US Army Corps
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Seattle District

**DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT NOTICE OF AVAILABILITY**

U.S. Army Corps of Engineers
Planning, Environmental and Cultural Resources Branch
4735 E Marginal Way S
Public Notice Date: February 3, 2026
Seattle, WA 98124-2385

Expiration Date: March 5, 2026
Reference: PMP-26-01
Name: Spencer Island Ecosystem Restoration Project – Puget Sound and Adjacent Waters

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Seattle District (USACE) has prepared a draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Spencer Island Ecosystem Restoration Project pursuant to the National Environmental Policy Act (NEPA). The purpose of the IFR/EA is to evaluate the feasibility and Federal interest in ecosystem restoration at Spencer Island in Snohomish County, Washington.

The IFR/EA evaluates restoration benefits, costs, and environmental effects to determine Federal interest, compares the environmental consequences of a range of alternatives, and identifies a preferred alternative for implementation. The study is authorized under the Puget Sound and Adjacent Waters Restoration Program, Section 544 of the Water Resources Development Act of 2000 (Public Law 106-51).

The purpose of this notice is to solicit comments from interested individuals, organizations, and agencies on USACE's proposed action under NEPA.

**COMMENT AND REVIEW PERIOD**

USACE invites submission of comments on the environmental impact of the proposed action. Comments will be considered in determining whether it would be in the best public interest to proceed with the proposed project. USACE will consider all submissions received before the expiration date of this notice. The nature or scope of the proposal may be changed upon consideration of the comments received. If significant effects on the quality of the human environment are identified and cannot be mitigated for, USACE would initiate an Environmental Impact Statement (EIS) and afford all the appropriate public participation opportunities attendant to an EIS.

**COMMENT SUBMISSION**

Submit comments to this office, Attn: Planning, Environmental, and Cultural Resources Branch, 4735 E Marginal Way S, Seattle, WA, 98124-2385, no later than 30 days after the posting of this notice to ensure consideration. Comments not received within the comment period are deemed unexhausted and therefore forfeited.

In addition to sending comments via mail to the above address, comments may be e-mailed to tyler.t.tran@usace.army.mil. This Notice and the Draft IFR/EA can be found online at the link below.

Project Name: Spencer Island Ecosystem Restoration Project

http://www.nws.usace.army.mil/Missions/Environmental/Environmental-Documents/

Posting Date: February 3, 2026 End of Comment Period: March 5, 2026

# SPENCER ISLAND ECOSYSTEM RESTORATION

# PUGET SOUND & ADJACENT WATERS

# SNOHOMISH COUNTY, WASHINGTON

DRAFT INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT
February 2026

Photo Credit: Sydney Kerkhove-Peltier, USACE

US Army Corps of Engineers®
Seattle District

PUGET SOUND NEARSHORE ECOSYSTEM RESTORATION PROJECT

Washington Department of FISH and WILDLIFE

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List of Acronyms and Abbreviations

| | |
|---|---|
| AAEQ | Average Annual Equivalent |
| AIS | Automatic Identification System |
| APE | Area of Potential Effects |
| BCR | Benefit Cost Ratio |
| BiOp | Biological Opinion |
| BMP | Best Management Practice |
| CAA | Clean Air Act |
| CAR | Coordination Act Report |
| CE-ICA | Cost Effectiveness and Incremental Cost Analysis |
| CERCLA | Comprehensive Environmental Response, Compensation, & Liability Act |
| CFR | Code of Federal Regulations |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| CY | Cubic Yards |
| DA | Design Agreement |
| DO | Dissolved Oxygen |
| DPS | Distinct Population Segment |
| EFH | Essential Fish Habitat |
| EOP | Environmental Operating Principles |
| EPA | Environmental Protection Agency |
| ER | Engineering Regulation |
| ESA | Endangered Species Act |
| FR/EA | Feasibility Report and Environmental Assessment |
| FWCA | Fish and Wildlife Coordination Act |
| GRP | Gross Regional Product |
| HTRW | Hazardous, Toxic, & Radiological Waste |
| LERRD | Lands, Easements, Rights-of-Way, Relocations, and Disposal |
| MHW | Mean High Water |
| MHHW | Mean Higher High Water |
| MLW | Mean Low Water |
| MLLW | Mean Lower Low Water |
| MMPA | Marine Mammal Protection Act |
| MSL | Mean Sea Level |
| MTL | Mean Tide Level |
| $N_2O$ | Nitrous Oxide |
| NAAQS | National Ambient Air Quality Standards |
| NED | National Economic Development |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic & Atmospheric Administration |
| $O_3$ | Ozone |

| | |
|---|---|
| O&M | Operations and Maintenance |
| OMRR&R | Operations, Maintenance, Rehabilitation, Repair, and Replacement |
| OSE | Other Social Effects |
| P&G | Principles and Guidelines |
| PAL | Planning Aid Letter |
| PDT | Project Delivery Team |
| PED | Pre-construction, Engineering and Design |
| PM | Particulate Matter |
| PPT | Parts Per Thousand |
| PPA | Project Partnership Agreement |
| RED | Regional Economic Development |
| ROD | Record of Decision |
| SHPO | State Historic Preservation Officer |
| SLC | Sea Level Change |
| U.S. | United States |
| USCG | United States Coast Guard |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WAC | Washington Administrative Code |
| WDOE | Washington Department of Ecology |
| WDFW | Washington Department of Fish & Wildlife |

# Executive Summary

The U.S. Army Corps of Engineers (USACE), Seattle District prepared this integrated Feasibility Report and Environmental Assessment (FR/EA) to evaluate the Federal interest and the costs, benefits, and environmental impacts of ecosystem restoration at Spencer Island in Snohomish County, Washington. An evaluation of benefits, costs, and environmental effects determines the Federal interest. This evaluation resulted in the tentatively selected plan, also referred to as the "proposed action" or "preferred alternative" for purposes of the National Environmental Policy Act of 1969 (NEPA). In accordance with regulations implementing NEPA, this FR/EA compares the environmental consequences of the alternatives and recommends a preferred alternative for implementation.

This study is authorized by the Puget Sound and Adjacent Waters Restoration program, Section 544 of the Water Resources Development Act of 2000 (Public Law 106-51. USACE is undertaking this action in partnership with the Washington Department of Fish & Wildlife (WDFW), the study's Non-Federal Sponsor.

Spencer Island sits between Union and Steamboat Sloughs, near Everett, Washington, in Snohomish County. The island was originally a forested wetland tidal swamp, but the wetland habitat has been significantly degraded due to historical diking and draining for agricultural purposes. This has led to approximately four feet of land subsidence (decrease in elevation). Without proactive restoration efforts, Spencer Island is likely to experience ongoing ecological degradation, with a shift toward habitat homogenization and reduced capacity to support vital salmonid populations.

The purpose of the proposed action is to restore the natural processes in the nearshore zone at Spencer Island. This action is needed because valuable natural resources in Puget Sound have declined to a point that the ecosystem may no longer be self-sustaining without immediate intervention to curtail significant ecological degradation. The degradation and loss of nearshore ecosystems is of critical importance because the nearshore zone serves as the connection between terrestrial, freshwater, and marine ecosystems. The alterations to the physiographic processes of the nearshore zone directly affect the ecosystem functions upon which humans depend such as fisheries, aquaculture, and recreation.

To achieve this purpose and address this need, multiple alternative plans were formulated, including the no action alternative.

1 – No Action
2 – Minimum Restoration
3 – Low Restoration

4a – Interior Channel Restoration
4b – Interior Channel Restoration with Bridges
5a – Partial South Cross Dike Lowering Restoration
5b – Partial South Cross Dike Lowering Restoration with Bridges
6a – Maximum Dike Lowering Restoration
6b – Maximum Dike Lowering Restoration with Bridges
7—Maximum Ecosystem Measures Restoration
8 – High Restoration

One of the main issues to address is the lack of connectivity between aquatic habitats at Spencer Island. To resolve this problem, action alternatives include options for dike breaching, dike elevation lowering, filling agricultural drainage ditches, and excavating tidal channels. This initial array of alternatives was pared down to a focused array of alternatives (Alternatives 1, 2, 5a, and 8) because of the Non-Federal Sponsor and other landowner's need to maintain some passive recreation at Spencer Island and to reduce long-term maintenance costs. The focused array of alternatives was then evaluated according to USACE policy and guidance. This evaluation resulted in the tentatively selected plan (TSP), Alternative 8, also referred to as the "proposed action" or "preferred alternative" for purposes of the National Environmental Policy Act of 1969 (NEPA), 42 USC 4321, et. seq., as amended. In accordance with NEPA, this FR/EA compares the environmental consequences of the alternatives and recommends a preferred alternative for implementation.

Alternative 8 includes dike breaching, dike lowering, excavation of channels, and filling of historic drainage ditches to restore estuarine processes and seasonal riverine flooding to the interior of Spencer Island. The plan also includes trail improvements, removal of an existing tide gate and two existing 60-foot bridges, new marsh/upland planting benches, two new permanent viewing areas, and a new hand-carried boat launch. If implemented, the recommended plan/proposed action would restore ecosystem processes that support habitat for an array of native fish and wildlife in Puget Sound's second largest river delta, including Puget Sound Chinook salmon and other species listed under the Endangered Species Act. Project design details will continue to be developed and refined in design and implementation phase. The design prepared for this FR/EA is at the 35% level; no further design work is planned for the feasibility phase.

The total cost to design and implement the project is estimated at $13,167,000.

THE OFFICIAL COMMENT PERIOD FOR THIS ENVIRONMENTAL ASSESSMENT IS FROM FEBRUARY 3 TO MARCH 5, 2026.

This document is available online:

https://www.nws.usace.army.mil/Missions/Environmental/Environmental-Documents/

under “Spencer Island Ecosystem Restoration Project”

# 1 Introduction

The U.S. Army Corps of Engineers, Seattle District (USACE) is undertaking this feasibility study to develop and evaluate alternatives for ecosystem restoration at Spencer Island in Snohomish County, Washington. This report documents the planning process for assessing the Federal interest in ecosystem restoration to demonstrate consistency with USACE planning policy and NEPA. Spencer Island was identified as a cost-effective ecosystem restoration action as part of the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) feasibility study undertaken by the USACE in partnership with the Washington Department of Fish & Wildlife (WDFW) as the Non-Federal sponsor. The PSNERP integrated Feasibility Report/Environmental Impact Statement (FR/EIS) is incorporated in whole by reference (USACE 2016, 2017). Documents can be accessed online at https://www.nws.usace.army.mil/Missions/Civil-Works/Programs-and-Projects/Projects/Puget-Sound-Nearshore-Ecosystem-Restoration/.

This report was prepared by the Project Delivery Team (PDT), a multidisciplinary team representing USACE and WDFW. This document is an integrated feasibility report and environmental assessment (FR/EA) tiered from the PSNERP FR/EIS and its associated ROD. The following sections provide background information regarding the basis for this study. The sections required for NEPA compliance are denoted with an asterisk (*).

## 1.1 Study Purpose and Scope

This feasibility study evaluates significant aquatic ecosystem degradation at Spencer Island and analyzes proposed measures to restore ecosystem processes, structure, and function. The scope of environmental effects analysis extends 300 feet beyond Spencer Island and evaluates potential off-site flooding effects as well as the benefits of enhancing Snohomish River salmon populations. The study identifies and evaluates a full range of reasonable alternatives including the No-Action Alternative.

This Environmental Assessment is tiered from the PSNERP FR/EIS and summarizes and incorporates by reference its programmatic analyses and ROD. The scope of this EA builds upon this prior analysis and determinations and focuses on new information and site-specific analyses necessary to evaluate potential environmental effects and support decision-making for the proposed actions at Spencer Island.

The site specific NEPA process for this FR/EA was contemplated during the PSNERP IFR/EIS and its ROD in 2017, and began on June 10, 2025 (TSP milestone reformulation), prior to the July 3, 2025 rescission and replacement of the USACE regulations implementing NEPA (90 FR 29463), which states that “Actions that were ongoing as of [July 3, 2025] will continue to use the rule in place at the time the action was stated.” Therefore, this EA relies upon NEPA, as amended in

2023 and 2025, and the Corps' procedures implementing NEPA for the Civil Works program (53 Fed. Reg. 3120-3137 (Feb. 3, 1988).

## 1.2 Study Authority*

This project is authorized under the Puget Sound and Adjacent Waters Restoration (PSAW) program, Section 544 of the Water Resources Development Act of 2000 (Public Law 106-51) (Sec 544), which authorizes implementation of restoration projects with immediate ecosystem benefits. Per PSAW program requirements, USACE consulted with regional stakeholders, including non-profit organizations, Tribes, and State and Federal agencies, to prioritize projects for implementation. Based on this consultation, the Spencer Island project was specifically selected for implementation through the PSNERP General Investigation as documented in the 2016 FR/EIS, the 2016 Department of the Army Chief's Report, and the Record of Decision signed January 19, 2017.

The United States Congress' explanatory statement accompanying its fiscal year 2022 appropriations act specifies funding for this project. It encourages USACE to proceed with the tiered implementation strategy developed with the PSNERP study using all existing authorities, and it directs USACE to recognize the PSNERP study as the feasibility component for the purposes of Sec 544.

## 1.3 Lead Federal Agency and Non-Federal Sponsor*

USACE is the lead Federal agency. WDFW is the Non-Federal Sponsor partnering with USACE in conducting this feasibility study. As the Non-Federal Sponsor, WDFW contributes 50% of the total feasibility study costs in the form of cash or in-kind contributions. A feasibility cost sharing agreement was executed in 2017.

## 1.4 Location and Description of the Study Area*

The study area is within the Whidbey Subbasin of Puget Sound in western Washington. It includes Spencer Island, which is located between Union and Steamboat Sloughs near Everett, Washington, and portions of Mid-Spencer and Smith Islands, located to the north and west of Spencer Island. The area is in the Snohomish River Estuary, the second largest estuary in Puget Sound. The site is at approximately river mile 3.8. The project area covers approximately 330 acres of Spencer Island and two acres of Smith Island (Figure 1.1).

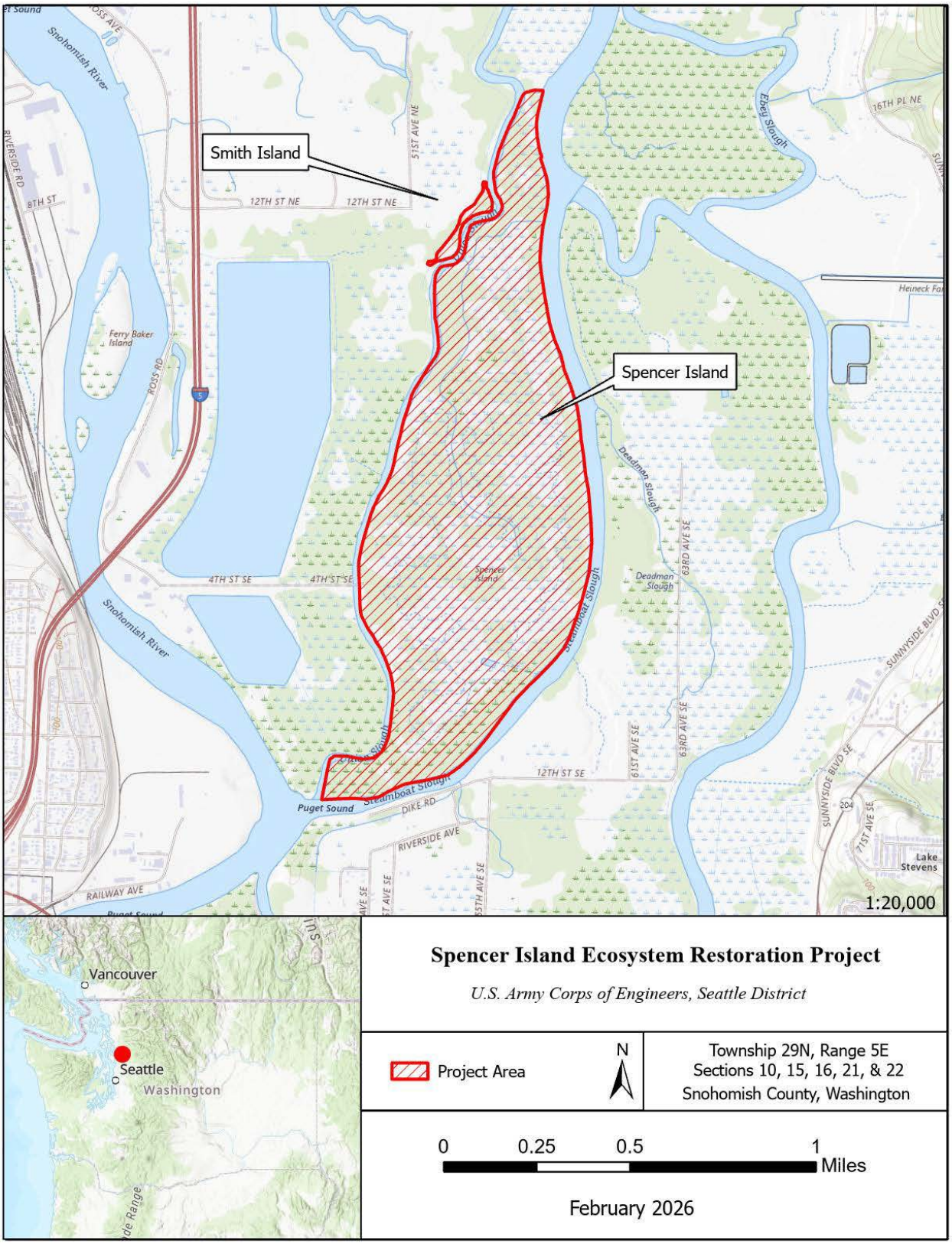


**Figure 1.1. Project Location and Vicinity Map**

Historically, the Snohomish River delta hosted large areas of intertidal wetlands estimated at 29 square miles (76 sq. km) of vegetated estuarine wetlands (Simenstad et al., 2011). Since the late 1800s, farmers converted most of the land to agricultural use by constructing dikes and excavating drainage ditches. Beginning in the 1989, ecosystem restoration projects have begun to return some of the daily tidal inundation and seasonal river flooding to parcels around the estuary.

## 1.5 Proposal for Federal Action*

USACE is proposing to implement aquatic ecosystem restoration at Spencer Island in the Snohomish River delta. Aquatic ecosystem restoration efforts would involve a comprehensive examination of the problems contributing to the ecosystem's degradation, and the development of alternative means for their solution. The intent of ecosystem restoration is to, partially or fully, reestablish the attributes of a naturalistic, functioning, and self-regulating system. The primary problem identified at Spencer Island is the lack of connectivity between aquatic habitats. To resolve this problem, the measures proposed for implementation in the study area include options for dike breaching, dike elevation lowering, filling agricultural drainage ditches, and excavating tidal channels.

## 1.6 Overview of Integrated Feasibility Report/Environmental Assessment

The purpose of the feasibility report is to identify the plan that reasonably maximizes the national ecosystem restoration benefits, is technically feasible, and is environmentally acceptable. The purpose of the EA portions of the report is to present a concise document that tiers from the PSNERP FR/EIS to comply with NEPA requirements to focusing analysis on this proposed action's environmental effects of the alternatives, incorporate environmental concerns into the decision-making process, and determine whether any environmental impacts are significant and warrant the preparation of another EIS. A tiered EA eliminates repetitive discussion of general issues already covered PSNERP FR/EIS and concentrates on the issues specific to the subsequent action.

The six steps of the USACE planning process each align with a NEPA requirement. The planning steps appear in Table 1-1 below with the document chapter and NEPA element to which they relate:

Table 1-1. USACE Six Step Planning Process Alignment with NEPA Requirements

| Planning Step | NEPA Element | Document Chapter |
|---|---|---|
| **Step 1: Problems, Opportunities, Objectives, and Constraints** | **Purpose and Need for Action** | **Chapter 2** |
| **Step 2: Inventory and Forecast of Conditions** | Affected Environment | Chapters 2 & 4 |
| **Step 3: Formulate Alternative Plans** | Alternatives including Proposed Action | Chapter 3 |
| **Step 4: Evaluate Effects of Alternative Plans** | Environmental Consequences | Chapters 3 & 4 |
| **Step 5: Compare Alternative Plans** | Alternatives including Proposed Action | Chapters 3 & 4 |
| **Step 6: Select Recommended Plan** | Agency Preferred Alternative | Chapter 5 |

# 2 Need and Objectives of Action

This chapter presents results of the first step of the planning process, the specification of water and related land resources problems and opportunities in the study area. The chapter also establishes the planning objectives and planning constraints, which are the basis for formulation of alternative plans.

## 2.1 Historical and Existing Conditions

Spencer Island has a rich ecological history that reflects significant changes due to human intervention and natural processes. Originally a forested wetland tidal swamp, the island underwent substantial transformation since the late 1800s when it was diked and drained for agricultural purposes. This led to land subsidence (decrease in elevation), a common issue in areas where diking and drainage have been implemented.

Currently, Spencer Island features diked freshwater and estuarine intertidal wetlands, with parts of its original ecosystem still intact at the northern and southern ends. However, hydrological alterations due to short-circuiting of the natural water flow and the presence of dikes have degraded conditions for aquatic species and limited tidal and fluvial inundation.

Since its purchase by Snohomish County and WDFW in 1989, efforts have been made to restore the island's habitats. Notable restoration activities include the creation of three dike breaches that have allowed tidal action to reestablish over approximately 80 acres of marsh. While these efforts have led to some natural processes returning, challenges remain. Snohomish County and WDFW do not maintain the dikes as flood control features. The remnant dikes are used for walking trails on portions of the island that are still accessible on foot.

Land use today includes recreational activities such as waterfowl hunting, birdwatching, and walking. Nearby restoration projects have influenced salinity regimes in the estuary, modifying habitats for juvenile salmon. Despite these challenges, ongoing monitoring and modeling efforts aim to understand and mitigate the impacts of hydrology on Spencer Island’s ecosystem, with the goal of restoring its vital brackish tidal marsh habitats and improving connectivity with adjacent sloughs.

## 2.2 Future Without Project Conditions

The PSNERP FR/EIS provides a detailed analysis of resources relevant to the nearshore zone and is incorporated by reference. This tiered FR/EA focuses on the site-specific problems at Spencer Island. If restoration efforts are not implemented at Spencer Island, future conditions are expected to reflect a continuation of the negative influences of human development that degrade ecological function.

