed abatement is required and the schedule and method of activities to ensure bird impacts are avoided.

Conservation Measure 2: For temporary and permanent habitat restoration/enhancement, use only native and local (when possible) seed and plant stock.

Conservation Measure 3: Consider creating vehicle wash stations prior to entering sensitive habitat areas to prevent accidental introduction of non-native plants.

Conservation Measure 4: Remove invasive/exotic species that pose an attractive nuisance to migratory birds.

Stressor: Artificial Lighting
Conservation Goal: Prevent increase in lighting of native habitats during the bird breeding season.

Conservation Measure 1: To the maximum extent practicable, limit construction activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.

Conservation Measure 2: If construction activity time restrictions are not possible, use down shielding or directional lighting to avoid light trespass into bird habitat (i.e., use a 'Cobra' style light rather than an omnidirectional light system to direct light down to the roadbed). To the maximum extent practicable, while allowing for public safety, low intensity energy saving lighting (e.g. low pressure sodium lamps) will be used.

Conservation Measure 3: Minimize illumination of lighting on associated construction or operation structures by using motion sensors or heat sensors.

Conservation Measure 5: Bright white light, such as metal halide, halogen, fluorescent, mercury vapor and incandescent lamps should *not* be used.

Stressor: Human Disturbance
Conservation Goal: Minimize prolonged human presence near nesting birds during construction and maintenance actions.

Conservation Measure 1: Restrict unauthorized access to natural areas adjacent to the project site by erecting a barrier and/or avoidance buffers (e.g., gate, fence, wall) to minimize foot traffic and off-road vehicle uses.

Stressor: Collision

Conservation Goal: Minimize collision risk with project infrastructure and vehicles.

Conservation Measure 1: Minimize collision risk with project infrastructure (e.g., temporary and permanent) by increasing visibility through appropriate marking and design features (e.g., lighting, wire marking, etc.).

Conservation Measure 2: On bridge crossing areas with adjacent riparian, beach, estuary, or other bird habitat, use fencing or metal bridge poles (Sebastian Poles) that extend to the height of the tallest vehicles that will use the structure.

Conservation Measure 3: Install wildlife friendly culverts so rodents and small mammals can travel under any new roadways instead of over them. This may help reduce raptor deaths associated with being struck while tracking prey or scavenging road kill on the roadway.

Conservation Measure 4: Remove road-kill carcasses regularly to prevent scavenging and bird congregations along roadways.

Conservation Measure 5: Avoid planting "desirable" fruited or preferred nesting vegetation in medians or Rights of Way.

Conservation Measure 6: Eliminate use of steady burning lights on tall structures (e.g., >200 ft).

Stressor: Entrapment

Conservation Goal: Prevent birds from becoming trapped in project structures or perching and nesting in project areas that may endanger them.

Conservation Measure 1: Minimize entrapment and entanglement hazards through project design measures that may include:

1. Installing anti-perching devices on facilities/equipment where birds may commonly nest or perch
2. Covering or enclosing all potential nesting surfaces on the structure with mesh netting, chicken wire fencing, or other suitable exclusion material prior to the nesting season to prevent birds from establishing new nests. The netting, fencing, or other material must have no opening or mesh size greater than 19 mm and must be maintained until the structure is removed.
3. Cap pipes and cover/seal all small dark spaces where birds may enter and become trapped.

Conservation Measure 2: Use the appropriate deterrents to prevent birds from nesting on structures where they cause conflicts, may endanger themselves, or create a human health and safety hazard.

1. During the time that the birds are trying to build or occupy their nests (generally , between April and August, depending on the geographic location), potential nesting

surfaces should be monitored at least once every three days for any nesting activity, especially where bird use of structures is likely to cause take. It is permissible to remove non-active nests (without birds or eggs), partially completed nests, or new nests as they are built (prior to occupation). If birds have started to build any nests, the nests shall be removed before they are completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.

2. If an active nest becomes established (i.e., there are eggs or young in the nest), all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied. Construction activities that may displace birds after they have laid their eggs and before the young have fledged should not be permitted. If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, all netting shall be removed and properly disposed of.

Stressor: Noise

Conservation Goal: Prevent the increase in noise above ambient levels during the nesting bird breeding season.