Spencer Island is partially restored in terms of ecological function. The dikes that once protected the island from daily tidal inundation and river flooding are in disrepair and are no longer being maintained as a flood control system. There is only minimal maintenance of walking trails on top of the remnant dikes on a portion of the island. Three large dike breaches have occurred at Spencer Island since the early 2000s. All three breaches remain. The dike breaches allow daily tidal inundation into the island and much of the island has reverted back to wetlands. Although much of the island is now wetland, the current habitat conditions and predicted future habitat conditions are less than ideal. The primary driver of habitat forming processes within the island is related to the hydrology of the island. With very few breaches in the dikes, tidal waters rush into and out of the island at high velocities and much of the flow is captured in the artificial drainage ditches that persist within the island.

Over the coming decades, it is likely that the dikes will continue to erode and breach, but in unpredictable locations and configurations, making habitat conditions and quality in the future difficult to predict. The rapid filling and draining through the dike breaches and drainage ditches would likely hinder the development of a stable tidal channel network for decades or more. The large breach that connects Steamboat Slough to the interior of the island would likely evolve over time, gradually widening as it accommodates a larger tidal prism sea level rises. This widening would occur slowly, as the near-vertical slopes of the channel would begin to erode and adjust to hydrologic forces. Excessive water velocities within the marsh would continue to degrade habitats, making it difficult for Spencer Island to support healthy estuarine conditions.

As erosion through the drainage ditches is predicted to continue, habitat conditions are expected to remain degraded for decades, although the severity may decrease eventually over decades of time. Some tidal channels may gradually become more complex. Where vegetation can establish, sedimentation rates might increase (improve), potentially offsetting some impacts of predicted sea level rise. Tidal elevations are expected to continue to rise into the future trending with sea level rise (Snover et al., 2019).

Portions of the marsh within the island hold water creating ponds that do not effectively drain at low tide. This type of ponding is typically not associated with natural estuarine wetlands. Ponding can be problematic for fish by trapping them at low tide and exposing them to increased predation or lethal water temperatures. Ponding is likely to persist in areas that are not effectively drained by the current network, leading to stagnant water conditions that could further inhibit ecological recovery.

Another issue related to predicted sea level rise and the current drainage pattern within Spencer Island is lack of sedimentation. Spencer Island has subsided by approximately 4 feet since it was altered by farming. With the subsidence and the current drainage patterns, the

island's ability to adapt (i.e. accumulated marsh sediment at a pace that keeps up sea level rise) will continue to be compromised.

In terms of providing habitat for salmonids, the alternated hydrology of the island would continue to be a physical barrier by inhibiting volitional movement into and out of the island, and the altered hydrology would continue to negatively impact habitat forming processes.

In summary, without proactive restoration efforts that focus on restoring natural hydrology (e.g., strategic dike breaches, dike lowering, ditch filling, channel creation), Spencer Island is likely to experience ongoing ecological degradation, likely for decades or more. Further analysis of the future without project conditions is presented in section 3.3 and in Chapter 4.

Further analysis of the future without project conditions is presented in Section 3.3 and in Chapter 4.

## 2.3 Problems and Opportunities

At Spencer Island, 426 acres of historic estuarine habitat for salmonids and other fish and wildlife have been degraded due to historic diking and draining for agricultural purposes, which has led to subsidence (lowered elevation) of approximately four feet. These changes have impacted the native plant communities by lowering plant species diversity and allowing greater coverage by invasive plant species. Specific impacts to fish species include hydraulic and hydrologic conditions that limit fish access to Spencer Island due to high flow rates, as well as channel characteristics and natural processes that reduce habitat suitability and survivability. Puget Sound Chinook, Puget Sound steelhead, and bull trout, which are listed as threatened under the Endangered Species Act (ESA), use the area for rearing, acclimation to the marine environment, and resting during homeward migration. The degradation of ecosystem processes at Spencer Island has negatively impacted these listed species and other fish, wildlife, and plant species that historically inhabited the site in greater numbers.

The primary stressors impairing ecosystem processes at Spencer Island are the combination of over two miles of tidal barriers (dikes) and their associated drainage networks (over two miles of ditches). These stressors impair the following ecosystem processes:

- Exchange of Aquatic Organisms
- Tidal Flow
- Tidal Channel Formation and Maintenance
- Sediment Input
- Sediment Transport
- Erosion and Accretion of Sediments

- Detritus Import and Export

Opportunities for this study include the following:

1. State and county agencies have acquired land to support wildlife habitat in an ecologically significant area, leading to an opportunity to partner with them to implement effective aquatic ecosystem restoration measures to restore the physiographic ecosystem processes that create and sustain valued habitat and wetland resources.
2. The project area is in a location designated by the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) as critical habitat for multiple species protected under the ESA. This project presents an opportunity to contribute to the conservation and recovery of those species by addressing the quality of physical and biological features essential to their primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering.
3. This project also presents an opportunity to improve conditions for recreation that is compatible with the aquatic ecosystem restoration purpose of the project by improving non-motorized access and/or conditions for wildlife viewing.

## 2.4 Purpose and Need for Action*

The purpose of the proposed action is to restore the natural processes in the nearshore zone at Spencer Island that sustain the biological, economic, and aesthetic resources important to the people of the Puget Sound region and the nation in a cost-effective and socially feasible manner with minimal risks, and to facilitate effective monitoring and adaptive management to maximize attainment of restoration objectives.

The need for the proposed action comes from recognizing that valuable natural resources in Puget Sound have declined to a point that the ecosystem may no longer be self-sustaining without immediate intervention to curtail significant ecological degradation. Impairment of nearshore processes and degradation of ecosystem functions are critical factors in the declining health of Puget Sound. Anthropogenic stressors causing this impairment and degradation include the direct effects of physical alterations to the landscape that have eliminated large expanses of habitat and have disrupted the major ecological processes that create and sustain habitats (see section 1.8.4 of the PSNERP FR/EIS [USACE 2016] for more information). The degradation and loss of nearshore ecosystems is of critical importance because the nearshore zone serves as the connection between terrestrial, freshwater, and marine ecosystems. The

alterations to the physiographic processes of the nearshore zone directly affect the ecosystem functions upon which humans depend such as fisheries, aquaculture, and recreation.

## 2.5 Resource Significance

This report proposes to restore Snohomish estuary ecosystem resources at Spencer Island that create and sustain habitat, which in turn supports species listed under the Endangered Species Act as well as other fish, wildlife, vegetation, and tidal wetland resources. These resources are technically, institutionally, and publicly significant as described in the following sub-sections:

### 2.5.1 Indigenous Knowledge

The Tulalip Tribes and other indigenous peoples have lived in the study area since long before European settlement. They have long championed the importance of estuarine habitats that support salmon and other species and worked for their conservation and restoration. The Tulalip Tribes partnered with USACE on the Qwuloolt project, a previous Snohomish Delta ecosystem restoration project. Their work with others monitoring and stewarding that project and others in the Snohomish River delta has informed the PDT's development of alternatives.

### 2.5.2 Technical Significance

PSNERP's Nearshore Science Team (NST), a group of experts representing various technical disciplines, including biology, geology, and sociology, collaborated on and authored several pivotal publications that emphasize the technical significance of resources found in the Puget Sound nearshore, including the following:

- Strategies for Nearshore Protection and Restoration in Puget Sound (Cereghino et al., 2012)
- Implications of Observed Anthropogenic Changes to the Nearshore Ecosystem in Puget Sound (Fresh et al., 2011)
- Historical Change and Impairment of Puget Sound Shorelines (Simenstad et al., 2011)
- A Geomorphic Classification of Puget Sound Shorelines (Shipman 2008)
- Valuing Puget Sound's Valued Ecosystem Components (Leschine and Petersen 2007)
- Conceptual Model for Assessing Restoration of Puget Sound Nearshore Ecosystems (Simenstad et al., 2006)

The report "Strategies for Nearshore Protection and Restoration in Puget Sound" identifies the Snohomish River delta as one of only two of Puget Sound's 16 major river deltas with high restoration potential. This is based on a statistical analysis of the delta's historical potential to deliver ecosystem services, present-day levels of degradation, and risk factors that indicate challenges to management of those services (Cereghino et al., 2012).

According to the Snohomish River Basin Ecological Analysis for Salmonid Conservation (Snohomish Basin Salmonid Recovery Technical Committee 2004), prepared in cooperation with NMFS, "the loss of rearing habitat quantity and quality along mainstems and within the estuary and nearshore environment is thought to be the primary factor affecting population performance for Snohomish Basin Chinook salmon. Actions that improve floodplain connectivity and habitat complexity in the vicinity of and downstream from Chinook spawning areas are predicted to have the highest effectiveness in terms of population performance improvements." The report includes Spencer Island within its "high priority area" for "bull trout and Chinook priority use and potential".

### 2.5.3 Institutional Significance

The Snohomish Estuary, including Spencer Island, makes up part of the Federally designated critical habitat for Puget Sound Chinook salmon and Puget Sound steelhead, both of which are listed as threatened under the ESA. Chinook salmon are also the primary food source for the Southern Resident killer whale, listed as endangered under the ESA.

Regionally, the Shared Strategy for Puget Sound (absorbed by the Puget Sound Partnership in 2007) is a groundbreaking collaborative effort to protect and restore salmon runs across Puget Sound. The Puget Sound Partnership engages local citizens, tribes, technical experts and policy makers to build a practical, cost-effective recovery plan endorsed by the people living and working in the watersheds of Puget Sound. Its Salmon Recovery Plan (Shared Strategy 2007), adopted by NMFS, states a goal of protecting and restoring 2,720 acres of Snohomish estuary habitat.

Locally, the Snohomish Conservation District and Washington State University Extension - Snohomish County, are government agencies whose missions include stewardship of Snohomish delta ecosystem resources.

### 2.5.4 Public Significance

Public recognition of the significance of a resource may involve memberships in a conservation organization, financial contributions to resource-related efforts, volunteer labor, and correspondence regarding the importance of the resource. Many large non-profit organizations have indicated interest in improving the ecosystem quality and function of the Puget Sound (e.g., Ducks Unlimited, Seattle Audubon Society, and The Nature Conservancy). Reflecting the concerns of a range of people nearby, many local groups have formed around improving conditions in the Puget Sound within the study area, including the following:

- Forterra
- Marine Resource Committees
- Regional Fisheries Enhancement Groups (Sound Salmon Solutions)

- Orca Network
- Puget Sound Restoration Fund
- Pacific Coast Joint Venture
- Puget Soundkeeper Alliance
- Washington Council of Trout Unlimited
- Washington Water Trails Association
- Wild Fish Conservancy
- Washington Environmental Council

Public significance is further highlighted by the State of Washington's multi-million-dollar restoration budget, support from municipalities, NGOs, and other non-Federal partners in the cost-sharing of restoration efforts, as well as implementing millions of dollars' worth of generally smaller scale restoration work in Puget Sound without Corps involvement. State, Tribal, and local funding agencies have supported multiple completed, ongoing, and planned restoration projects in the Snohomish delta. These investments are important aspects of public significance of the resources within Puget Sound.

## 2.6 Objectives, Constraints, and Considerations

The primary objectives of this study are to improve fish access, tidal hydrology, and nearshore ecosystem processes at Spencer Island.

### 2.6.1 Planning Objectives

Planning objectives represent desired positive changes to the future without-project conditions that contribute to addressing the problems and opportunities. The Federal objective, as set forth in the Water Resources Development Act of 2007, specifies that that investments in water resource projects should reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

In addition to the Federal objectives, project-specific planning objectives were developed in partnership with WDFW to shape the formulation of alternatives.

The planning objectives of this study target restoration of the following ecosystem processes: exchange of aquatic organisms, tidal flow, tidal channel formation and maintenance, sediment transport, and detritus import and export. All objectives target activities within the study area over a 50-year period of analysis beginning in 2028.

The planning objectives are:

1. Improve fish access.
   Alternatives that improve access for fish into, within, and out of the area of the island currently encircled by dikes would address this objective, providing more usable high-value habitat such as off-channel estuarine rearing habitat for juvenile salmonids migrating to the ocean. The effectiveness of an alternative at achieving this objective would be measurable by the tidal channel connectivity component of the ecosystem output model described in Section 3.3.2.1.
2. Improve tidal hydrology to support tidal channel formation and maintenance.
   Alternatives that improve tidal channel formation and maintenance would contribute to the sustainability and positive evolution of the restored habitat for fish and other native plants and animals. They would also improve detritus import and export processes. The effectiveness of an alternative at achieving this objective would be measurable by the tidal channel connectivity and marsh connectivity components of the ecosystem output model described in Section 3.3.2.1.
3. Improve nearshore ecosystem processes (sedimentation, erosion, exchange of aquatic organisms, and detritus recruitment).
   Alternatives that improve sediment transport processes contribute to the sustainability and improvement of the restored habitat by slowing or reversing the subsidence of the site caused by diking and draining. They would also improve detritus import and export processes, which contribute to habitat structure and food availability. The effectiveness of an alternative at achieving this objective would be measurable by the tidal channel connectivity and marsh connectivity components of the ecosystem output model described in Section 3.3.2.1.

### 2.6.2 Planning Constraints

Constraints are restrictions that limit the extent of the planning process. Constraints, like objectives, are unique to each planning study. Plans should be formulated to meet the study objectives and avoid violating the constraints

No unique planning constraints were identified for this feasibility study.

### 2.6.3 Considerations

Project considerations differ from constraints. They are factors that may affect project costs and design elements but are not legal or policy constraints that would prevent a project from being constructed. Considerations of this study include:

1. Avoid or minimize impacts to recreational access for activities such as walking, wildlife viewing, and hunting to the extent practicable.

2. Avoid or minimize impacts to an underground gas pipeline at the north end of the island to the extent practicable or relocate the pipeline.
3. Avoid or minimize negative project-induced flooding impacts.

## 2.7 Public Scoping Comments and Topics of Interest*

The feasibility study scoping process for PSNERP is covered in detail in the 2016 FR/EIS. During the scoping process, agencies and the public identified topics of interest for analysis. Those topics appear in section 4.2 of this document. The topics (i.e. resources) carried forward for detailed analysis have been refined specific to the action at Spencer Island. USACE, WDFW, and the technical working group did not identify any additional topics of interest during the process of updating the design for this project, except for the recreational usage of Spencer Island.

WDFW sought public opinion on whether to maintain full, partial, or limited recreational access to the project area. WDFW issued press releases, reached out to specific user groups, held a public comment period to solicit feedback, and hosted a public meeting to obtain comments on the draft proposed alternatives. Public comments and concerns received were weighed together with current site conditions and actions necessary to restore ecosystem processes to develop the range of project alternatives.

# 3 Plan Formulation

The guidance for conducting civil works planning studies, Engineering Regulation (ER) 1105-2-103, Policy for Conducting Civil Works Planning Studies (USACE 2023), requires the systematic formulation of alternative plans that contribute to the Federal Objectives. To ensure sound decisions are made with respect to development of alternatives and ultimately with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This chapter presents the results of the plan formulation process.

## 3.1 Management Measures

To achieve the project objectives the PDT identified the following management measures for potential implementation:

1. Berm or Dike Removal or Modification
2. Channel Rehabilitation or Creation
3. Hydraulic Modification
4. Revegetation

Management measure (MM) #1 is included in all action alternatives in the form of dike lowering and dike breaching. Dike lowering is removing material to bring a length of dike down to the elevation where it is likely to overtop on approximately an annual basis. Dike breaching is removing material in discrete locations to a depth that allows daily tidal exchange. This measure addresses the following ecosystem processes: exchange of aquatic organisms, tidal flow, tidal channel formation and maintenance, sediment input, sediment transport, erosion and accretion of sediments, and detritus import and export.

MM #2 is included in most action alternatives and consists of excavating channels across portions of Spencer Island within the dikes, adding sinuosity (and therefore length) to existing interior channels, and strategically filling drainage ditches.

MM #3 is included in all action alternatives in the form of removing or replacing an undersized culvert or bridge opening and/or adding large wood to channels to encourage conditions for more natural tidal estuarine flow conditions and increase opportunities for the exchange of aquatic organisms. The wood added to channels would be sourced onsite from sections of lowered or breached dikes.

MM #4, identified by PSNERP as a supplementary enhancement measure, is included in all alternatives. Revegetation is a dependent measure; it would only be implemented along with one of the primary restorative measures listed above. This would consist of planting and/or seeding native species that typically occur in the ecological settings being restored.

Revegetation would occur where both soil is disturbed and where hydraulic conditions favor planting and survival.

## 3.2 Formulation of Alternatives

Alternative plans are one or more management measures functioning together to address one or more of the planning objectives. In this case, the PDT formulated alternatives from the management measures described above that would each address all the planning objectives to varying degrees.

In developing alternative plans that meet the planning objectives, the PDT took into account the planning considerations listed in Section 2.6.2.

### 3.2.1 Initial Array of Alternative Plans

To meet the planning objectives, the PDT formulated an initial array of eleven alternative plans, including the No-Action alternative. This broad array included varying degrees of restoration as well as versions of plans that included bridges over dike breaches to retain pedestrian access. These plans ranged in magnitude from smaller to larger in scale. Larger scale plans include more linear feet of dike lowering and breaches (MM #1) and more channel improvement work (MM #2). Hydraulic modification (MM #3) is included as appropriate in all alternatives: if an undersized culvert or bridge opening is situated in an area suited for dike lowering or breaching, then it would be removed and the large wood produced as a byproduct of the dike lowering or breaching would be utilized elsewhere on the site to restore hydraulic conditions. In all alternatives, revegetation (MM#4) is proportionate to the amount of soil disturbance resulting primarily from the dike lowering. The alternatives would result in varying degrees of ecosystem restoration and recreational access.

The initial array includes the following alternatives:

1 – No Action. Under this alternative, no project would be implemented.

2 – Minimum Restoration. This alterative was included in the PSNERP study and includes the following major components:

- Lowering the Steamboat Slough dike.
- Breaching the Union Slough dikes in two locations, with a pedestrian bridge over one breach.
- Construction of marsh benches within the island with material generated from dike lowering and breaching.
- Improving approximately 4,900 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.

3 – Low Restoration. This alternative adds the following major components to Alternative 2:

- Breaches in the Steamboat Slough dike.
- Lowering the North Cross Dike.

4a – Interior Channel Restoration. This alternative adds the following major components to Alternative 3:

- Lowering the Union Slough dike.
- Breaches in the Union Slough dike.
- Breach in the North Cross Dike.
- Excavation of minimal tidal channels interior to the island.
- Filling of historic agricultural drainage ditches.
- Improving approximately 1,800 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.
- Two widened viewing areas at the ends of remaining dike trails and a hand-carried boat launch.

4b – Interior channel Restoration with Bridges. This alternative adds the following major component to Alternative 4a:

- Includes pedestrian bridges over dike breaches.

5a – Partial Dike South Lowering Restoration. This alternative differs from Alternative 4a in the following ways:

- Lowering a portion of the South Cross Dike.
- Only minimal interior starter tidal channel excavation.
- No interior remnant drainage ditch filling.

5b – Partial South Cross Dike Lowering Restoration with Bridges. This alternative adds the following major component to Alternative 5a:

- Includes pedestrian bridges over dike breaches.

6a – Maximum Dike Lowering Restoration. This alternative differs from Alternative 5a in the following ways:

- Lowering the entire South Cross Dike.

6b – Maximum Dike Lowering Restoration with Bridges. This alternative adds the following major component to Alternative 6a:

- Includes pedestrian bridges over dike breaches.

7 – Maximum Ecosystem Measures Restoration. This alternative includes all the components listed in the previous alternatives, except pedestrian bridges. The entire South Cross Dike is lowered in this alternative.

8 – High Restoration. This alternative includes all the components listed in the previous alternatives, except pedestrian bridges. The South Cross Dike is only partially lowered in this alternative.

### 3.2.2 Focused Array of Alternative Plans

To screen the initial array of alternative plans, the PDT presented the alternatives to the two public entities that own the project lands, WDFW (the Non-Federal Sponsor) and Snohomish County. The two landowners conducted public outreach to assess stakeholders' views of the range of alternatives. They also considered the construction and maintenance history of the Union Slough dike on Spencer Island.

A central question during the public outreach was how much to prioritize ecosystem restoration vs. passive recreation (e.g. walking, hunting, and bird watching). Outreach results indicated a balanced interest in recreation and restoration, with slightly more interest in restoration.

Using the results of the public outreach, the PDT assessed the initial array of alternatives considering the Spencer Island dikes' history and the fact that the public has slightly more interest in restoration for this site.

The Spencer Island dikes were originally constructed in the 1930s and then in 1960s, raised and widened with material including hog fuel (a byproduct of the lumber industry, consisting of wood fibers, bark, and wood chips). Maintenance on the embankments became limited when agricultural practices ended after WDFW and Snohomish County purchased the land. Given the condition of the dikes, bridge construction and maintenance would be expensive and difficult to justify. Since ecosystem restoration is the purpose of the authority under which this study is being pursued, the PDT screened out alternatives that included pedestrian bridges.

The public also indicated a balanced interest in pursuing ecosystem restoration and passive recreation at the site. For this reason, alternatives that would remove the entire South Cross Dike (the most-used trail at the site) were screened out. Given the considerable interest in passive recreation at the site, the PDT sought opportunities to optimize recreation while developing restoration alternatives. For example, portions of some construction access roads are left in place as improved trails, graded viewing areas, and a hand-powered boat launch are included in some alternatives. Separately from this project, the sponsor is considering design and construction of additional recreational features. Construction of any such features could

require permission from the Corps per the requirements of 33 USC 408 (Section 408), which governs modifications to USACE projects.

While analyzing alternative options, the team also considered ways to reduce the amount of the project-related induced flooding. Removal of remnant dike on Smith Island along Union Slough adjacent to a constructed breach and tidal channel was identified as way to significantly reduce negative inundation impacts by increasing the area available for additional flowage resulting from restoration measures. As a result, this design change was added to reformulate all relevant alternatives, including the TSP.

**Table 3-1. Screening of Initial Array of Alternatives**

| Alternative | Screened out? | Rationale for Screening Out |
|---|---|---|
| 1 – No Action | No | (Required baseline for NEPA and the USACE planning process.) |
| 2 – Minimum Restoration | No | (Original alternative presented by the PSNERP study. Retained as restoration baseline.) |
| 3 – Low Restoration | Yes | Bridge construction and long-term maintenance costs. |
| 4a – Interior Channel Restoration | No | |
| 4b – Interior channel Restoration with Bridges | Yes | Bridge construction and long-term maintenance costs. |
| 5a – Partial South Cross Dike Lowering Restoration | No | |
| 5b – Partial South Cross Dike Lowering Restoration with Bridges | Yes | Bridge construction and long-term maintenance costs. |
| 6a – Maximum Dike Lowering Restoration | Yes | Lowers entire South Cross Dike; unacceptable recreation access impacts |
| 6b – Maximum Dike Lowering Restoration with Bridges | Yes | Lowers entire South Cross Dike, unacceptable recreation access impacts. Bridge construction and long-term maintenance costs. |

| | | |
|---|---|---|
| 7 – Maximum Ecosystem Measures Restoration | Yes | Lowers entire South Cross Dike; unacceptable recreation access impacts |
| 8 – High Restoration | No | |

The focused array of alternative plans includes the following:

1 – No Action. Under this alternative, no project would be implemented.

2 – Minimum Restoration. This alternative includes the following major components:

- Lowering the Steamboat Slough dike.
- Breaching the Union Slough dikes in two locations, with a pedestrian bridge over one breach.
- Construction of marsh benches within the island with material generated from dike lowering and breaching.
- Improving approximately 4,900 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.
- Removal of remnant dike on Smith Island along Union Slough adjacent to a constructed breach and tidal channel to avoid induced flooding by increasing the area available for additional flowage resulting from restoration measures

4a – Interior Channel Restoration. This alternative includes the following major components:

- Lowering the Steamboat Slough and Union Slough dikes.
- Breaching the Steamboat Slough and Union Slough dikes in 13 locations, with excavated starter channels connected to seven of the breaches.
- Breaching the North Cross Dike in one location with an excavated starter channel.
- Excavation of tidal channels interior to the island.
- Filling historic agricultural drainage ditches.
- Construction of marsh benches within the island with material generated from dike lowering and breaching.
- Improving approximately 1,800 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.
- Two widened viewing areas at the ends of remaining dike trails and a hand-carried boat launch.

- Removal of remnant dike on Smith Island along Union Slough adjacent to a constructed breach and tidal channel to avoid induced flooding by increasing the area available for additional flowage resulting from restoration measures

5a – Partial South Cross Dike Lowering Restoration. This alternative includes the following major components:

- Lowering the Steamboat Slough and Union Slough dikes, and the North and S Dikes.
- Breaching the Union Slough dikes in 18 locations, with excavated starter channels connected to seven of the breaches.
- Breaching the North Cross Dike in one location with an excavated starter channel.
- Construction of marsh benches within the island with material generated from dike lowering and breaching.
- Improving approximately 1,800 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.
- Two widened viewing areas at the ends of remaining dike trails and a hand-carried boat launch.
- Removal of remnant dike on Smith Island along Union Slough adjacent to a constructed breach and tidal channel to avoid induced flooding by increasing the area available for additional flowage resulting from restoration measures

8 – High Restoration. This alternative includes the following major components:

- Lowering the Steamboat Slough and Union Slough dikes, and the North and South Cross Dikes.
- Breaching the Steamboat Slough and Union Slough dikes in 19 locations, with excavated starter channels connected to eight of the breaches.
- Breaching the North Cross Dike in one location with an excavated starter channel.
- Excavation of tidal channels interior to the island.
- Filling historic agricultural drainage ditches.
- Construction of marsh benches within the island with material generated from dike lowering and breaching.
- Improving approximately 1,800 feet of trail by leaving portions of construction access roads in suitable condition for pedestrian use.
- Two widened viewing areas at the ends of remaining dike trails and a hand-carried boat launch.
- Removal of remnant dike on Smith Island along Union Slough adjacent to a constructed breach and tidal channel to avoid induced flooding by increasing the area available for additional flowage resulting from restoration measures

The focused array of alternatives (action alternatives only) are displayed below (Figure 3.1 to Figure 3.4). Additional evaluation and comparison of the alternatives guide the PDT in identifying the tentatively selected plan.

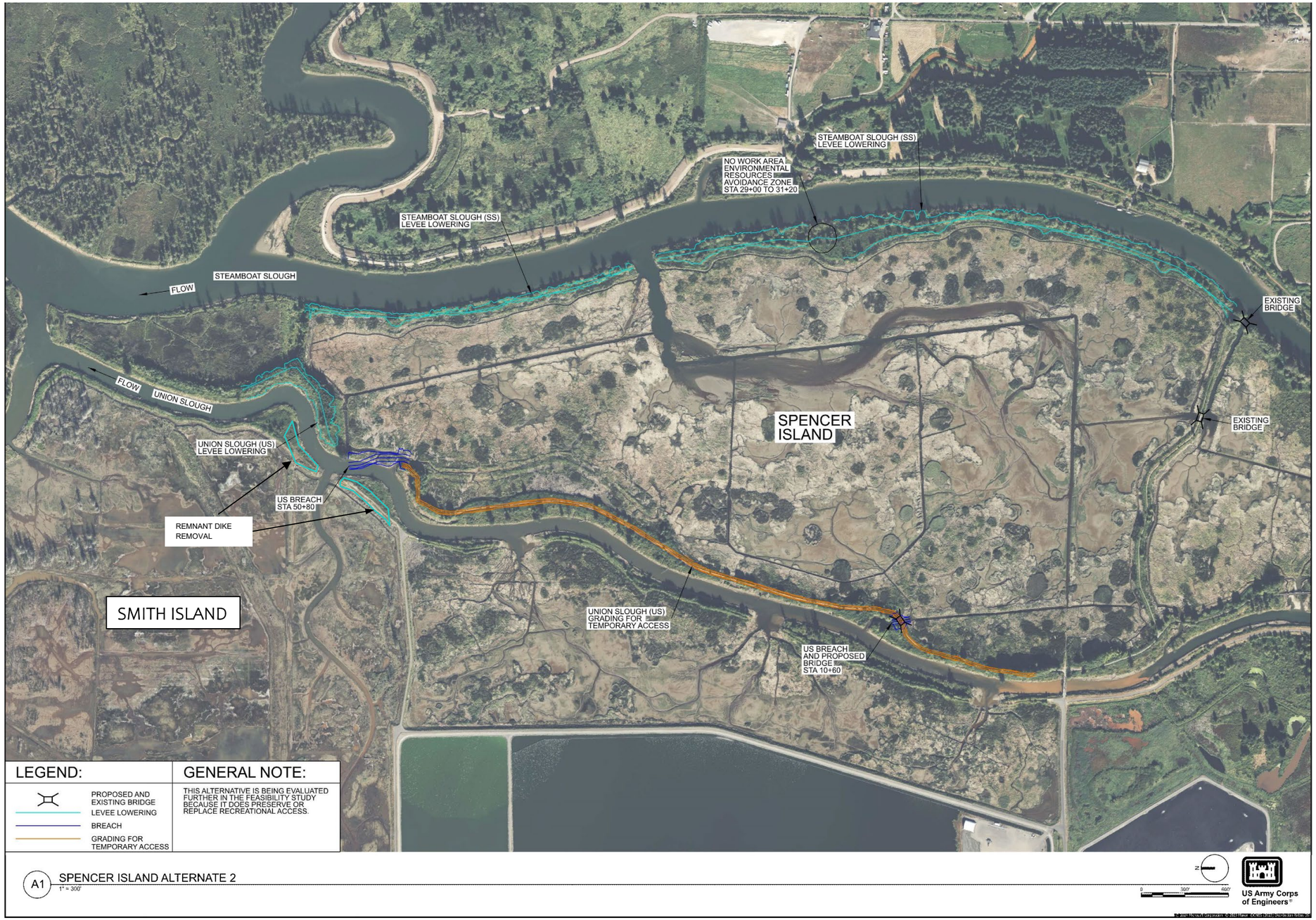


**Figure 3.1. Alternative 2 - Minimum Restoration**

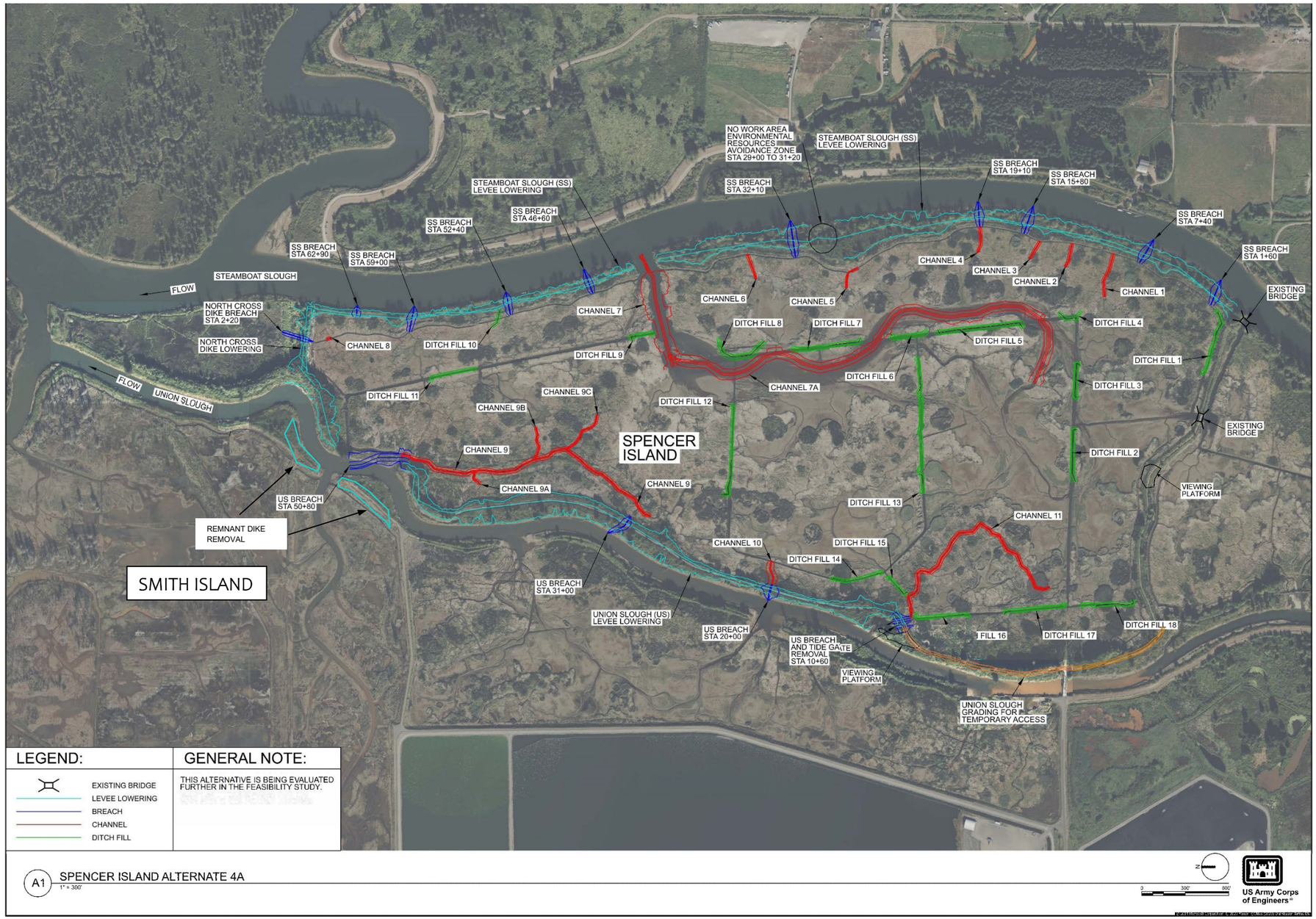


**Figure 3.2. Alternative 4a – Interior Channel Restoration**

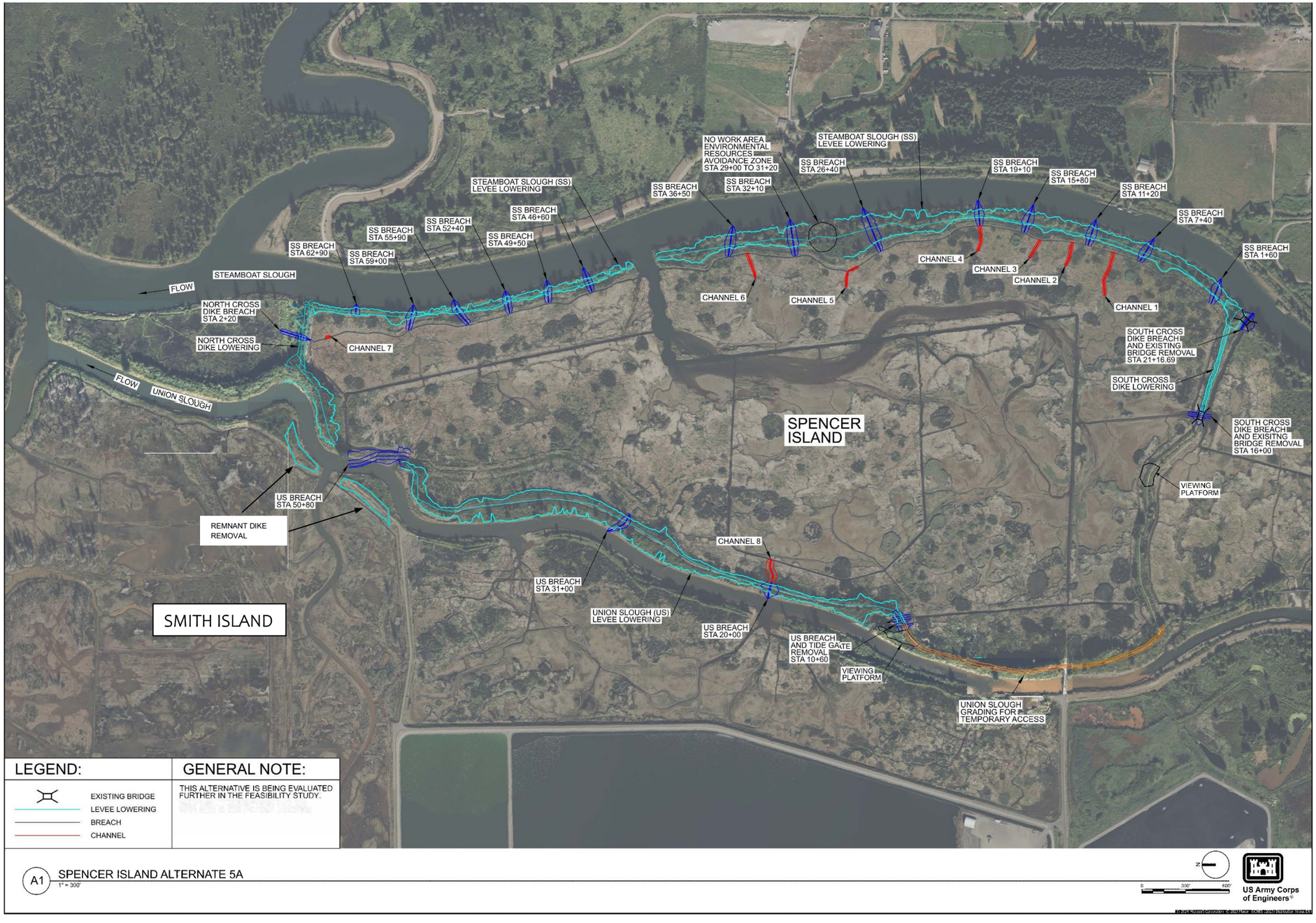


Figure 3.3. Alternative 5a - Partial South Cross Dike Lowering Restoration

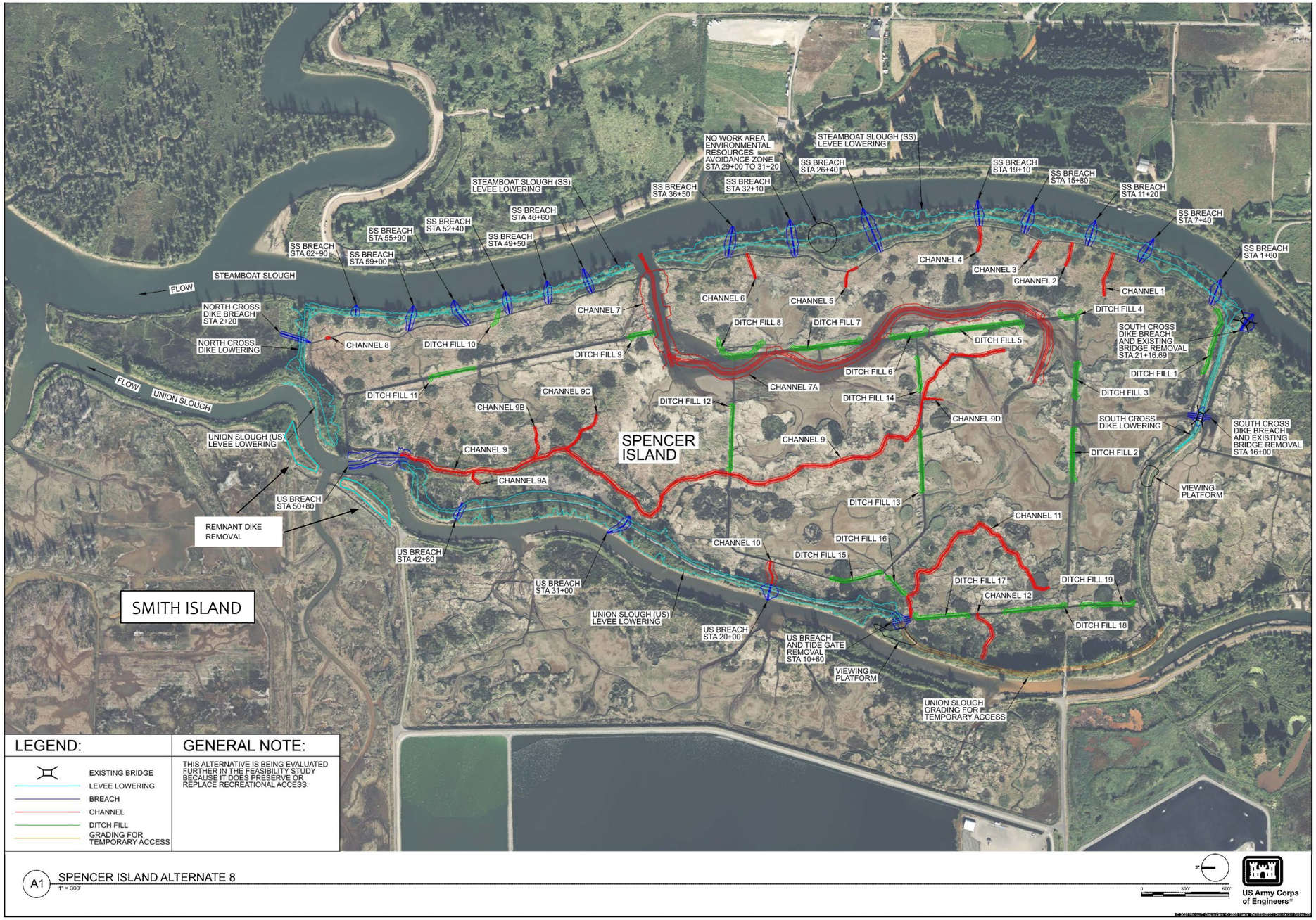


Figure 3.4. Alternative 8 - High Restoration

## 3.3 Evaluation and Comparison of the Focused Array of Alternatives

The evaluation and comparison process incorporates the four accounts established in the Principles and Guidelines to facilitate the evaluation and analysis of effects of alternative plans. The four accounts are Environmental Quality (EQ), Regional Economic Development (RED), Other Social Effects (OSE), and National Economic Development (NED).

### 3.3.1 Environmental Quality

The environmental quality account considers non-monetary effects on ecological, cultural, and aesthetic resources. Under this account, plans are evaluated with regards to their impacts to the environment, both positive and negative. Ecosystem restoration projects are evaluated to determine the degree of ecosystem benefits they provide. As with all project types, they are also evaluated regarding the degree to which they avoid or minimize negative environmental impacts in the study area to the extent practicable considering other criteria and planning objectives.

As this project is being conducted under an ecosystem restoration authority (Sec 544), alternatives are developed specifically to generate ecosystem benefits. Those benefits (and the costs to provide them) differentiate the alternatives significantly more than the other alternative comparison parameters. To estimate the ecosystem benefits that would be provided by each alternative for the purpose of evaluating cost-effectiveness, the PDT utilized an ecosystem benefit model developed for Puget Sound river delta ecosystem restoration projects, "Ecosystem Output Calculator for CAP[1] and CAP-like River Delta Ecosystem Restoration in Puget Sound" (USACE 2023a). This model scores each alternative based on physical parameters related to how tidal and riverine flows enter and transit the site. Alternatives that result in conditions closer to those found in a comparable, unimpaired site in Puget Sound, score best. The hydraulic factors that drive alternative scores also directly influence the ecosystem processes that correspond to the study planning objectives. All action alternatives in the final array would provide benefits, increasing in magnitude from Alterative 2 through Alternative 8. Ecosystem outputs, quantified as "habitat units", are presented and compared to costs in section 3.3.2, *Cost Effectiveness and Incremental Cost Analysis*. Negative environmental impacts resulting from the alternatives are limited to construction impacts such as removal of vegetation, noise stemming from construction equipment, and equipment emissions. These negative impacts would be negligible since there are plans to revegetate, and

[1] Continuing Authorities Program

construction would be intermittent. These impacts would vary in proportion to the scale of the alternatives.

### 3.3.2 Cost Effectiveness and Incremental Cost Analysis

USACE uses Cost Effectiveness and Incremental Cost Analysis (CE-ICA) to compare monetary costs and non-monetary benefits of ecosystem restoration alternatives to assist in decision-making. CE/ICA provides information regarding the efficiency with which the alternatives improve environmental quality. Average Annual Cost (AAC), discounted to the current price level, is the input and the output is Ecosystem Output, measured in Average Annual Habitat Units (AAHUs). The following Sections provide information on calculation of the inputs (3.3.2.2) and outputs (3.3.2.1) for CE-ICA. The results of CE-ICA are discussed in Sections 3.3.2.3 and 3.3.2.4.