Conservation Measure 1: Minimize an increase in noise above ambient levels during project construction by installing temporary structural barriers such as sand bags

Conservation Measure 2: Avoid permanent additions to ambient noise levels from the proposed project by using baffle boxes or sound walls.

Stressor: Chemical Contamination

Conservation Goal: Prevent the introduction of chemicals contaminants into the environment.

Conservation Measure 1: Avoid chemical contamination of the project area by implementing a Hazardous Materials Plan. For more information on hazardous waste and how to properly manage hazardous waste, see the EPA Hazardous Waste website.

Conservation Measure 2: Avoid soil contamination by using drip pans underneath equipment and containment zones at construction sites and when refueling vehicles or equipment.

Conservation Measure 3: Avoid contaminating natural aquatic and wetland systems with runoff by limiting all equipment maintenance, staging laydown, and dispensing of fuel, oil, etc., to designated upland areas.

Conservation Measure 4: Any use of pesticides or rodenticides shall comply with the applicable Federal and State laws.

1. Choose non-chemical alternatives when appropriate
2. Pesticides shall be used only in accordance with their registered uses and in accordance with the manufacturer's instructions to limit access to non-target species.

3. For general measures to reducing wildlife exposure to pesticides, see EPA's Pesticides: Environmental Effects website.

Stressor: Fire

Conservation Goal: Minimize fire potential from project-related activities.

Conservation Measure 1: Reduce fire hazards from vehicles and human activities (e.g., use spark arrestors on power equipment, avoid driving vehicles off road).

Conservation Measure 2: Consider fire potential when developing vegetation management plans by planting temporary impact areas with a palate of low-growing, sparse, fire resistant native species that meet with the approval of the County Fire Department and local FWS Office.

4. Is located in the same aquatic area drainage subbasin or marine shoreline and attains the following ratios of area of functional mitigation to area of alteration:

a. a 3:1 ratio for a type S or F aquatic area; and

b. a 2:1 ratio for a type N or O aquatic area;

D. For purposes of subsection C. of this section, a mitigation measure is in the same aquatic area reach if the length of aquatic area shoreline meets the following criteria:

1. Similar geomorphic conditions including slope, soil, aspect and substrate;

2. Similar processes including erosion and transport of sediment and woody debris;

3. Equivalent or better biological conditions including invertebrates, fish, wildlife and vegetation; and

4. Equivalent or better biological functions including mating, reproduction, rearing, migration and refuge; or

5. For tributary streams, a distance of no more than one-half mile;

E. The department may reduce the mitigation ratios in subsection C. of this section to 2:1 ratio for a type S or F aquatic area and 1.5:1 ratio for a type N or O aquatic area if the applicant provides a scientifically rigorous mitigation monitoring program that includes the following elements:

1. Monitoring methods that ensure that the mitigation meets the approved performance standards identified by the department;

2. Financing or funding guarantees for the duration of the monitoring program; and

3. Experienced, qualified staff to perform the monitoring;

F. For rectifying an illegal alteration to any type of aquatic area or its buffer, mitigation measures must meet the following standards:

1. Located on the site of the illegal alteration at a 1:1 ratio of area of mitigation to area of alteration; and

2. To the maximum extent practical, replicates the natural prealteration configuration at its natural prealteration location including the factors in subsection B. of this section; and

G. The department may modify the requirements in this section if the applicant demonstrates that, with respect to each aquatic area function, greater functions can be obtained in the affected hydrologic unit that the department may determine to be the drainage subbasin through alternative mitigation measures.

H. For temporary alterations to an aquatic area or its buffer that is predominately woody vegetation, the department may require mitigation in addition to restoration of the altered aquatic area or buffer. (Ord. 16267 § 58, 2008: Ord. 15051 § 197, 2004: Ord. 10870 § 485, 1993).