#### *3.3.2.1 Ecosystem Output Model*

To estimate the ecosystem benefits that would be provided by each alternative, the PDT utilized an ecosystem benefit model developed for Puget Sound river delta ecosystem restoration projects, "Ecosystem Output Calculator for CAP[2] and CAP-like River Delta Ecosystem Restoration in Puget Sound" (USACE 2023a). This model is described above in Section 3.3.1, and explained in further detail in the Economics Appendix (C.3.1 Habitat Modeling Description).

All alternatives in the focused array would provide ecosystem benefits, increasing in magnitude from Alternative 1, the No-Action Alternative, through Alternative 8, high restoration. For alternative evaluation, the PDT calculated the net increase in habitat units over the No-Action Alternative. To account for the time it takes ecosystem processes to reestablish native site conditions, the PDT estimated a benefit accrual rate for each alternative, given in Average Annual Habitat Units (AAHUs). For more information on the methods used to estimate ecosystem benefits, see section C.3.1 of Appendix C. Ecosystem Outputs are displayed in Table 3-4.

#### *3.3.2.2 Alternatives Cost*

A Total Project Cost Summary (TPCS) was prepared for each alternative in the final array of alternatives. The TPCS includes the costs for real estate; preconstruction, engineering, and design (PED); construction; construction management; monitoring and adaptive management; and contingency. These costs are escalated to calculate the Project First Cost and the Total Project Cost. Project First Cost is used to calculate the input, AAC, for Cost Effectiveness Analysis.

[2] Continuing Authorities Program

The Project First Cost and construction duration for the focused array of alternatives are displayed in Table 3-2. Additional cost details are available in section 5.4 and Appendix I, Cost Engineering.

**Table 3-2. Alternative Summary of Project First Costs**

| Alternative | Project First Cost ($ '000)* | Construction Duration |
|---|---|---|
| **1 – No Action** | - | 0 Months |
| **2 – Minimum Restoration** | 11,850 | 5 Months |
| **4a – Interior Channel Restoration** | 12,086 | 7 Months |
| **5a – Partial South Cross Dike Lowering Restoration** | 11,156 | 7 Months |
| **8 – High Restoration** | 13,167 | 6 Months |

***Source: CAP 544 Spencer Island TPCS 20251212.xlsx***
****Note: FY26 Oct 2025 Price Level***

The IWR Planning Suite Annualization Tool was used to determine the interest during construction (IDC) for each alternative using the Project First Costs and construction durations in Table 3-2 and at the FY26 Federal discount rate of 3.25 percent (USACE 2025). Total Project Investment Cost is the sum of IDC and Project First Cost.

As the outputs for CE-ICA are annualized, the costs must also be annualized. The Total Project Investment Cost was annualized over the 50-year period of analysis beginning in 2028, using a 3.25 percent discount rate, to calculate the Average Annual Equivalent (AAEQ) cost. AAC is the sum of AAEQ cost and annual O&M cost. The PDT does not expect this ecosystem restoration project to result in any new operations and maintenance requirements, so there are no O&M costs. Additional details on the annualization of costs can be found in the Economics Appendix (Appendix C, C.3.2). A summary of annualized costs for each alternative is given in Table 3-3.

Table 3-3. Alternatives Summary of Annualized Costs ($ '000)*

| Alternative | IDC | Total Project Investment Cost | AAEQ Cost | Annual O&M | AAC |
|---|---|---|---|---|---|
| **1** | - | - | - | - | - |
| **2** | 79 | 11,929 | 486 | - | 486 |
| **4a** | 113 | 12,199 | 497 | - | 497 |
| **5a** | 105 | 11,261 | 459 | - | 459 |
| **8** | 106 | 13,273 | 541 | - | 541 |

*Source: IWR Planning Suite II: Annualization Calculator*
**Note: FY26 October 2025 Price Level and 3.25 Percent Federal Discount Rate*

### *3.3.2.3 Cost Effectiveness Analysis – Focused Array of Alternatives*

Cost effectiveness analysis allows for the comparison of non-monetary benefits, such as habitat units, to identify cost-effective alternatives. According to ER 1105-2-100, "Cost effective" means that, for a given level of non-monetary output, no other plan costs less, and no other plan yields more output for less money (USACE 2000). Application of cost-effective analysis yields an array of cost-effective plans that each produce their associated level of output at the least cost. Average Cost is calculated by dividing the ACC by the Output, which is given in Average Annual Habitat Units, to get an average cost per unit of output. The results of the cost-effective analysis are presented in Table 3-4 and Figure 3.5.

Cost-effectiveness analysis was conducted for the focused array of alternatives, with ACC and Average Annual Habitat Units (AAHUs), as the input and output, respectively. The analysis identified that Alternative 1 (No Action), Alternative 5a (Partial South Cross Dike Lowering Restoration), and Alternative 8 (High Restoration) are cost-effective. Both Alternative 2 (Minimum Restoration) and Alternative 4a (Interior Channel Restoration) are not cost-effective as more ecosystem output can be produced under Alternative 5a than under alternatives 2 and 4a, at an AAC less than that of alternatives 2 and 4a. USACE policy does not allow for implementation of ecosystem restoration alternatives that are not cost-effective; therefore, only the No-Action Alternative, Alternative 5a, and Alternative 8 are carried forward as the final array of alternatives.

Two best-buy alternatives, beyond the No-Action Alternative, were identified from the CE-ICA: Alternative 5a (Partial South Cross Dike Lowering Restoration) and Alternative 8 (High Restoration). 'Best-buy' alternatives are the most efficient alternatives (the incremental cost per unit is lowest for a particular level of output).

Table 3-4. Alternative Summary of Cost Effectiveness Analysis

| Alternative | Output (AAHUs) | AAC ($ '000)* | Average Cost ($ '000/AAHU)* | Cost Effective? | Best Buy? |
|---|---|---|---|---|---|
| **1** | 0 | - | - | Yes | Yes |
| **2** | 29 | 486 | 16.8 | No | No |
| **4a** | 69 | 497 | 7.2 | No | No |
| **5a** | 91 | 459 | 5.0 | Yes | Yes |
| **8** | 98 | 541 | 5.5 | Yes | Yes |

*Source: IWR Planning Suite II: CE-ICA*
**Note: FY26 October 2025 Price Level and 3.25 Percent Federal Discount Rate*

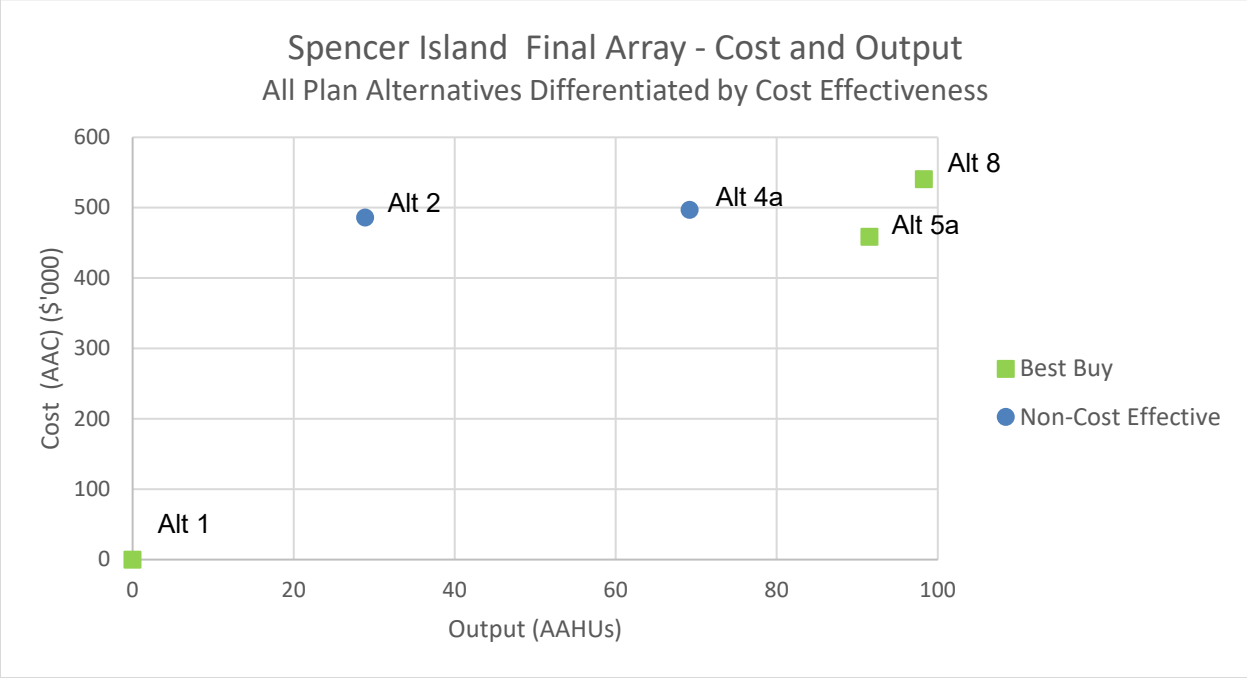


Figure 3.5. Cost Effectiveness Analysis – Focused Array of Alternatives
**Note: FY26 October 2025 Price Level and 3.25 Percent Federal Discount Rate*

Average costs can facilitate the comparison of production efficiencies across alternatives by placing each alternative plan in a common metric: dollars per unit of output. Based on the ecosystem output model and CE-ICA results, Alternative 5a is the most productively efficient alternative, with the least cost per output.

### *3.3.2.4 Incremental Cost Analysis – Best-Buy Alternatives*

In Incremental Cost Analysis, incremental costs and incremental outputs are compared across Best-Buy Alternatives to determine if each incremental increase in cost is justified by the associated incremental increase of ecosystem output. The results of the Incremental Cost Analysis are displayed in Table 3-5 and Figure 3.6.

Alternative 5a has an incremental increase in AAC from Alternative 1 of about $459,000 (Table 3-5). This is associated with an incremental increase in output of about 91 AAHUs. The incremental cost per incremental output under Alternative 5a is approximately $5,000 (Table 3-5).

Alternative 8 has an incremental increase in AAC from Alternative 5a of approximately $82,000 (Table 3-5) which is associated with an incremental increase in output from Alternative 5a of about 7 AAHUs. The incremental cost per incremental output under Alternative 8 is approximately $12,100 (Table 3-5).

**Table 3-5. Incremental Cost Analysis - Best Buy Alternatives ($ '000)***

| Alternative | Incremental Cost | Incremental Output (AAHUs) | Incremental Cost per Output |
|---|---|---|---|
| **1** | - | 0 | - |
| **5a** | 459 | 91 | 5.0 |
| **8** | 82 | 7 | 12.1 |

***Note: FY26 October 2025 Price Level and 3.25% Federal Discount Rate***

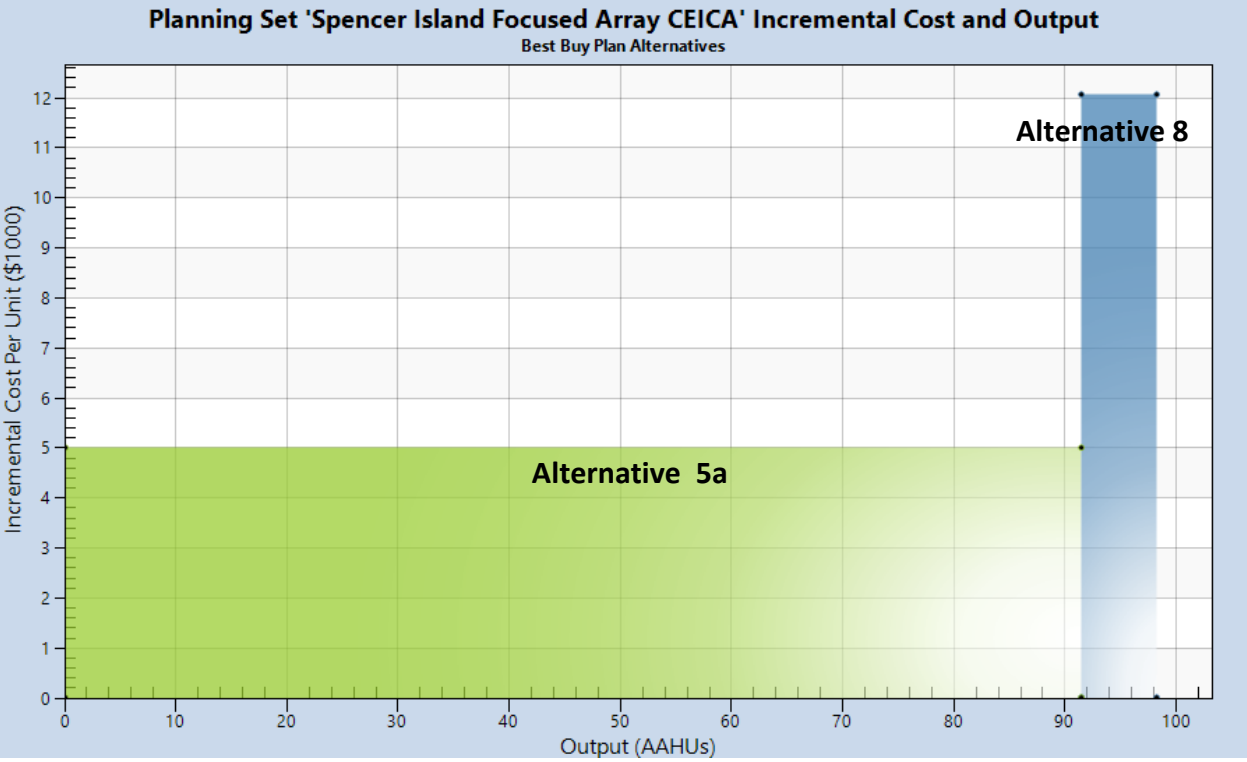


**Figure 3.6. Incremental Cost Analysis - Best Buy Alternatives**

Alternative 5a has the least incremental cost per output of the Best-Buy Alternatives, as determined by the ecosystem output model and CEICA. According to the results of the analysis, Alternative 5a is the most efficient alternative.

Through discussions with stakeholders and from lessons learned from other ecosystem restoration projects in the Snohomish Delta the PDT identified the importance of channel network improvement measures (i.e. ditch filling, channel creation) in increasing the quality of aquatic habitat in the Snohomish Delta. If drainage ditches are not filled, tidal flows would continue via existing drainage ditches, which are not suitable habitat for salmonids and other species in the Snohomish Delta. Thus, the environmental benefits associated with channel network improvement measures are not fully captured by the metrics in the ecosystem output model. Through drainage ditch filling, Alternative 8 creates more assurance of restoring channel network connectivity than Alternative 5a. Although the impacts of channel network improvement measures on restoring the natural ecosystem processes at Spencer Island are not fully captured in the ecosystem output model, these impacts are discussed and taken into consideration in the identification of a Recommended Plan in Section 3.4.

### 3.3.3 Regional Economic Development (RED)

The RED account measures changes in the distribution of regional economic activity that would result from each alternative plan. Evaluations of regional effects are measured using nationally consistent projections of income, employment, output, and population.

The PDT used a regional economic impact modeling tool, RECONS (Regional Economic System), developed by the USACE Institute for Water Resources, Louis Berger, and Michigan State University to estimate local and regional economic impacts associated with the construction expenditures for the implementation of the action alternatives. RECONS provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This modeling tool allows the PDT to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

Regional economic impacts are typically classified into one of three categories, direct effects, indirect effects, and induced effects:

- Direct effects represent the impacts the new Federal expenditures have on industries which directly support the new project.
- Indirect effects represent changes to secondary industries that support the direct industries.

- Induced effects are the changes in consumer spending patterns caused by the changes in employment income within the 'direct' and 'indirect' industries.

Inputs for RECONS model are expenditures entered by business line work activity, each of which have their own production function. These expenditures are specifically the Project First Cost (FY26 October 2025 Price Level). See the Economics Appendix (C.4.1) for additional information on assumptions and a description of RECONS metrics.

#### *3.3.3.1 RECONS Results*

The regional economic impacts of the action alternatives are summarized in Tables 3-5 and 3-6. The regional economic impacts are shown for the local impact area, Snohomish County (Table 3-6), and the state impact area, Washington State (Table 3-7).

The construction expenditures associated with Alternative 5a are estimated to be $11,156,000. Of this total expenditure $10,323,000 would be captured within the local impact area, Snohomish County. The remainder of the expenditure would be captured within the state of Washington and the nation. The construction expenditures associated with Alternative 8 are estimated to be $13,167,000. Of this total expenditure $12,184,000 would be captured within the local impact area, Snohomish County. The remainder of the expenditure would be captured within the state of Washington and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. "Total Impact" is the sum of direct and secondary impacts.

Under Alternative 5a, the Civil Works expenditures of $11,156,000 support a total of 107 full-time equivalent jobs, $9,642,000 in labor income, $10,053,000 in the gross regional product, and $15,206,000 in economic output in the local impact area, Snohomish County.

Under Alternative 8, the Civil Works expenditures of $13,167,000 support a total of 127 full-time equivalent jobs, $11,380,000 in labor income, $11,865,000 in the gross regional product, and $17,947,000 in economic output in the local impact area, Snohomish County.

Table 3-6. Summary of Total (Direct + Indirect) Regional Economic Impacts (Local Impact, Snohomish County, WA ($ '000)*)

| Action Alternative | Expenditure | Regional Output | Jobs** | Labor Income | Value Added |
|---|---|---|---|---|---|
| **5a** | 11,156 | 15,206 | 107 | 9,642 | 10,053 |
| **8** | 13,167 | 17,947 | 127 | 11,380 | 11,865 |

**Note: FY26 October 2025 Price Level and 3.25 Percent Federal Discount Rate*
***Note: Jobs are presented in full-time equivalence (FTE)*

More broadly, these expenditures under Alternative 5a support 152 full-time equivalent jobs, $12,088,000 in labor income, $13,845,000 in the gross regional product, and $21,669,000 in economic output in the state of Washington. These regional impacts are limited to the construction period for job creation and additional spending.

Under Alternative 8 these expenditures support 180 full-time equivalent jobs, $14,266,000 in labor income, $16,341,000 in the gross regional product, and $25,576,000 in economic output in the state of Washington. These regional impacts are limited to the construction period for job creation and additional spending. A detailed summary of the regional economic impacts associated with the construction expenditures for Alternatives 5a and 8 can be found in Appendix C, Economics (C.4.1.2).

Table 3-7. Summary of Total (Direct + Indirect) Regional Economic Impacts (State Impact, Washington State ($ '000)*)

| Action Alternative | Expenditure | Regional Output | Jobs** | Labor Income | Value Added |
|---|---|---|---|---|---|
| **5a** | 11,156 | 21,669 | 152 | 12,088 | 13,845 |
| **8** | 13,167 | 25,576 | 180 | 14,266 | 16,341 |

**Note: FY26 October 2025 Price Level and 3.25 Percent Federal Discount Rate*
***Note: Jobs are presented in full-time equivalence (FTE)*

Implementation of Alternative 5a would result in regional economic impacts similar to those of Alternative 8, at a smaller magnitude proportional to construction expenditures. Alternative 1, No Action, would not provide any regional economic benefits via construction expenditures to the local economy.

### 3.3.4 Other Social Effects (OSE)

As defined in the Planning Guidance Notebook, the Other Social Effects account includes plan effects on social aspects such as community impacts, life, health and safety factors,

displacement, energy conservation, and others (USACE 2000). In ecosystem restoration projects, the improvement of ecosystem resources can have direct and indirect social value, primarily associated with recreational enjoyment of improved resources to the project.

In the Institute for Water Resource manual "Applying Other Social Effects In Alternatives Analysis," Other Social Effects are categorized into 7 social factors: Health and Safety; Economic Vitality (having a stable or growing base with access to good jobs); Social Connectedness (sustaining a sense of connection to the community and neighborliness); Identity (feeling pride in the community); Social Vulnerability and Resiliency (ensuring that the requirement of special needs populations in the community are adequately addressed); Participation (feeling that one's participation is valued and recognized in community decision making); Leisure and Recreation (having access to healthy and safe outdoor recreation); and Public Safety. The social factors associated with project implementation would vary from project to project. For the Spencer Island Ecosystem Restoration Project, the applicable social factors are Participation and Leisure and Recreation.

**Alternative 1 – No Action**

Implementation of Alternative 1, the No-Action Alternative, would have minor negative impacts on Leisure and Recreation. Under the No-Action Alternative, recreational access and opportunities would decline in the FWOP condition (C3.4.2). As trails continue to erode from tidal action, the existing breaches would continue to widen, and the bridges over existing breaches would likely fail as they have in the past. If the bridges were to fail, access to the southern perimeter loop trail and the northern portion of the island would be lost. The degree of access lost under the No-Action Alternative is uncertain.

**Alternative 5a (Partial South Cross Dike Lowering Restoration) & Alternative 8 (High Restoration)**

Social impacts under Alternative 5a and Alternative 8 are primarily driven by the improved access to recreation and higher success rates of wildlife dependent activities associated with both alternatives.

The Participation social factor reflects the degree to which the community feels their participation matters in decision making and has trust in public officials and public interest in the community. The PDT collaborated with the public, including various recreation groups, the Tulalip Tribes, and others throughout plan formulation. Alternative 8 incorporates specific design considerations brought to the PDT by the Tulalips Tribe.

Implementation of Alternative 8 would display to the community that their knowledge and preferences were fully incorporated into the design, which could improve public participation in the FWP condition. The PDT continues to collaborate with the Tulalip Tribes on project design to ensure that elements of the project are incorporated so that their resources of interest can benefit from the proposed action.

There would be minor beneficial impacts to recreation access under Alternatives 5a and 8, compared to the FWOP condition (C.3.4.2). The increase in environmental output associated with these alternatives would have indirect benefits to Leisure and Recreation. The action alternatives would all provide greater access for migratory species to increased habitat in comparison to the No-Action Alternative and because increased habitat access yields greater abundance of migratory species, the strengthened biodiversity would provide increased opportunities for birdwatching and other wild-life related activities. Put in another way, the improved habitat under Alternatives 5a and 8 would likely improve the success of wildlife dependent activities. Additionally, increased Leisure and Recreation opportunities in the area provide increased benefits for mental and physical health. The degree to which social impacts would differ between the action alternatives was not measured – it is assumed that social effects under Alternative 5a and Alternative 8 would be of the same magnitude.

### 3.3.5 National Economic Development

For water resources projects intended to generate economic benefits, USACE evaluates alternatives under the NED account by considering net economic benefits and the benefit-cost ratio in dollars. For this ecosystem restoration project, the only NED account consideration is cost, which is addressed in section 3.3.2, *Cost Effectiveness and Incremental Cost Analysis.* Traditionally, NED benefits are associated with flood risk management and navigation studies where costs and benefits of implementing an alternative are assessed relative to flood damage, and transport of commodities. Recreation Benefits are also included in NED. For this ecosystem restoration project, focused on nonmonetary ecosystem benefits, the NED account was considered qualitatively. An evaluation of the impacts to recreation under each alternative can be found in Section 4.10; for further details see Section C.3.4.2 of the Economics Appendix.

The restoration of Spencer Island enhances a recreational opportunity in the nation that provides NED benefits to recreators, especially boaters, hunters, and birdwatchers. There would be a benefit to recreators through the implementation of any of the action alternatives. Under the No-Action Alternative, there would be a minor decrease in recreational benefits from the current condition due to a decrease in quality of and access to recreational opportunities. There would be similar minor recreational benefits under alternatives 5a and 8, with increased quality of recreational opportunities and access maintained.

Construction expenditures in the local area would not be considered a net benefit to the nation, as they are associated with regional transfers, and are evaluated in the Regional Economic Development Section (3.3.3).

### 3.3.6 Completeness, Effectiveness, Efficiency, and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Principles and Guidelines in the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria to qualify for further consideration and comparison with other plans. This section describes the relative degree to which the alternatives meet the criteria. The results are summarized Figure 3.7, along with the other factors considered in plan evaluation and comparison.

**Completeness** is the extent to which a given alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale. Each alternative is complete, as each would produce its intended benefits to the ecosystem without investments outside of the scope of the alternative.

**Effectiveness** is the extent to which an alternative alleviates the specified problems and achieves the specified opportunities. As described in section 3.3.1, *Environmental Quality*, alternative effectiveness for this ecosystem restoration project is estimated using an ecosystem benefit model (USACE 2023). The model evaluates the degree to which the alternatives restore the ecosystem processes included in the project objectives (section **Error! Reference source not found.**), thereby addressing the problems described in section 2.3. The estimated ecosystem outputs for each alternative are given in Table 3-4. Those outputs provide a measure of the effectiveness of the alternatives for use in evaluation and comparison. All action alternatives are effective, increasing in effectiveness from Alternative 2a through Alternative 8.

**Efficiency** is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost. Efficiency is evaluated and compared by analyzing the quantity of habitat units generated by the alternatives with respect to their costs (see section 3.3.2, *Cost Effectiveness and Incremental Cost Analysis).* The relative efficiency of the alternatives is summarized in Table 3-4 and Table 3-5.

**Acceptability** is the workability and viability of the alternative plan with respect to acceptance by state and local entities, Tribes, and the public and compatibility with existing laws, regulations, and public policies. Acceptability has two dimensions – implementability and satisfaction. Implementability means the extent to which the alternative is feasible from a technical, financial, and legal perspective. Satisfaction is the extent to which the plan is

welcome from a political or preferential perspective (USACE 2023). All alternatives are implementable. Alternatives 2 and 5a may be marginally more implementable than Alternatives 4a and 8, due to the complexity of the internal channel excavation included as part of the latter two. Therefore, on a scale of 1-5 for Implementability, the PDT scored Alternatives 2 and 5a as a "5" and Alternatives 4a and 8 as a "4". All alternatives would deliver satisfaction to different individuals and institutions. Alternatives 2 and 4a may deliver more satisfaction to members of the public whose main concern is maintenance of the loop trail at the southern end of the island. The degree of satisfaction for those who primarily value salmonid habitat restoration may increase relative to the magnitude of restoration, which increases from Alternative 1 through Alternative 8. Based on the public and institutional outreach conducted by WDFW and USACE to date, all alternatives in the final array are comparably satisfactory. As no one alternative is ideal for all constituencies, on a scale of 1-5 the PDT scored each alternative as a "4".

Table 3-8 summarizes the evaluation of the focused array of alternatives against these criteria.

**Table 3-8. Completeness, Effectiveness, Efficiency, Acceptability of the Alternatives**

| Alternative | Complete? (Yes/No) | Effectiveness (Rank) | Efficiency | Acceptable (1-5) |
|---|---|---|---|---|
| 1 – No Action | Yes | 0 | Best Buy | 4 |
| 2 – Minimum Restoration | Yes | 1 | Non-Cost Effective | 4 |
| 4a – Interior Channel Restoration | Yes | 2 | Non-Cost Effective | 4 |
| 5a – Partial South Cross Dike Lowering Restoration | Yes | 3 | Best Buy | 4 |
| 8 – High Restoration | Yes | 4 | Best Buy | 4 |

### 3.3.7 Significance of Outputs

Section 2.5 describes the significance of the natural resources that this project aims to restore. Each alterative would restore the same set of resources of Tribal, institutional, technical, and public significance. On a scale of 1-5, the PDT ranked all alternatives as a "5" for significance of outputs. The degree to which these significant resources would be restored by the array of alternatives (or magnitude of restoration), is estimated using the ecosystem output model (Section 3.3.1).

## 3.4 Identifying a Tentatively Selected Plan (Agency Preferred Alternative)*

Figure 3.7 shows how the metrics used to evaluate alternatives relate to the Federal Objectives, the USACE Guiding Principles, the four Principles and Guidelines accounts, the study planning objectives and constraints, and the four P&G evaluation criteria. USACE planning policy requires ecosystem restoration planning teams to identify plans from among the array of alternatives. These plans include:

- National Ecosystem Restoration (NER) Plan: A plan that reasonably maximizes aquatic ecosystem restoration benefits compared to costs, consistent with the Federal Objectives and Guiding Principles. The plan must be shown to be cost effective to achieve the desired level of output.
- Total Net Benefits Plan: A plan that reasonably maximizes total net benefits across all benefit categories including monetized and non-monetized benefits.
- The least environmentally damaging practicable Alternative (LEDPA), as required by the Clean Water Act under Section 404 (Title 40, Part 230 of the Code of Federal Regulations (40 CFR Part 230)). For ecosystem restoration projects, the NER plan is likely the LEDPA given the definition above. The incremental cost analysis which considers objectives informs the "practicability" of the NER plan.
- A locally preferred plan in cases where the Non-Federal Sponsor requests a plan other than one of the plans listed above. In this case, the Non-Federal Sponsor did not request a different plan.

Table 3-9 summarizes the metrics used to evaluate and compare the alternative plans and indicates which alternative(s) correspond to the plans listed above. The following paragraphs discuss plan tradeoffs according to the metric evaluations displayed in the columns of Table 3-9.

Annual Average Cost. The AAC increase as the net benefits generated by each plan increase, up to Alternative 5a, which has a lower ACC than Alternatives 2 and 4a. Both Alternative 2 and Alternative 4a have a higher ACC than Alternative 5a and generate fewer benefits (average annual habitat units). For this reason, Alternatives 2 and 4a are not cost-effective and therefore eliminated from further consideration. Alternative 8 has a higher ACC than Alternative 5a and produces more ecosystem benefits.

Average Annual Habitat Units. The AAHUs increase as the net benefits generated by each plan increase from Alternative 1 through 8. The PDT observed that the ecosystem benefit model does not appear to proportionately reflect the habitat value provided by channel improvement measures such as channel creation and ditch filling, meaning that alternatives with interior

channel work may be relatively more beneficial to the environment than the AAHU scores suggest. See Channel Network Improvement, below.

Cost per Average Annual Habitat Unit. Likely due to economies of scale, the cost per AAHU for Alternatives 5a and 8 are considerably lower than those for Alternatives 2 and 4a. These average costs allow for comparison across alternative in a single unit: dollars per AAHU. On average, Alternatives 5a and 8 produce habitat units at a lower cost than other alternatives.

Significance of Resources. Each alternative addresses the same set of environmental resources, to varying degrees. As described in section 2.5, the environmental resources to be restored by the action alternatives are very significant when considered Tribally, technical, institutionally, and publicly.

Tidal marsh restored. All action alternatives restore roughly the same amount of tidal marsh, to varying degrees. The acreage of tidal marsh restored increases slightly from Alternative 2 through 8.

Channel Network Improvement. Because the ecosystem benefit model does not appear to proportionately reflect the habitat value provided by tidal channel improvement measures, the PDT added a Channel Network Improvement metric to reflect the difference in magnitude of improvements to fish channel habitat among the alternatives. Monitoring of restoration in the Snohomish estuary over the last 15 years has shown that simply restoring tidal connection without interior channel restoration does not necessarily lead to the development of new tidal channels. This index is based on the feet of channel created and enhanced by a given alternative. Percentages reported are the feet of tidal channel restored or enhanced as a percent of the total feet of channel. Higher percentages represent more fish habitat improvement. The two alternatives that include more interior channel work and ditch filling (4a & 8) score considerably higher on the Channel Network Improvement index. While over time other alternatives may eventually develop an interior channel network, there is much less uncertainty that Alternatives 4a and 8 would achieve this important juvenile salmonid habitat feature, particularly in a timely fashion. Sec 544, the legislation authorizing this project, is specifically intended to produce *immediate* and substantial ecosystem restoration, preservation, and protection benefits.

Recreation Benefits. The principal recreation feature at the site is the trail network that provides access for recreation activities such as bird watching, walking, and hunting. All alternatives retain and/or enhance some amount of trail access. The smaller Alternatives (2 and 4a), leave more of the existing trail intact and some of it improved. They retain the loop trail at the island's south end. By contrast, Alternatives 5a and 8 remove a portion of the South Cross Dike, greatly improving the habitat value of the area south of the South Cross Dike. Alternative

4a also includes two viewing areas and a hand-powered boat launch, as do Alternatives 5a and 8. Subjectively speaking, more habitat improvement (as with Alternatives 5a and 8) could mean a qualitative improvement to the recreation experience. The PDT used a more objective measure based on the amount and quality of trail available with each alternative, resulting in Alternatives 2 and 4a and scoring higher for recreation. The relative values provided in Table 3-9 are the PDT's combined scores for the alternatives with respect to the quantity and quality of trail available with each alternative; higher scores indicate better recreational opportunities.

RED Benefits. RED benefits increase proportionately with the Project First Cost of the alternatives. The larger the alternative, the greater the RED benefits. Because this project is being pursued under an ecosystem restoration authority, this factor is less influential when considering which alternative should be the TSP.

Acceptability (Implementability and Satisfaction). As discussed in section 3.3.6, when balancing recreation and ecosystem restoration values, all action alternatives would deliver a comparable degree of satisfaction to the public at large. While all alternatives have the same real estate requirements (and the land is all publicly owned), Alternatives 4a and 8 are marginally less implementable due to the construction complexity involved in the interior channel work. For "Implementability" and "Satisfaction" ratings in Table 3-9, higher numbers indicate an alternative is either more easily implemented or offers a greater degree of satisfaction to the public.

Completeness. As discussed in section 3.3.6, each alternative is complete, as each would produce its intended benefits to the ecosystem without investments outside of the scope of the alternative. As such, this consideration does not impact plan selection.

**Conclusion**. In considering the various impacts this project could have to habitat for fish and wildlife species (in particular ESA-listed species), recreational opportunities, and the regional economic impacts, ecosystem benefits carry the greatest weight given that this project is being carried out under an ecosystem restoration authority. The most notable tradeoff is trading less recreational pedestrian access for more habitat restoration. Given that considerable pedestrian access would remain with Alternative 8 (in addition to increased boating access), and that Alternative 8 would cost-effectively deliver the most ecosystem restoration benefits of any alternative with costs not exceeding the programmatic per-project Federal spending limit, the PDT selected Alternative 8 - High Restoration as the TSP. Alternative 8 is also the NER plan, the Total Net Benefits Plan, and the LEDPA.

## *Factors Considered in Plan Evaluation and Comparison*

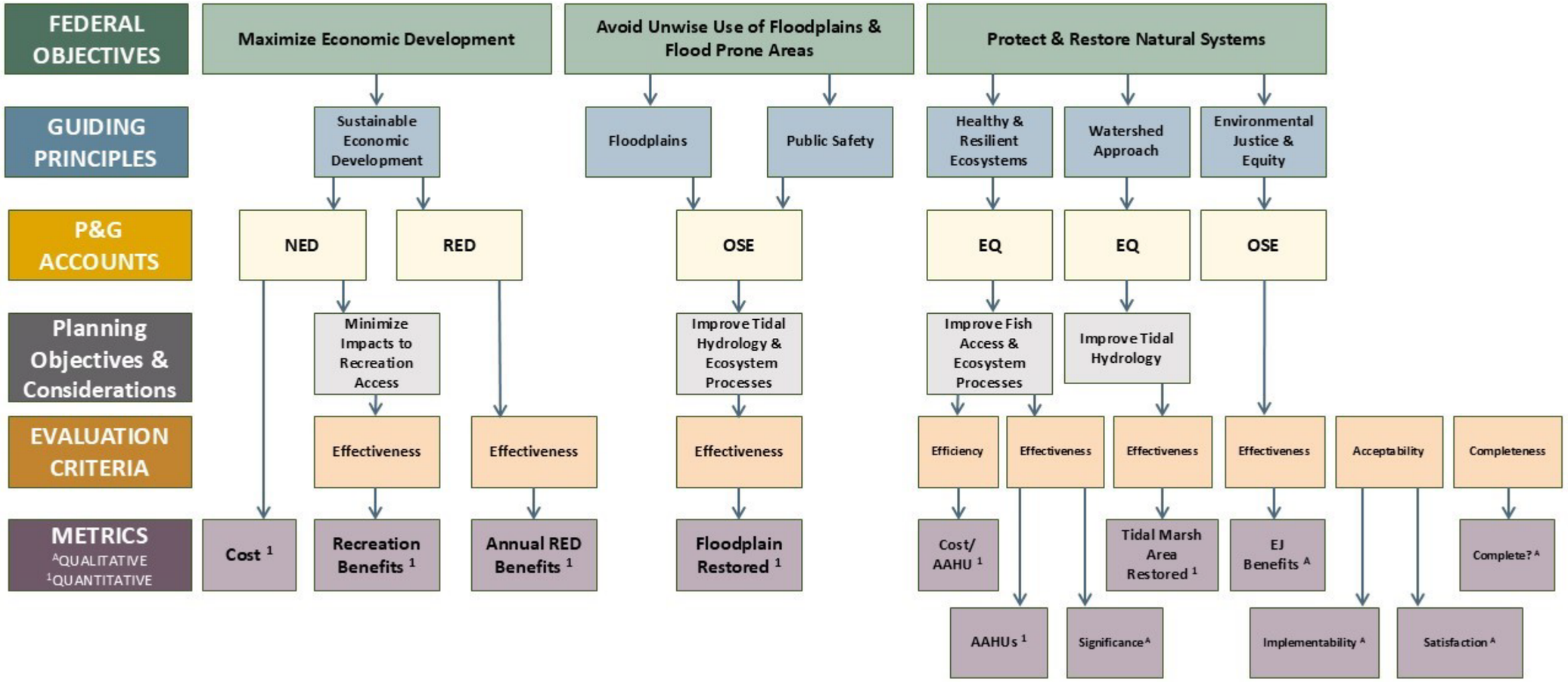


Figure 3.7. Factors Considered in Plan Evaluation and Comparison

Table 3-9. Plan Evaluation and Comparison Metrics

| | METRICS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ALTERNATIVES** | **Avg. Ann. Cost ($ '000, FY25 dollars)** | **Output (AAHUs)** | **Cost / AAHU ($ '000, FY25 dollars)** | **Significance of Outputs** | **Tidal Marsh Restored (Acres)** | **Channel Network Improvement** | **Recreation Benefits** | **RED Benefits (State Output, $ '000, FY25 dollars)** | **Implementability (1-5)** | **Satisfaction (1-5)** | **Completeness?** |
| **ALTERNATIVE 1: NO ACTION** | 0 | 0 | 0.0 | 5 | 0 | 0% | 2 | 0 | N/A | 0 | Yes |
| **ALTERNATIVE 2: MINIMUM RESTORATION** | 486 | 28.9 | 16.8 | 5 | 131.1 | 17% | 2 | 23,017 | 5 | 4 | Yes |
| **ALTERNATIVE 4A: INTERIOR CHANNEL RESTORATION** | 497 | 69.2 | 7.2 | 5 | 131.5 | 71% | 2 | 23,476 | 4 | 4 | Yes |
| **ALTERNATIVE 5A: PARTIAL SOUTH CROSS DIKE LOWERING RESTORATION** | 459 | 91.5 | 5.0 | 5 | 133.7 | 66% | 1 | 21,669 | 5 | 4 | Yes |
| **ALTERNATIVE 8: HIGH RESTORATION** [T, R, L] | 541 | 98.3 | 5.5 | 5 | 133.8 | 92% | 1 | 25,576 | 4 | 4 | Yes |

**Notes:**

1. Plan identification: T=Total Net Benefits Plan, R=NER Plan, L=Least Environmentally Damaging Practicable Alternative
2. Cost/AAHU Column: Green=Best Buy

# 4 Affected Environment and Environmental Consequences of the Alternatives*

This chapter describes the existing conditions and future without project conditions used for analysis in this study, as well as the probable environmental outcomes that would occur if each proposed alternative were implemented. Existing conditions are the physical, chemical, biological, and sociological characteristics of the study area. Characterizing resource conditions is critical for understanding the probable future condition of those resources (i.e., the future without project condition) and for defining problems and opportunities. The assessment of environmental effects is based on a comparison of conditions with and without implementation of the proposed plan and a reasonable range of alternatives; in this case, two action alternatives formulated as described in Chapter 3 are compared to the No-Action Alternative. The PSNERP FR/EIS analyzed all resources relevant to the nearshore zone and is incorporated by reference; this tiered FR/EA focuses only on the site-specific analysis required for selecting a plan at Spencer Island. The scope of analysis in this document focuses only on resources that are potentially affected by the alternatives and have a material bearing on the decision-making process without repeating analyses from the PSNERP study Table 4-1. The spatial scale of analysis focuses on Spencer Island plus the hydraulic influence around the perimeter of the island. The time scale for analysis is a 50-year period beginning in 2028, the year construction is planned to begin.

## 4.1 Alternatives Analyzed for Environmental Effects

While Chapter 3 outlines the formulation and evaluation of alternatives to identify the NER plan, Chapter 4 analyzes the environmental effects to specific resources of the identified range of reasonable alternatives to support selection of a plan for implementation. For NEPA purposes, the PDT selected the following three alternatives for more detailed environmental effects analysis: Alternative 1 – No Action, Alternative 5a – Partial South Cross Dike Lowering Restoration, and Alternative 8 – High Restoration (the TSP). Analysis of the No-Action Alternative and the Tentatively Selected Plan is required by NEPA. Analysis of Alternative 5a is included to provide a second action alternative as a point of comparison, as it represents the only other Best Buy Alternative. An overview of these alternatives follows.

### 4.1.1 Alternative 1: No-Action Alternative

The No-Action Alternative, or the future without project condition, is analyzed as the baseline condition and serves as the reference condition for comparison with the action alternatives. In this case, taking no action would result in the Spencer Island landscape remaining in its degraded condition, characterized by human-made drainage ditches and embankments

(remnant dikes) that inhibit natural ecosystem processes and rearing habitat for juvenile salmon, steelhead, and bull trout.

### 4.1.2 Alternative 5a: Partial South Cross Dike Lowering Restoration

This alternative would partially restore estuarine ecosystem processes and the associated fish and wildlife habitat at the site. It would include lowering of the Union Slough and Steamboat Slough dikes, the North Cross Dike and part of the South Cross Dike , multiple dike breaches in the Union Slough and Steamboat Slough dikes, and some starter channels at dike breaches. It would result in approximately 0.1 feet of additional flooding to restored wetlands on Smith Island during a 1% annual exceedance probability flood event. Additionally, there would be fewer total feet of pedestrian trail, with the remaining trail being of higher quality. Two viewing areas and a hand-carried boat launch would be included. This alternative does include filling or plugging the drainage ditches.

### 4.1.3 Alternative 8: High Restoration (Preferred Alternative)

This alternative differs from Alternative 5a in the following ways:

- Alternative 8 would include more dike breaches, and an additional starter channel.
- Alternative 8 would include excavation of interior channels.
- Alternative 8 would include filling of historic drainage ditches.

## 4.2 Resources Analyzed and Resources Screened from Detailed Analysis

The environmental analysis conducted as a part of the NEPA process is intended to provide the decision maker with relevant and timely information about the environmental effects of the decision and the reasonable alternatives available to mitigate those effects. Table 4-1 identifies the resources evaluated for detailed analysis with a rationale for inclusion or exclusion. The descriptions of effects in the PSNERP FR/EIS apply to the Spencer Island site because it was included in two of the action alternatives analyzed for effects. Resources are excluded from detailed analysis in this tiered FR/EA if they were already analyzed in sufficient detail in the PSNERP FR/EIS, and if they are not potentially affected by the alternatives and have no material bearing on the decision-making process. Table 4-1 provides the relevant section of the PSNERP FR/EIS in which the effects of the action are described and analyzed for significance of environmental consequences.