21A.24.381 Aquatic habitat restoration project approval. To ensure that agriculture will remain the predominate use in the agriculture production district, the department shall only approve an aquatic habitat restoration project, a floodplain restoration project or a project under the mitigation reserves program that is proposed for a site located within an agricultural production district, as follows:

A. The project shall be allowed only when supported by owners of the land where the proposed project is to be sited;

B. Except as provided in subsection C. of this section, the project shall be located on lands that the department of natural resources and parks determines are unsuitable for direct agricultural production purposes, such as portions of property that have not historically been farmed due to soil conditions or frequent flooding and that it determines cannot be returned to productivity by drainage maintenance; and

C. If the project is located on land determined by the department of natural resources and parks to be suitable for direct agriculture, then:

1. The applicant shall demonstrate to the satisfaction of the department that there are no unsuitable lands available within the agricultural production district that meet the technical or locational requirements of the project;

2. The applicant shall demonstrate to the satisfaction of the department of natural resources and parks that the project will not reduce the ability to farm in the area and that agriculture will remain the predominate use in the agricultural production district; and

3. The project must either:

a. be included in, or be consistent with, an approved Water Resources Inventory Area Plan, Farm Management Plan, Flood Hazard Management Plan or other similar watershed scale plan; or

b. not reduce the baseline agricultural productivity within the agricultural production district. (Ord. 17485 § 22, 2012: Ord. 16267 § 59, 2008).

21A.24.382 Wildlife habitat conservation areas - development standards.

The following development standards apply to development proposals and alterations on sites containing wildlife habitat conservation areas:

A. Unless allowed as an alteration exception under K.C.C. 21A.24.070, only the alterations identified in K.C.C. 21A.24.045 are allowed within a wildlife habitat conservation area;

B. For a bald eagle:

1. The wildlife habitat conservation area is an area with a four-hundred-foot radius from an active nest;

2. Between March 15 and April 30, alterations are not allowed within eight hundred feet of the nest; and

2. Between January 1 and August 31, land clearing machinery, such as bulldozers, graders or other heavy equipment, may not be operated within eight hundred feet of the nest;

C. For a great blue heron:

1. The wildlife habitat conservation area is an area with an eight-hundred-twenty-foot radius from the rookery. The department may increase the radius up to an additional one-hundred sixty-four feet if the department determines that the population of the rookery is declining; and

2. Between January 1 and July 31, clearing or grading are not allowed within nine-hundred-twenty-four feet of the rookery;

D. For a marbled murrelet, the wildlife habitat conservation area is an area with a one-half-mile radius around an active nest;

E. For a northern goshawk, the wildlife habitat conservation area is an area with a one-thousand-five-hundred-foot radius around an active nest located outside of the urban growth area;

F. For an osprey:

1. The wildlife habitat conservation area is an area with a two-hundred-thirty-foot radius around an active nest; and

2. Between April 1 and September 30, alterations are not allowed within six-hundred-sixty feet of the nest;

G. For a peregrine falcon:

1. The wildlife habitat conservation area is an area extending for a distance of one-thousand feet of an eyrie on a cliff face, the area immediately above the eyrie on the rim of the cliff, and the area immediately below the cliff;

2. Between March 1 and June 30, land-clearing activities that result in loud noises, such as from blasting, chainsaws or heavy machinery, are not allowed within one-half mile of the eyrie; and

3. New power lines may not be constructed within one-thousand feet of the eyrie;

H. For a spotted owl, the wildlife habitat conservation area is an area with a three-thousand-seven-hundred-foot radius from an active nest;

I. For a Townsend's big-eared bat:

1. Between June 1 and October 1, the wildlife habitat conservation area is an area with a four-hundred-fifty-foot radius from the entrance to a cave or mine, located outside of the urban area, with an active nursery colony

2. Between November 1 and March 31, the wildlife habitat conservation area is an area with a four-hundred-fifty-foot radius around the entrance to a cave or mine located outside the urban growth area serving as a winter hibernacula;

3. Between March 1 and November 30, a building, bridge, tunnel, or other structure used solely for day or night roosting may not be altered or destroyed;

4. Between May 1 and September 15, the entrance into a cave or mine that is protected because of bat presence is protected from human entry; and

5. A gate across the entrance to a cave or mine that is protected because of bat presence must be designed to allow bats to enter and exit the cave or mine;

J. For a Vaux's swift:

1. The wildlife habitat conservation area is an area with a three-hundred-foot radius around an active nest located outside of the urban growth areas;

2. Between April 1 and October 31, clearing, grading, or outdoor construction is not allowed within four hundred feet of an active or potential nest tree. The applicant may use a species survey to demonstrate that the potential nest tree does not contain an active nest;

K. The department shall require protection of an active breeding site of any federal or state listed endangered, threatened, sensitive and candidate species or King County species of local importance not listed in subsections B. through J. of this section. If the Washington state Department of Fish and Wildlife has adopted management recommendations for a species covered by this subsection, the department shall follow those management recommendations. If management recommendations have not been adopted, the department shall base protection decisions on best available science. (Ord. 17485 § 23, 2012: Ord. 15051 § 198, 2004).