Table 4-1. List of Resources Considered for Detailed Effects Analysis

| Resource | Included in PSNERP (Yes/No); section of FR/EIS | Site-specific effects not already considered | Rationale for inclusion or exclusion from detailed analysis |
|---|---|---|---|
| Hydraulics and Geomorphology | Yes; 5.1.1 | Local effects of restoring aquatic habitat connectivity | Included: key component of restoration goals |
| Groundwater | No | No | Excluded: No effects from proposed action |
| Water Quality | Yes; 5.1.6 | No | Excluded: no more than short-term, minor, localized effects from construction minimized through Best Management Practices (PMPs) |
| Air Quality | Yes; 3.5.2 | No | Excluded: no more than short-term, minor, localized effects from construction minimized through BMPs |
| Gas Emissions | Yes; 5.1.7 | No | Included: updated regulations require analysis; however, emissions would be a negligible contribution to the enormity of global GHG emissions |
| Noise | Yes; 3.5.6 and 5.1.8 | No | Excluded: no more than short-term, minor, localized effects from construction minimized through BMPs |
| Hazardous, Toxic, and Radiological Waste | Yes; 5.1.5 | Potential presence of arsenic in soils | Included: potential presence of contamination requires investigation and design considerations |
| Fish | Yes; 5.2.3 | Yes | Included: The goal of the restoration is to enhance fish habitat, which necessitates a comparison of the various alternatives. |
| Wildlife and Marine Mammals | Yes;<br><br>5.2.4 Birds | Yes | Included: This project would result in a reduction of riparian habitat, and an analysis would be required to minimize the impacts across the different alternatives. Marine mammals would not be included |

| Resource | Included in PSNERP (Yes/No); section of FR/EIS | Site-specific effects not already considered | Rationale for inclusion or exclusion from detailed analysis |
|---|---|---|---|
| | 5.2.5 Marine Mammals | | since the project location is too far upstream in the-estuary. |
| Benthic Invertebrates | Yes; 5.2.2 | No | Excluded: no more than short-term, minor, localized effects from construction minimized through BMPs |
| Vegetation | Yes; 5.2.1 | Yes | Included: Up to approximately 400 trees would be removed in this proposed action and could affect ecosystem functions. |
| Threatened and Endangered Species | Yes; 5.2.7 | No | Excluded: no more than short-term, minor, localized effects from construction minimized through BMPs covered by programmatic BiOp |
| Invasive Species | Yes; 5.2.6 | No | Excluded: invasive plant species on site would be cleared and replaced with no significant impacts to the ecosystem |
| Cultural Resources | Yes; 5.3.1 Archaeological Resources and 5.3.2 Historic Buildings and Structures | Archaeological resources identified on site | Included: construction and resulting hydrology and geomorphology have potential to affect known archaeological resources |
| Aesthetics | Yes; 3.5.3 | No | Excluded: no noticeable change to aesthetic values of the deltaic island |
| Recreation Resources | Yes; 5.4.2 | Length of walking trails and access to site may change | Included: action alternatives may affect access to site and usage patterns of various interest groups including waterfowl hunters and birdwatchers |
| Public Services and Utilities | Yes; 3.5.5 | No | Excluded: no public services or utilities would be affected |

| Resource | Included in PSNERP (Yes/No); section of FR/EIS | Site-specific effects not already considered | Rationale for inclusion or exclusion from detailed analysis |
|---|---|---|---|
| Public Health and Safety | Yes; 5.4.5 | No | Excluded: no reduction to public safety |
| Land-based Transportation and Traffic | Yes; 5.4.4 | No | Excluded: site access is covered in recreation resources; no transportation or traffic resources would be affected |

## 4.3 Hydrology, Hydraulics and Geomorphology

Existing hydrologic, hydraulic conditions, and geomorphic conditions are discussed in this section. Hydrologic conditions are related to tidal elevations and fluctuations, river flow rates and frequencies, inundation frequencies; hydraulic conditions are related to velocities, depths, elevations; and geomorphic conditions, largely shaped by hydrologic and hydraulic conditions, are related to sedimentation, erosion, and associated landforms. How those conditions would change over the 50-year period of analysis with implementation of the No-Action Alternative or either of the two action alternatives is included in Sections 4.3.1 through 4.3.3 below. This information is based on a combination of compiled site data, studies by others, GIS analysis and numerical modeling performed as part of this project (Appendix B).

Spencer Island is located in the Snohomish River estuary where freshwater river outflows meet and mix with incoming seawater from Puget Sound. The island is located between two Snohomish River distributary channels (Union Slough to the west and Steamboat Slough to the east). The interior tidal marsh within the island is connected to the river sloughs through breaches in the remnant dikes that ring the island. The slough channels and interior island channels and drainage ditches experience daily tidal fluxes from Puget Sound. Due to the difference in channel length and size between the mainstem river and distributary channels, high and low tides occur at slightly different times in the two sloughs. This results in dynamic conditions where upstream and downstream tidal fluxes can occur simultaneously in the mainstem and slough channels on incoming and outgoing tides depending on the location and phase of the tide cycle. This creates dynamic tidal water mixing conditions within the island. Spencer Island is also subject to frequent river (fluvial) flooding from the Snohomish River basin, which drains the combined flows of the Snoqualmie, Skykomish, Tolt, Sultan and Pilchuck Rivers.

Tidal and riverine flows within the island are currently restricted by the remnant dikes ringing Spencer Island, as well as the South Cross Dike. Flow into the island is concentrated at the main dike breach along the northeast side of the Steamboat Slough dike. At lower tides, flow within the island is concentrated in remnant drainage ditches. Concentrated flows are often at speeds that limit access by juvenile salmon, and large portions of the island are frequently inaccessible to juvenile salmon and other aquatic species. Mixing of freshwater riverine flows and saltwater tidal flows is limited, which could lead to less uniform transitioning of salinity gradients across the site.

Daily tidal fluctuations, coastal and riverine flood frequency and elevations (hydrologic forcings, or forces responsible for causing erosion and sedimentation) are expected to remain essentially the same within Union Slough and Steamboat slough for all alternatives but vary significantly within Spencer Island depending on the alternative. Tidal elevations are expected to continue to rise into the future trending with sea level rise and associated predicted global temperature increases (Snover et al., 2019). Riverine hydrology is predicted to be altered by increased fall and winter precipitation intensity and runoff, with a reduced mountain snowpack. This would increase fall and winter flood peaks and reduce spring and summer snowmelt runoff. Sediment loads would likely increase because of increases in peak streamflow in the basin. There are no large dams now nor are there likely to be any in the foreseeable future on the Snoqualmie or Skykomish River basins that would affect stream flows or sediment loads.

Refer to the Hydrology, Hydraulics, and Coastal Engineering annexes in the Engineering Appendix for supporting information (Appendix B).

### 4.3.1 Alternative 1: No-Action Alternative

Under the No-Action Alternative (also known as the future without project condition), hydrologic conditions remain as described in Section 4.3 above. The hydraulic and geomorphic conditions would be as follows: Spencer Island would remain connected to Steamboat and Union Slough via existing dike breaches and possibly new dike breaches if they form naturally along Steamboat Slough north of the South Cross Dike. Dike breaches that form along the dike segments would reduce public trail access. Existing bridges found near the South Cross Dike would experience increased overtopping and damage due to higher tide levels and riverine flooding. The bridges would likely require multiple repairs or possibly replacement over the 50-year period of analysis. The South Cross Dike would likely require frequent repair due to overtopping and erosion damage, potentially resulting in additional dike breaching.

Most of the daily tidal exchange for Spencer Island would continue to occur in the main breach channel along Steamboat Slough, less so along other breaches/channels. The concentration of tidal flow in this very large breach and connected ditches detrimentally affects fish access and

residence time within the island. This impairment would continue unless enough dike breaches developed naturally to redistribute the tidal flows; that would likely not occur until well after the 50-year period of analysis. A second major tidal channel on the island intersects the South Cross Dike. This channel is spanned by a pedestrian bridge that would remain. The bridge and riprap lined channel underneath impedes fish passage due to excessive velocities and shallow depths.

Sedimentation rates in Union Slough would continue to be greater than along Steamboat Slough due to ongoing diversion of flows that would otherwise cross Spencer Island from Steamboat Slough into Union Slough but for the presence of the remnant dikes, as well as complex tidal hydrology that creates a focal point for sediment deposition. This trend would persist and daily flows within Union Slough would decrease over time relative to Steamboat Slough, which would reduce tidal exchange with the island to and from Union Slough.

The island marsh would continue to drain through the old agricultural ditch network to the tidal channels and sloughs. The locus of erosion would migrate slowly up the ditch network, maintaining degraded conditions for fish passage and residence. The eroded ditches would eventually more closely resemble a natural dendritic channel condition over time; however, the slow rate of erosion suggests that there would not be substantial improvement over existing conditions in the period of analysis. Poor habitat conditions would perpetuate far into the future as the natural habitat recovery rate is predicted to be very slow and not necessarily result in conditions that would be optimal for salmon.

Persistence of dikes that divert water, nutrients, sediment, and large wood away from the island would continue to degrade island habitats, natural processes, and hydrology. The dikes displaced most of the forested tidal swamp habitat along the perimeter of the island creating optimal habitat for invasive plant species, which would persist and likely flourish under changing climate.

Marsh vegetation communities would continue to adjust to daily tidal fluxes, marsh geomorphic changes, coastal and riverine floods, and changes in the salinity regime caused by completed restoration projects in the vicinity, and as sea level rises. Slow conversion from fresh/ brackish tidal marsh to salt marsh and tide flat/open water is expected during the period of analysis.

Floodplain inundation would increase over time throughout the estuary and delta due to sea level rise and increased river runoff. Spencer Island is wholly within the mapped FEMA 100-year floodplain and this condition would not change.

In summary, under the No-Action Alternative, restoration of aquatic habitat conditions within the island would be left to nature to influence and change over time. Because the natural conditions within the island have been so altered by the dikes and drainage ditches, natural recovery could take many decades or more and not necessarily result in desired conditions, particularly for salmon.

### 4.3.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

Alt 5a would lower dikes and add additional dike breaches in the remnant dikes on Spencer Island. These actions would redistribute tidal flow from existing breaches to new breaches and naturalize river overflows into tidal wetlands (primarily marsh) on Spencer Island and Smith Island. Inflows of water, sediment and organic material would also be naturalized. Excessive velocities that impede fish passage would be reduced. Areas within the island that receive little natural disturbance (i.e. habitat forming processes), due to the presence of dikes would be reinvigorated through restored hydrology. The dike lowering would increase hydrologic connection between Spencer Island, the sloughs, and adjacent tidal marshes, primarily on Smith Island. The wetland habitat on Smith Island would benefit from increased hydrologic connectivity to Spencer Island. This is considered an incidental beneficial effect for this study and it is not accounted for as part of the plan formulation process.

Average daily hydrologic conditions in Union Slough and Steamboat Slough would generally remain as described above for the No Action Alternative. Within and adjacent to Spencer Island, the future with project hydraulic and geomorphic conditions are anticipated to be as follows: Spencer Island would become significantly more connected to Steamboat and Union Slough via existing and newly constructed breaches and channels. Breaches that may naturally form along the dike segments that have active pedestrian trails would likely to be repaired by WDFW or Snohomish County, preserving pedestrian access and maintaining altered hydrology. Two existing bridges near the South Cross Dike that would otherwise experience increased overtopping frequency due to increasing sea levels and runoff would be removed as part of this alternative. The most vulnerable portion of the South Cross Dike that would require frequent repair due to overtopping and erosion damage would be removed, eliminating a major fish barrier.

As with the No-Action Alternative, most of the daily tidal exchange would continue to occur in the main breach channel along Steamboat Slough, however the addition of dozens of additional connections (breaches) would redistribute this water around the island, reducing excessive velocities near the main breach. Sedimentation rates in Union Slough relative to those in Steamboat Slough would be reduced as flood flows would more naturally cross Spencer Island into Union Slough, mobilizing stored bed sediments in Union Slough. Modeling does not indicate that widespread erosion would occur within Spencer Island or adjacent areas.

The drainage of the island marsh through the existing ditch network would be similar as that described for the No-Action Alternative. The new breaches would lead to reduced erosion in the ditch network compared to the No-Action Alternative. The ditch would likely persist much in the current configuration for decades.

Removal of dikes that divert water, nutrients, sediment, and large wood away from the island would beneficially restore island habitats, natural processes, and hydrology. Conditions impacting marsh vegetation would be similar as described for the No-Action Alternative. Salinity and temperature drivers would be similar for Alternative 5a as that describe for the No-Action Alternative. Dike breaching and channel construction would allow freshwater from the sloughs to enter the island along most of the perimeter, providing a substantial improvement in fish access. Risks would remain for fish to be drawn into ditches and flushed out in tide cycles.

Floodplain inundation over time is expected to be similar for Alternative 5a as for the No-Action Alternative. Dike removal would not significantly alter flood elevations or water levels in the sloughs for daily conditions, tidal floods, and frequent river floods. During infrequent flood events, it would result in approximately 0.1 feet of additional flooding to restored wetlands on Smith Island during a 1% annual exceedance probability flood event. Velocities during flood would remain below thresholds for erosion due to deep inundation present throughout Spencer and Smith Island tidal wetlands and enlargement of breaches to widths characteristic of natural tidal channels.

In summary, under Alternative 5a, restoration of aquatic habitat conditions is intentionally influenced with the proposed work. This alternative hastens natural habitat recovery but does not address much of the negative influences associated with the interior drainage ditches that negatively affect salmon access and use of the island habitat. This alternative relies on a fair amount of natural habitat recovery following project construction, which could take decades to achieve.

### 4.3.3 Alternative 8: High Restoration (Preferred Alternative)

Under Alternative 8, hydrologic conditions would be similar to those described for Alternative 5a. Most of the tidal exchange would continue to occur in the main breach channel along Steamboat Slough; however, the addition of dozens of additional breaches, along with new tidal channel construction and ditch blocks, would redistribute water flows around the island, significantly reducing excessive velocities near the main breach.

Impacts to sedimentation rates in Union Slough would be similar as described for Alternative 5a. The island marsh would drain through the primary tidal channels. These constructed tidal channels would be at widths and depths that significantly reduce velocities and erosion. This alternative includes blocking ditches to reinforce a more natural distribution of water flow. The

main breach channel would be widened and made shallower to reduce velocities. Conditions for fish access and residence would dramatically improve, both at the main breach and the South Cross Dike. The remnant portions of unfilled ditches would become part of a more natural dendritic channel network.

Conditions impacting marsh vegetation would be similar as described for the No-Action Alternative. Salinity and temperature drivers would be similar for Alternative 8 as that describe for Alternative 5a. Since the marsh network would be restored with Alternative 8, fish residency would be significantly improved. Floodplain conditions would be similar for Alternative 8 as those described for Alternative 5a. As with Alternative 5a, flood velocities are expected to remain below thresholds for erosion due to enlargement of breaches to widths characteristic of natural tidal channels.

The key difference between Alternative 5a and Alternative 8 is that Alternative 8 builds upon Alternative 5a with the addition of ditch and channel work within the island. This additional work is essential for hastening improvement of habitat, access to that habitat, and habitat forming processes for the benefit of salmon and other aquatic species. This additional work would purposely restore more natural hydrology within the island within the shortest time period through strategically influencing within-island water flows and velocities. Much of the hydrologic issues that negatively affect salmon would be improved immediately following construction.

## 4.4 Air Quality and Gas Emissions

The Clean Air Act establishes National Ambient Air Quality Standards (NAAQS) to regulate harmful pollutants (42 U.S.C. § 7403). NAAQS are established for six common air pollutants: ozone, carbon monoxide, nitrogen dioxide, particulate matter (solid and liquid particles suspended in the air), sulfur dioxide, and lead. Areas that persistently exceed the standards are designated as nonattainment areas. Snohomish County is not currently classified as a nonattainment area and air quality is regulated by the Puget Sound Clean Air Agency (Ecology 2024). The EPA establishes de minimis thresholds for pollutants in nonattainment and maintenance areas (40 C.F.R. § 93.153). Once a nonattainment area has attained and maintained NAAQS, it may be redesignated as a “maintenance area”. According to the Washington State Department of Ecology, all areas of Washington, except a small area in Whatcom County, currently meet air quality standards (Ecology 2024) meaning the project is in an attainment area.

Emission and accumulation of atmospheric gasses contribute to climate change by absorbing energy and slow the rate at which energy, such as heat or light, escapes into space, essentially

insulating and warming the Earth. Emissions are often reported in carbon dioxide ($CO_2$) equivalent ($CO_{2e}$), which provides a common unit of measure to compare different gas specie emissions to account for the ability of various gasses to absorb different amounts of energy. Anthropogenic emissions have contributed to inordinate global-scale changes to climate, including significant increasing trends in global temperatures; 2024 was the warmest year on record (NOAA 2025). The concern for Federal projects is whether the contribution of emissions to the atmosphere would be of sufficient magnitude to outweigh the benefits of implementing the proposed action. The most recent estimates (2021) of annual atmospheric emissions for Washington State were 96.1 MMT CO2e (Ecology 2025) and in 2019, Snohomish County reported 6.8 MMT CO2e (Snohomish County 2022).

The project area and its surroundings were historically developed for agriculture in the past, but the area is currently used as a park for recreation with a water treatment plant nearby.

For the Spencer Island Ecosystem Restoration Project, emission analyses were conducted to estimate total emissions from construction activities in Table 4-2 and $CO_2$ equivalence ($CO_2$ eq) in Table 4-3.For all alternatives, none of the resulting emission rates would approach the EPA's emission thresholds (Table 4-2). Additional design changes may be required to keep the project within funding limits. Therefore, the final emission rates could differ from the reported rates below. However, these design changes are expected to be minor and the overall magnitude of emissions would likely remain similar.

**Table 4-2. Total Emissions Summary**

Summarizes total emissions in metric tons (MT) for particulate matter (PM 2.5 and PM 10), Carbon monoxide (CO), Carbon Dioxide (CO2), Reactive Organic Gases (ROG), Methane (CH4), Nitrogen Oxide (NOx), and Sulfur Dioxide (SO2). The total emissions are reported for the various alternatives analyzed in this project and are compared to the Environmental Protection Agency's de minimis standards.

| Alternatives | PM 2.5 (MT) | PM 10 (MT) | CO (MT) | $CO_2$ (MT) | ROG (MT) | $CH_4$ (MT) | $NO_x$ (MT) | $SO_2$ (MT) |
|---|---|---|---|---|---|---|---|---|
| Alternative 5a | 0.67 | 0.66 | 4.68 | 2,225 | 0.84 | 0.05 | 10.13 | 0.01 |
| Alternative 8 (Preferred Alternative) | 0.74 | 0.75 | 5.43 | 3,602 | 0.99 | 0.07 | 11.4 | 0.01 |
| EPA de minimis standards | 100 | 100 | 100 | N/A | 100 | N/A | 100 | 100 |

**Table 4-3. Carbon Dioxide Equivalence**

Represents the carbon dioxide equivalence ($CO_2e$) in metric tons (MT) for $CO_2$, methane ($CH_4$), Nitrous Oxide ($N_2O$), and for the total $CO_2$ equivalence for the various alternatives analyzed in this project.

| Alternatives | $CO_2$ (MT) | $CH_4$ $CO_{2e}$ (MT) | $N_2O$ $CO_{2e}$ (MT) | Total $CO_{2e}$ (MT) |
|---|---|---|---|---|
| Alternative 5a | 2,224.87 | 1.52 | 12.94 | 2,239.33 |
| Alternative 8 (Preferred Alternative) | 3,601.80 | 1.96 | 16.65 | 3,620.48 |

**Table 4-4. Net Emissions**

Represent the net emissions for carbon dioxide (CO2), methane (CH4), carbon dioxide equivalence (CO2e) in metric tons (MT) for all alternatives analyzed for this project.

| Alternatives | $CO_2$ (MT) | $CH_4$ (MT) | $N_2O$ (MT) | $CO_{2e}$ (MT) |
|---|---|---|---|---|
| Alternative 5a | -1,582 | 1 | 1 | -1,339 |
| Alternative 8 (Preferred Alternative) | -2,743 | 2 | 1 | -2,346 |

### 4.4.1 Alternative 1: No-Action Alternative

The No-Action Alternative there would be no direct effect on air quality. However, emissions would continue to from wetlands that currently exist on site. The site currently contains approximately 202 acres of emergent wetlands and approximately 80 acres of intertidal areas. The emissions associated with the No-Action Alternative were not quantified, because wetlands would not be affected under this alternative, and excluding these emissions simplifies the comparison of emissions among alternatives.

### 4.4.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

The emission rates estimated for this alternative would be de minimis when compared to EPA's emission thresholds (Table 4-2). Short-term increases in emissions would occur during construction. However, overtime, Spencer Island would be expected to function as a net $CO_{2e}$ sink, as the Partial South Cross Dike Alternative would convert approximately 26.6 acres of upland dikes to emergent wetland habitat. If this alternative were implemented, $CO_2$ would be sequestered at an estimated rate of approximately 76 MT of $CO_2$ per year. At the rate, approximately 29 years would be required for Spencer Island to sequester the $CO_2$ emissions generated by implementing this alternative.

### 4.4.3 Alternative 8: High Restoration (Preferred Alternative)

The Preferred Alternative would have effects on air quality similar to those described for Alternative 5a; however, estimated emissions would be approximately 1.7 times greater than those associated with Alternative 5a.

## 4.5 Hazardous, Toxic, and Radioactive Waste

The Everett Smelter, located about a mile northwest of Spencer Island, was identified as a source of concern through a standard Phase 1 Environmental Site Assessment. The Smelter, though it was decommissioned in 1912, spread large quantities of arsenic and lead via wind dispersal. In the early 2000s, the Washington State Department of Ecology (DOE) completed soil remediation in the immediate vicinity of the former smelter. The cleanup did not extend to Spencer Island because the potential contamination was not found to be a substantial enough risk to human health or the environment to warrant cleanup action.

In 2024, out of an abundance of caution, a Phase 2 Environmental Site Assessment was completed to help characterize the nature and extent of potential arsenic contamination associated with the historical smelter operations. The results of the Phase 2 assessment found that arsenic levels in soil and sediment samples were below Washington State cleanup levels. Arsenic concentrations ranged between 2.5 ppm and 33 ppm with a site-wide average of 17.45 ppm. The concentrations were low enough to satisfy both the state criteria of 57 ppm under the Washington State Sediment Management Standards (SMS) and the criteria of 20 ppm under Washington's Model Toxic Control Act (MTCA). The more restrictive standard of 20 ppm under MTCA applies to upland soil and all arsenic concentrations that were above 20 ppm were located in sediment areas subject to the 57 ppm standard.

Additionally, PAHs were sampled in an isolated portion of Spencer Island due to the presence of a derelict vessel, which has since been removed. All PAH samples were below Washington State SMS cleanup standards.

Contaminant thresholds were found to be below all relevant state criteria and are therefore not material to planning considerations.

If the regulatory agencies subsequently determine that further investigation or remedial response under CERCLA or other applicable Federal or State environmental laws, those activities would be a responsibility of the non-Federal sponsor and would be coordinated with, and subject to the approval of, EPA or other regulatory agency. Should a regulatory agency make such a decision, the non-Federal sponsor will be fully responsible for coordinating those efforts prior to USACE proceeding with the ecosystem restoration project.

### 4.5.1 Alternative 1: No-Action Alternative

This alternative would have no effect to HTRW on Spencer Island. Any contaminants within the soils on site would remain undisturbed.

### 4.5.2 Alternative 5a: Partial South Cross Dike Lowering Restoration

Conditions remain similar as discussed in 4.5 HTRW, indicating contaminants are below threshold concentrations.

### 4.5.3 Alternative 8: High Restoration (Preferred Alternative)

Conditions remain similar as discussed in 4.5 HTRW, indicating contaminants are below threshold concentrations.

## 4.6 Fish

The site currently has limited tidal floodplain, marsh, and channel connectivity due to levees that were built by the previous landowner, which restrict access to and degrade the quality of fish habitat. Since the goal of the restoration is to enhance fish habitat, the PDT evaluated a range of alternatives that consider varying levels of connectivity improvements, as fish need access to habitat across all water levels. The effects of these alternatives would be expected to primarily impact anadromous fish such as ESA-listed Chinook, steelhead, and migratory bull trout but would have minimal effects on benthic and forage fish. This is because the project is located further up the estuary, where salinity ranges from 0 to 17 ppt, a range that is not conducive to most benthic or forage fish habitats. Additionally, the site lacks deepwater and reef-associated habitats that support rockfish, as Spencer Island is bordered by two sloughs rather than deep marine waters. Submerged aquatic vegetation is limited, and the site is instead characterized by tidal marsh habitat.

### 4.6.1 Alternative 1: No-Action Alternative

This alternative would not achieve the project's objectives of improving fish access or restoring ecosystem processes that support fish habitat. Spencer Island would remain inaccessible to fish during both high and low water events, as there are only a few breaches connecting the island to the surrounding sloughs. With limited breaches, water flows in and out of the island too quickly, creating velocities that are too fast for juvenile salmon. If this issue is not addressed, Spencer Island would continue to lack the necessary conditions to function as quality habitat for salmonids.

### 4.6.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

Under this alternative, extensive lowering of levees and the creation of breaches would be incorporated into the project’s design, ultimately benefiting fish habitat access during most tide levels. However, during low tide, fish habitat improvements would be limited due to the

restricted work on tide channels. The tide channels were originally constructed as channelized ditches by the previous landowner to flush water from the island and resulted in water velocities that are too fast for fish access to Spencer Island during low tide. These impacts would primarily affect fish during extremely low tides in the summer and winter. This alternative would require the removal of approximately 400 trees at Spencer Island, which currently provide shade and indirectly supply food for salmonids from insects that fall from the trees. A replanting plan would be implemented to offset the vegetation loss; however, the new tree plantings would take time to reestablish and plantings would be concentrated in specific areas, rather than widely distributed.

### 4.6.3 Alternative 8: High Restoration (Preferred Alternative)

The High Restoration Alternative includes design elements aimed at improving tidal marsh, floodplain, and channel connectivity, which would have positive impacts on fish at all water levels. Compared to Alternative 5a, this alternative would involve extensive tide channel work, enhancing access to fish habitat at Spencer Island during low tide events. Overall, this alternative significantly increases water connectivity at Spencer Island at a larger scale, providing greater benefits for fish and ESA-listed salmonids than any other alternative. While there would be vegetation impacts under this alternative, the project prioritizes aquatic habitat for fish over riparian habitat for wildlife.

## 4.7 Wildlife

This project would result in a reduction of riparian habitat, necessitating an analysis to minimize impacts across various alternatives. Marine mammals are not included in this analysis, as the project area is located too far upriver in the estuary and is too shallow to support their habitat requirements (Figure 1.1). The predominant wildlife at Spencer Island consists of bird species that rely on estuarine and riparian habitats. Birds also contribute to the recreational value of Spencer Island, as WDFW has designated the northern half of the island as hunting grounds. Amphibians are also present, as much of the area consists of wetland habitat. During field visits, the PDT has observed terrestrial mammals, such as beavers in the area. Currently, the riparian habitat spans approximately 26.6 acres, but it is narrow and elongated, as it is situated on the man-made levees constructed by the previous owner of Spencer Island.

### 4.7.1 Alternative 1: No-Action Alternative

This alternative would not fulfill the project's objective of restoring ecosystem processes, structures, and functions in the aquatic environment. While it may offer greater benefits for terrestrial mammals and birds by preserving riparian habitats and trees, the project prioritizes aquatic habitat restoration over riparian habitat.

### 4.7.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

Under this alternative, contractors would need to reduce the area of the existing 26.6 acres area of riparian habitat to approximately 3.5 acres of riparian habitat to address the goals under this alternative. While contractors would replant the remaining riparian area with native species, there would be a significant temporal loss of habitat function. The existing riparian habitat is primarily composed of deciduous trees which are generally fast growing. Therefore, the newly planted deciduous trees and shrubs would require 10 to 15 years re-establish habitat functions. There are some coniferous trees that contractors would need to remove and replanting those trees would most likely take more than 20 years to replicate the habitat functions that would be lost. Consequently, this temporary, but long-term reduction in habitat quality would negatively impact birds and terrestrial mammals that rely on mature riparian ecosystems. Conversely, amphibians may benefit as water connectivity would be greater and would allow them to access a greater range of habitats. This alternative reflects the project's primary goal of prioritizing habitat creation for fish over the preservation of existing riparian habitat for terrestrial wildlife.

### 4.7.3 Alternative 8: High Restoration (Preferred Alternative)

The High Restoration Alternative would similarly reduce the riparian habitat like Alternative 5a but to a spatial area of 5.4 acres. The quantitative loss and temporal impacts would be the same under the Preferred Alternative but under a slightly smaller scale due to the differences in riparian habitat loss.

## 4.8 Vegetation

***Emergent Wetland Vegetation***

Spencer Island contains approximately 202 acres of emergent wetlands and approximately 80 acres of unvegetated intertidal areas. The emergent wetlands are dominated by narrow leaf cattail, Lyngbye's sedge, and reed canarygrass. Only Lyngbye's sedge is native to the Snohomish Estuary. Other non-native species include purple loosestrife and cordgrass (*Spartina* spp.).

***Riparian Vegetation***

Spencer Island hosts approximately 26.6 acres of upland and riparian habitat occupied by about 400 trees and scattered patches of shrubs. Approximately 46 of those trees are native conifers such as Douglas-fir, western hemlock, and Sitka spruce ranging from saplings to approximately 1.5 feet diameter at breast height. The riparian vegetation is primarily located on the dike slopes. The fill used by previous farmers for the dike converted wetlands to uplands. Most of the riparian woody vegetation observed at Spencer Island consists of deciduous trees, including red alders, Pacific willows, and cottonwoods. Additionally, there are patchy shrubs throughout

the site, such as red osier dogwood, salmonberry, and hardhack. Invasive plant species include Himalayan blackberry, Scot's broom, knotweed, and tansy ragwort.

### 4.8.1 Alternative 1: No-Action Alternative

This alternative would not fulfill the project's objective of restoring ecosystem functions and structures that support vegetation. Riparian vegetation would remain sparse and/or dominated by non-native species, as the lack of floodplain and tidal connectivity at Spencer Island disrupts sediment dynamics and tidal hydrology.

### 4.8.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

Approximately 400 trees and interspersed shrubs within the existing riparian habitat would be removed due to lowering dikes and breaching dikes to fulfill this alternative's objectives (Section 3.2.2). The only remaining riparian habitat would be an improved trail area which contractors would construct along the southwestern part of Spencer Island. This riparian habitat and trail system would be approximately 3.5 acres and would be replanted with approximately 378 trees and 3,008 shrubs of native species established on-site and in nearby areas (Appendix E). Under this alternative, the USACE has prioritized flood refuge and aquatic habitat that would benefit ESA-listed salmonids over upland, riparian vegetation.

### 4.8.3 Alternative 8: High Restoration (Preferred Alternative)

Implementing the Preferred Alternative would result in approximately 5.4 acres of riparian habitat, representing a smaller overall vegetation disturbance footprint than Alternative 5a. Vegetation removal associated with dike lowering and breaching would therefore occur at a reduced scale, while still supporting the alternative's restoration objectives. Although tree and shrub removal would result in short-term impacts to riparian functions, the majority of removed vegetation consists of deciduous species that typically reestablish more rapidly than coniferous trees (approximately 10 to 15 years). Shrub species also exhibit relatively fast growth rates, further limiting the duration of adverse effects. As a result, impacts to riparian vegetation under the Preferred Alternative would be primarily short term and would be offset by the long-term benefits of increased flood refuge, enhanced aquatic habitat conditions.

## 4.9 Cultural Resources

Cultural resources are evidence on the physical landscape of past human activity, occupation, or use and include archaeological sites such as lithic scatters, villages, procurement areas, resource extraction sites, rock shelters, rock imagery, shell middens; submerged resource types such as fish traps, weirs, or watercraft; historic era sites such as trash scatters, homesteads, railroads, ranches, logging camps; and any structures over 50 years old. Cultural resources include traditional cultural properties, which are aspects of the landscape that are a part of traditional lifeways and practices and are considered important to a community. Historic

properties managed under Section 106 of the National Historic Preservation Act (NHPA) are those listed or eligible for listing in the National Register of Historic Places (NRHP). Eligible properties must be at least 50 years old and possess integrity of fundamental characteristics, meaning it must "possess integrity of location, design, setting, materials, workmanship, feeling and association" (36 CFR 60.4). Finally, an historic property must be significant under one or more of the following criteria.

- Criterion A: be associated with events that have made a significant contribution to broad patterns of our history.
- Criterion B: be associated with the lives of persons significant to our history.
- Criterion C: embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: have yielded, or may be likely to yield, information important in prehistory or history.

For the Spencer Island project, USACE coordinated its environmental review of impacts on cultural resources for NEPA with its responsibilities to consider effects on historic properties as required by the NHPA and its implementing regulations, 36 C.F.R. § 800. USACE determined and documented the area of potential effects (APE) for both direct and indirect effects. The APE includes the footprint of the ecosystem restoration efforts on Spencer Island, and possible staging areas and access routes. The Washington State Historic Preservation Officer (SHPO) agreed with USACE's determination of the APE in March 2023, and an updated APE in February 2024.

In 2023, USACE conducted a field investigation, literature review, and a review of the Washington Information System Architectural and Archaeological Records Data (WISAARD) database. During the WISAARD database search, one previously identified archaeological site (SN0042) and one built environment property (Spencer Island Levee) were located within the APE. Two previous cultural resources studies were conducted within the APE and nine were conducted within a half-mile radius of the APE.

USACE archaeologist sent letters via email to the Sauk-Suiattle Indian Tribe, the Snoqualmie Indian Tribe, the Swinomish Indian Tribal Community, the Stillaguamish Tribe of Indians, the Tulalip Tribes, and the Confederated Tribes and Bands of the Yakama Nation on March 1, 2023, and February 6, 2024. The letters requested assistance in identifying properties which may be of religious or cultural significance or other concerns with historic properties that may be affected by the project. USACE has not received a response from any tribe to date.

USACE archaeologists conducted a surface survey of accessible areas within the APE in 2023. Remnants of the Spencer Island Levee and Ditch Complex, Jackknife Bridge, and historic remains of a tractor were identified. No evidence of SN0042 was found during the survey, although two separate attempts were made to access it. USACE updated and evaluated all four cultural resources identified within the Project APE for eligibly on the NRHP. USACE determined that all four cultural resources are not eligible for the NRHP.

Results from the field investigation, literature review, and evaluations were compiled in a cultural report. USACE submitted the report and a letter documenting a finding of no historic properties affected by the undertaking to SHPO on March 7th, 2024. SHPO provided concurrence with USACE's finding of no historic properties affected with the stipulation of an inadvertent discovery plan on June 4th, 2024 (Appendix D). SHPO also concurred with USACE's determination that all four cultural resources identified within the APE are not eligible for the NRHP.

In the summer of 2025, USACE archaeologists conducted a surface survey of accessible areas within an APE addition on Smith Island in which no new cultural resources were identified. USACE updated the historic property inventory form and evaluated the Smith Island Dike and Ditch Complex for the NRHP. USACE determined that the Complex is not eligible for listing on the NRHP. On October 9, 2025, USACE sent updated letters to the aforementioned Tribes and received no response. As a result of identification, evaluation, and determination of historic properties efforts within the APE addition on Smith Island, USACE continues to find that no historic properties would be affected by the proposed undertaking. On October 20th, 2025, the WA SHPO concurred with USACE's finding and determination of eligible for the Smith Island Dike and Ditch (Appendix D).

### 4.9.1 Alternative 1: No-Action Alternative

With the No-Action Alternative, effects to historic properties would be the same as the existing condition. No construction activities would occur because of the No-Action Alternative. No significant impacts to cultural resources are expected under the No-Action Alternative. This alternative would have no effect on any cultural resources.

### 4.9.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

Under this alternative, there would be ground-disturbing activities within the Spencer Island Levee and Ditch Complex. USACE determined that the Spencer Island Levee and Ditch Complex is not eligible for the NRHP and that there would be no effect to it. Material and heavy equipment would be transported across Jackknife Bridge. USACE determined that Jackknife Bridge is not eligible for the NRHP and that there would be no effect to it.

### 4.9.3 Alternative 8: High Restoration (Preferred Alternative)

Under this alternative, there would be ground-disturbing activities within the Spencer Island Levee and Ditch Complex and heavy equipment transported across Jackknife Bridge. Impacts under this alternative would be essentially the same as those under Alternative 5a.

## 4.10 Recreation Resources

Spencer Island is a popular location for three primary user groups: waterfowl hunters who enter on foot and by small watercraft, birdwatchers who walk the established trails and may make excursions off trail, and walkers who primarily use the perimeter loop trail. Snohomish County owns the southern half of the island, and WDFW owns the northern half.

Snohomish County has several key recreational features on Spencer Island, including a trail network that mainly follows the island's perimeter and four wooden bridges that extend the trails across dike breaches (Figure 4.1). The County installed the three wooden bridges in 1994 as part of their initial restoration effort. All the original bridges were constructed with wood pilings and were installed by the same contractor that built the South Cross Dike and excavated the breaches. The original bridge over the Steamboat breach broke apart during a high-water event and was rebuilt by the county. The County constructed an additional bridge after the South Cross Dike was breached in 2005. In addition to the loop trail bridges, Snohomish County installed two recreational boardwalks as part of the early 1990's restoration and trails project. The northernmost boardwalk is approximately 126 feet long, and the southern boardwalk approximately 246 feet long. Because the boardwalks were installed prior to the unplanned breach in 2005 they are submerged during high water conditions.

Ducks Unlimited executed a smaller restoration project at Spencer Island, completed in the winter of 2007-2008. The project involved breaching a portion of the dike and expanding the breach at the north end of the Island on Union Slough. This project also added some recreational features such as a trail from the perimeter dike on Union Slough out to the marsh as a waterfowl hunting vantage point.

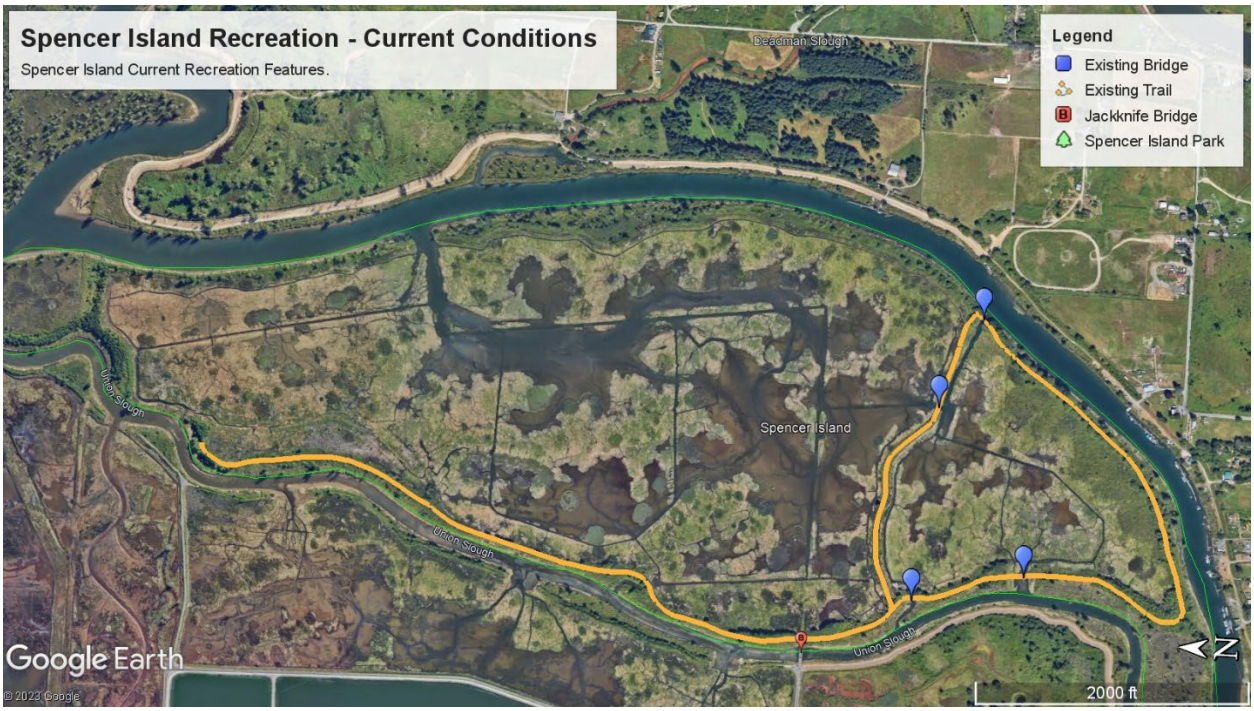


**Figure 4.1. Spencer Island Recreation Features - Current Condition**

Jackknife Bridge from Smith Island over Union Slough to the entrance of Spencer Island is owned by Snohomish County Parks Department. The bridge was installed in 1993 to replace a wooden bridge that was destroyed in the 1990 floods. Upon installation, the bridge was intended for pedestrian use as well as for emergency and maintenance vehicles; however, its aged condition may no longer support vehicle traffic.

Spencer Island currently provides the following recreation features:

- Dike loop trail across the South Cross Dike and around the southern portion of Spencer Island. This trail includes the South Cross Dike bridge and the three loop trail bridges.
- Dike top trail from Jackknife Bridge north along Union Slough to the breach at the NW portion of the perimeter dike.
- Trail from Jackknife Bridge south along Union Slough to the South Cross Dike.

### 4.10.1 Alternative 1: No-Action Alternative

Impacts to recreational resources would occur with the No-Action Alternative.

The dike-top trail and South Cross Dike breach would continue to degrade due to tidal action. The South Cross Dike bridge and the Steamboat Slough bridge are expected to cause ongoing repair and maintenance concerns for the Sponsor. The trail from Jackknife Bridge to the northern portion of the Island would continue narrowing, and an existing hole in the South

Cross Dike would continue to grow. These trails could become inaccessible under the No-Action Alternative. The southern loop-trail managed by Snohomish County sits at a higher elevation than the northern trails and would not likely be impacted by tidal flows. The quality and capacity of recreation access would continue to decline in the future without project condition.

### 4.10.2 Alternative 5a: Partial South Cross Dike Lowering Alternative

With implementation of any of the action alternatives, recreational opportunities would be temporarily lost in the immediate vicinity of the construction footprint while construction related activities are underway for approximately 7 months. During construction, recreationists may experience an increase in noise from operation of equipment that could impact their ability to seek solitude or may reduce the success of wildlife-dependent recreation activities. During this temporary reduction, similar recreation opportunities would remain available on adjacent lands. Recreation would resume in a manner similar to the existing condition after construction is complete.

Under Alternative 5a, the project would provide the following recreational features:

- South Cross Dike trail ending with a 0.3-acre earthen elevated viewing platform.
- Southern dike top trails and bridges.
- Dike top trail from Jackknife Bridge north along Union Slough to the end of the dike with a 0.4-acre gravel viewing pad.
- Trail connecting northern viewing pad to a hand-carried boat launch.
- Trail from Jackknife Bridge south along Union Slough to the South Cross Dike.

To facilitate mobilization of construction equipment, undersized trails would be widened, vegetation would be cleared, and the trails would be topped with gravel. Trails improved in this manner were qualified as “improved” trail in the recreation evaluation (C.3.4). This work would also facilitate future work by others to add boardwalks.

The final configuration to the trail network under Alternative 5a is shown in Figure 4.2. For additional details on the recreation evaluation, including FWP trail lengths, see Appendix C, Economics (C.3.4, Recreation Evaluation).