21A.24.383 Wildlife habitat conservation areas - modification. Upon request of the applicant and based upon a site-specific critical areas report that includes, but is not limited to, an evaluation of the tolerance of the animals occupying the nest or rookery to the existing level of development in the vicinity of the nest or rookery, the department may approve a reduction of the wildlife habitat conservation area for the following species:

A. Bald eagle;

B. Great blue heron; and

C. Osprey. (Ord. 17485 § 24, 2012: Ord. 15051 § 199, 2004).

21A.24.385 Wildlife habitat networks - applicability. The department shall make certain that segments of the wildlife habitat network are set aside and protected along the designated wildlife habitat network adopted by the King County Comprehensive Plan as follows:

A. This section applies to the following development proposals on parcels that include a segment of the designated wildlife habitat network:

1. All urban planned developments, fully contained communities, binding site plans, subdivisions and short subdivisions; and

2. All development proposals on individual lots unless a segment of the wildlife habitat network in full compliance with K.C.C. 21A.24.386 already exists in a tract, easement or setback area, and a notice of the existence of the segment has been recorded;

B. Segments of the wildlife habitat network must be identified and protected in one of the following ways:

1. In urban planned developments, fully contained communities, binding site plans, subdivisions and short subdivisions, native vegetation is placed in a contiguous permanent open-space tract with all developable lots sited on the remaining portion of the project site, or the lots are designed so that required setback areas can form a contiguous setback covering the network segments; or

2. For individual lots, the network is placed in a county-approved setback area. To the maximum extent practical, existing native vegetation is included in the network. The notice required by K.C.C. 21A.27.170 is required; and

C. All wildlife habitat network tracts or setback areas must meet the design standards in K.C.C. 21A.24.386. (Ord. 15051 § 201, 2004: Ord. 13694 § 90, 1999: Ord. 11621 § 52, 1994. Formerly K.C.C. 21A.14.260).

21A.24.386 Wildlife habitat networks - development standards and alterations. The following standards apply to development proposals and alterations on sites containing wildlife habitat network:

A. Unless allowed as an alteration exception under K.C.C. 21A.24.070, only the alterations identified in K.C.C. 21A.24.045 are allowed in the wildlife habitat network;

B. The wildlife habitat network is sited to meet the following conditions:

1. The network forms one contiguous tract or setback area that enters and exits the property where the network crosses the property boundary;

2. To the maximum extent practical, the network maintains a width of three-hundred feet. The network width shall not be less than one-hundred-fifty feet at any point; and

3. The network is contiguous with and includes critical areas and their buffers;

4. To the maximum extent practical, the network connects isolated critical areas or habitat; and

5. To the maximum extent practical, the network connects with wildlife habitat network segments, open space tracts or wooded areas on adjacent properties, if present;

C. The wildlife habitat network tract must be permanently marked in accordance with this chapter;

D. An applicant proposing recreation, forestry or any other use compatible with preserving and enhancing the habitat value of the wildlife habitat network located within the site must have an approved management plan. The applicant shall include and record the approved management plan for a binding site plan or subdivision with the covenants, conditions and restrictions (CCRs), if any. Clearing within the wildlife habitat network in a tract or tracts is limited to that allowed by an approved management plan;

E. If the wildlife habitat network is contained in a setback area, a management plan is not required. Clearing is not allowed within a wildlife habitat network within a setback area on individual lots, unless the property owner has an approved management plan;

F. In urban planned developments, fully contained communities, binding site plans, subdivisions and short subdivisions a homeowners association or other entity capable of long term maintenance and operation shall monitor and assure compliance with any approved management plan;

G. Segments of the wildlife habitat network set aside in tracts, conservation easements or setback area must comply with K.C.C. 16.82.150;