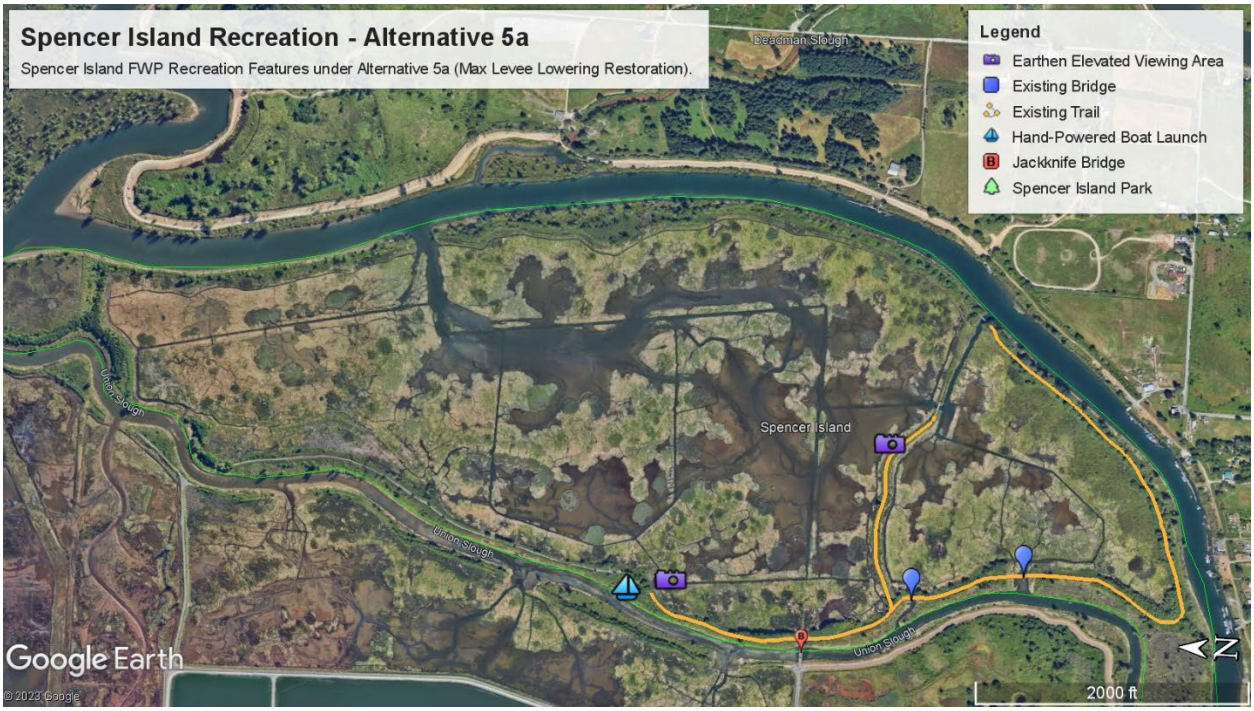


**Figure 4.2. Spencer Island FWP Trail Configuration - Alternative 5a**

Alternative 5a includes a designed breach of the western perimeter dike along Union Slough. The trail adjacent to the breach would be widened to create a viewing area for birdwatchers, and the trail from Jackknife Bridge north along Union Slough would end at this viewing area. Shortening this trail would remove pedestrian access to the northern portion of the island. This loss of access would not greatly impact waterfowl hunting use, as access to the Island for this type of recreation is primarily by boat. The viewing platform and boat launch would provide improved opportunities for the public to formally access both Union Slough and the restored Spencer Island tidal marsh, in comparison to the No-Action Alternative.

Another viewing area would be created mid-way along the South Cross Dike before the South Cross Dike bridge. The South Cross Dike trail would travel east along the cross dike, through the viewing area, and would end at the South Cross Dike bridge. Existing non-native vegetation around the viewing platform would be cleared to improve sightlines. The South Cross Dike bridge and loop trail bridge along Steamboat would be removed. Pedestrian access to most of the southern dike loop trail would be maintained, however the trail would not connect in a loop across the South Cross Dike. The dike-top trail from Jackknife Bridge to the South Cross Dike would be widened and flattened to improve the ease of access to the South Cross Dike and

southern trails. The earthen elevated platform would provide panoramic views of the improved habitat for wildlife viewers and birdwatchers with a greater capacity for recreational users.

Although both the northern and southern trails would be shortened, actions to widen the trails, create wildlife viewing areas, provide boat access, and improve habitat quality would result in recreational use similar to that of that existing condition. Under Alternative 5a, about 40% of the existing trail network would remain, and approximately 2000 feet of the remaining trail network would be improved in quality and capacity. Alternative 5a provides an improved trail network, unobstructed and panoramic bird watching opportunities, and improved opportunities to access both Union Slough and the restored Spencer Island tidal marsh.

Implementation of Alternative 5a would result in minor beneficial impacts to recreation. Alternative 5a includes improved access to remaining trails, improved viewsheds, and formal access to Union Slough. Access to Spencer Island would be maintained, and the current recreational uses, birdwatching, hunting, and walking, would still occur.

### 4.10.3 Alternative 8: High Restoration Alternative (Preferred Alternative)

Compared to Alternative 5a, the Preferred Alternative would result in slightly less public access overall, as it prioritizes ecosystem restoration over recreational use. Trail extents would be more restrictive; however, approximately 45 percent of the existing trail system would be maintained, which is about 5 percent more than under Alternative 5a. Under the Preferred Alternative, the South Cross Dike trail would terminate earlier at the viewing area. Construction duration and the associated temporary closure of public recreational access would be approximately six months, compared to approximately seven months under Alternative 5a. The final configuration to the trail network is shown in Figure 4.3.

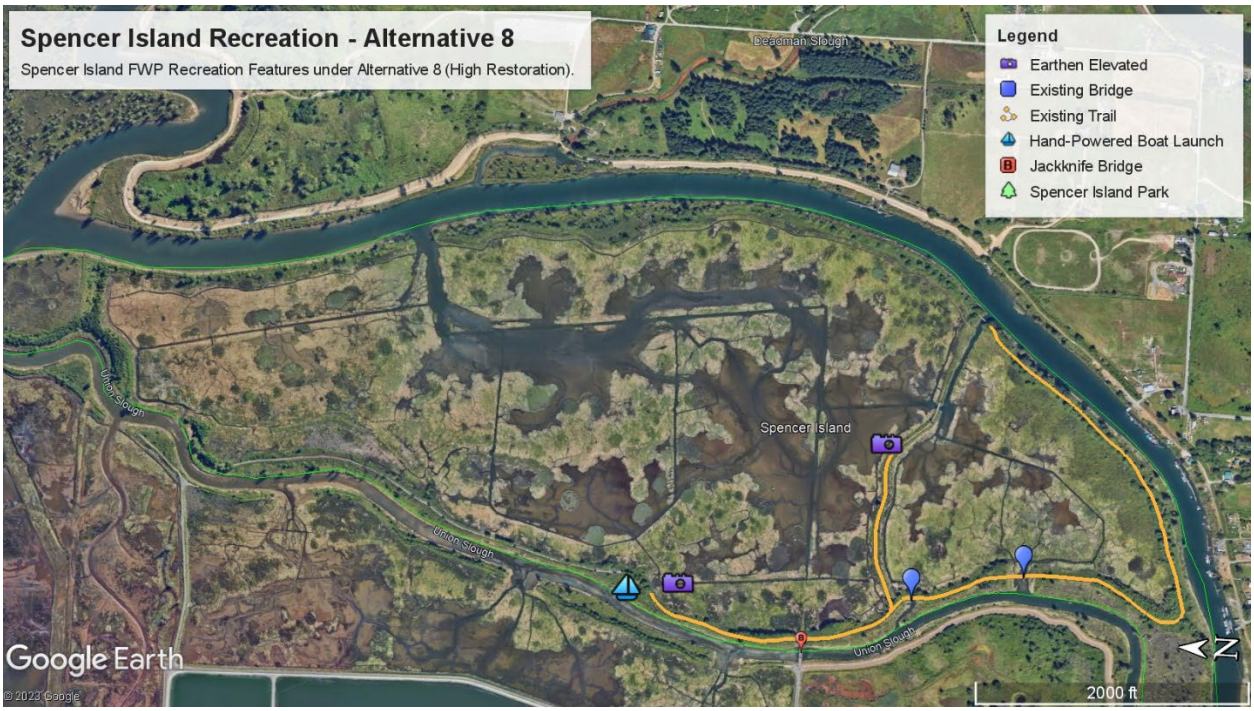


**Figure 4.3. Spencer Island FWP Trail Configuration - Alternative 8 (Preferred Alternative)**

# 5 Tentatively Selected Plan – Agency Preferred Alternative

This chapter discusses the details of the TSP, proposed as the agency's recommended plan for implementation upon conclusion of the feasibility analysis and the NEPA process.

## 5.1 Plan Components for Implementation

The TSP is Alternative 8 – High Restoration. The proposed restoration includes dike breaching, dike lowering, excavation of channels, and filling of historic drainage ditches to restore estuarine processes and seasonal riverine flooding to the interior of Spencer Island. These measures are intended to allow tidal freshwater (low salinity) hydrology to support channel formation and the development of a tidal forested wetland community. Key restoration elements at this site are shown in Figure 5.1 and include the following:

- Lowering of over 10,000 lineal feet (lf) of existing dikes
- Permanent trail improvements of approximately 1,800 lf
- Removal of existing 4-ft diameter metal tide gate on Union Slough Dike
- Removal of two existing 60-foot bridge at the South Cross Dike
- Filling of 8075 lf of existing ditches
- Excavation of 14 breach channels connecting the island to Steamboat Slough and 5 breaches to Union Slough
- Widening an existing breach on Smith Island to improve water conveyance
- Excavation of 1 breach channels through the North Cross Dike and 2 breach channels through the South Cross Dike
- Excavation of 12 new tidal channels
- Constructing new marsh/upland planting benches with material from dike lowering, breaching, and channel excavation
- Two new permanent viewing areas (interpretive signage, benches, etc.)
- One new hand-carried boat launch along Union Slough

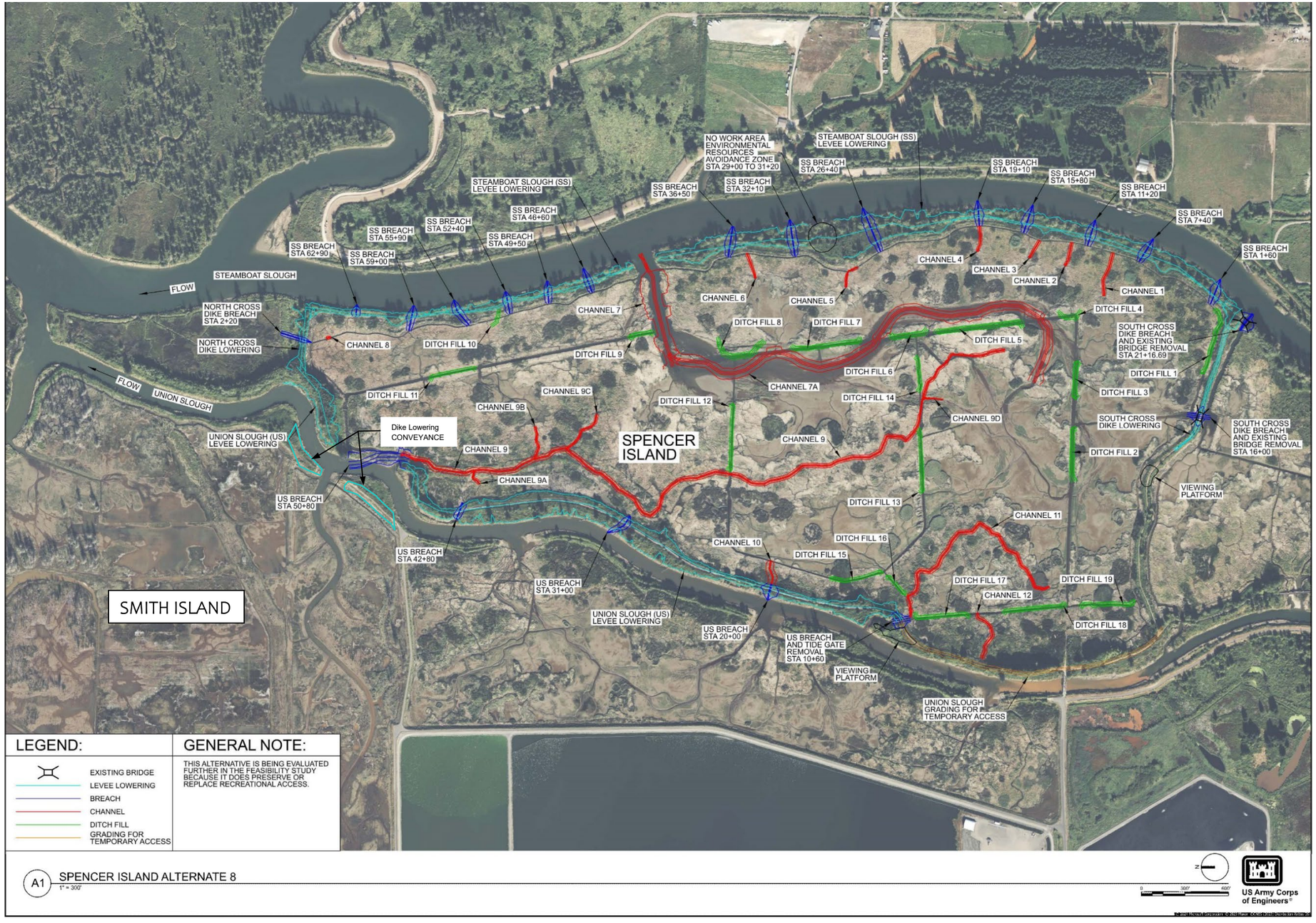


Figure 5.1. Tentatively Selected Plan: Alternative 8 - High Restoration

### 5.1.1 Best Management Practices

USACE has developed a list of standard Best Management Practices (BMPs) to reduce environmental effects of construction activities. These measures, as well as some specific to Spencer Island, appear below:

1. USACE will conduct a pre-construction meeting to look at existing conditions and to fine-tune any possible BMPs or environmental requirements.
2. At least one USACE biologist and geotechnical engineer will be available via phone during construction work hours. USACE biologists may visit the construction site and provide periodic updates to USFWS and NMFS on the construction. USACE biologists may schedule a visit to construction sites with USFWS and NMFS. The geotechnical engineer may also visit the construction site. The Project Manager and Construction Manager will coordinate all visits.
3. All invasive plant species on site above the high tide line will be actively removed and properly disposed of according to the methods outlined in the invasive plant species removal section.
4. Vegetation removal will be limited to the areas near breaches and lowered dikes as described in the plans.
5. Vegetation plantings (trees and shrubs) will occur on all disturbed surfaces and will consist of tree and shrub species identified in the planting plan. Bare root plants will be utilized if available.
6. All vegetation plantings will occur during late fall or winter to limit the plants' exposure to dry periods and watered if necessary.
7. Temporary erosion control will be installed as needed for all phases of the work to limit stormwater runoff. As construction advances, installation of silt fencing or similar site appropriate erosion control measure will occur along the full length of disturbed area of the project area. Additional erosion control measures will be used as needed to prevent the discharge or accumulation of sediment into the water, wetlands, adjacent swales, catch basins, storm drains, and offsite. Accumulation of sediment will be monitored in adjacent swales or storm drains daily and clear accumulation to ensure continued service throughout construction.
8. Large woody material generated will be salvaged and placed near tidal channels where it can continue to provide habitat function. Large woody material may be placed near breaches and on top of lowered dikes if tidal channels are not available. This includes any tree trunks and large shrubs.
9. Work will be conducted during daylight hours, unless night work is needed to complete work in one construction season.

10. All in-water work shall occur during low tide or during flood tides (incoming tides) and during the June 1 to October 31 fish window.
11. Work will be restricted to the areas shown in the project footprint.
12. Refueling will occur on the landward side of Spencer Island.
13. Construction equipment will not idle when not in use.
14. At least one fuel spill kit with absorbent pads will always be onsite.
15. All construction materials will be free of contaminants such as oils and excessive sediment.
16. Construction equipment will be regularly checked for drips or leaks. Any leak will be fixed promptly, or the equipment will be removed from the project area.
17. Fill placement will occur only within the project footprint and within areas identified in the plan.
18. Hog fuel excavated at breaches and lowered dikes will be spread thinly and evenly at the end of construction on disturbed areas.
19. All trash and unauthorized fill will be removed from the project area, including concrete blocks or pieces, bricks, asphalt, metal, treated wood, glass, floating debris, and paper and disposed of properly after work is completed.
20. Access to the rehabilitation site would be from existing roads, ramps, paths, public rights-of-way, etc., if available. Storage and staging will occur where indicated on the project plans, and will consist of temporary stockpiling of excess fill, project materials, supplies, equipment, and vehicles.

## 5.2 Design and Construction Considerations

This project is modeled after recent tidal marsh restoration work by WDFW on the Skagit River (Milltown) and by Snohomish County (Mid Spencer Island). Similar to Spencer Island, these projects restored tidal marsh along riverine distributary channels by removing dikes, constructed breaches, creating tidal channels, and building habitat mounds with the excavated spoils. The recently completed projects had to contend with daily tidal inundation, resulting in use of low ground pressure heavy equipment (amphibious excavators, tracked dump trucks) and mats to allow for access within the interior of the site despite soft wet soils.

At the Mid-Spencer site, excavation and disposal quantities were less than expected due to use of Lidar basemap data (includes vegetation artifacts that cause design existing ground elevations in terrain models to be higher than actual conditions). Since this project uses similar data sets as Mid Spencer, ground surveys in PED phase would most likely result in a decrease in both cut and fill quantities. Soil and vegetation conditions at Mid-Spencer Island are nearly identical to site conditions at Spencer Island and suggest soils would remain stable during construction and hold relatively steep side slopes. Organic materials (wood chips) composing

dikes would be mixed with native soils to build habitat mounds (marsh benches). Finished slopes for disposal areas would be rough graded to aid retention of seeds, nutrients, and sediment.

Like the Mid-Spencer project, dikes are breached presently requiring sequencing of work based on tides. Under these conditions, excavation would be expected to occur as the tide drops but remain above the tide as it is going out. Excavation below water level should generally not occur during ebb tides, but is allowable during the flood tide, to minimize release of turbid water from the site. During the fish window when most construction work would occur, spring tides are expected. Spring tides having a greater than typical tidal range resulting in a longer duration above or below a reference elevation than typical conditions. It is anticipated that overtime or night work may be necessary to complete the project in one construction season. Fortunately, the perimeter dike work can be done outside the fish window giving the contractor more time to prepare the site for more intensive earthwork activities conducted below OHW.

Work would proceed with vegetation clearing and dike improvements for access, fish rescues as needed, then channel and ditch work furthest from the Jackknife Bridge access point. Dikes would remain at an elevation that allows for equipment to be staged above high tides and dikes would be removed to the design elevations prior to breaching. Excavated materials would be dozed and graded to nearby disposal areas from the location where they are generated, minimizing the need for trucking/hauling. More than one crew can work at time (one along Union Slough, one along Steamboat, one in the interior of the marsh). Once a dike is breached access beyond that point would be lost and work would continue southward until both South Cross Dike bridges and Union Slough tide gates are removed. Refer to the Engineering Appendix (Appendix B) for more information on expected site conditions and how these influence the design.

In the beginning of the 65% design phase the PDT would update the characterization of the materials within existing levees to be removed (organic / inorganic) and identify the best locations on site for these materials.

## 5.3 Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas

Lands, easements, rights-of-way, relocations, and disposal areas required for the project include acreage on Spencer Island where work will be done and benefits will accrue and easements on Smith Island to address potential offsite flood risk impacts. For details see Appendix H (Real Estate). Estimated costs are shown in Table 5-1.

## 5.4 Cost Estimate

Feasibility-level costs and cost share details are displayed in Table 5-1 and Table 5-2 below. More detailed cost information is provided in Appendix I.

**Table 5-1. Feasibility-level Cost Estimate***

| Cost (Design & Implementation) | |
|---|---|
| Construction | $7,683,000 |
| Lands, Easements, Rights-of-way, Relocations, and Disposal Areas | $3,320,000 |
| Preconstruction, Engineering, & Design | $1,367,000 |
| Construction Management | $685,000 |
| Monitoring & Adaptive Management | $112,000 |
| Total | $13,167,000 |

*Project First Cost (Constant Dollar Basis), FY26 price level

**Table 5-2. Project Cost Share Estimate***

| | Federal | Non-Federal |
|---|---|---|
| Feasibility | $800,000 | $700,000 |
| Design & Implementation (Cash) | $9,148,000 | $4,922,000 |
| Lands, Easements, Rights-of-way, Relocations, and Disposal Areas | $0 | $3,497,000 |
| D&I Total (65% Fed, 35% Non-Fed) | $9,148,000 | $4,926,000 |
| Feasibility + D&I Total | $9,948,000 | $5,626,000 |

*Fully funded

**Note:** Sums may appear inaccurate due to rounding.

## 5.5 Effect of the Tentatively Selected Plan in Context of the Snohomish Estuary

Cumulative effects result when the impacts of an action are added to or interact with other past, present, and reasonably foreseeable future actions. This analysis was conducted within

the context of the Snohomish Estuary, the second-largest tidal delta in the southern Salish Sea, which has been substantially modified and fragmented by historical land uses like agriculture and flood control. A concerted effort of large-scale restoration is now underway to reverse these impacts, with projects since 2015 having doubled the available tidal channel habitat to benefit salmon populations (Table 5-3, Table 5-4). The proposed project would contribute to this ongoing, cumulative restoration effort, particularly in the upper estuary where rearing habitat is most limited. After direct and indirect effects were identified (summarized in Table 1-1), the potential for cumulative impacts was considered. Given that this project's objectives align with the broader restoration goals for the estuary, it was determined that there is little risk of negative cumulative impacts on most resources. A discussion of these cumulative effects follows.

**Table 5-3. Summary of Environmental Consequences**

| Resource | Short-term and Long-term Consequences of the Recommended Plan |
|---|---|
| Hydraulics and Geomorphology | Short-term: Reestablishment of hydrologic connectivity, geomorphic processes (erosion, sedimentation, dendritic channel network formation, large wood recruitment, native vegetation establishment), and normalization of inundation frequency at Spencer Island.<br><br>Long-term: Long-term consequences are less certain since it depends on relative rates of sea level rise, marsh dendritic channel network development, vegetation reestablishment, and fluvial sedimentation. This would determine how long the site remains a brackish marsh / spruce swamp, and when it converts to salt marsh, and then to tide flat. It is anticipated that in the 50-year period of analysis, the island would slowly convert from brackish to salt tidal marsh. |
| Water Quality | Short-term: Turbidity from construction activities would occur but would be minimized through BMPs.<br><br>Long-term: No long-term effects to water quality have been identified. |
| Air Quality | Short-term: Estimated air-pollutant concentrations from construction would stay below the threshold for NAAQS.<br><br>Long-term: No long-term effects to air quality have been identified. |
| Gas Emissions | Short-term: Construction would contribute a tiny fraction of global atmospheric gas emissions.<br><br>Long-term: No long-term changes in gas emissions are expected since emissions would be offset by planting trees, shrubs, and restoring wetland habitat. |

| Resource | Short-term and Long-term Consequences of the Recommended Plan |
|---|---|
| Underwater Noise | Short-term: Short-term effects of underwater noise would be minimized through BMPs and therefore would not be negatively affected.<br><br>Long-term: No long-term effects of underwater noise have been identified. |
| Hazardous, Toxic, and Radiological Waste (HTRW) | Short-term: No short-term HTRW effects have been identified.<br><br>Long-term: No long-term HTRW effects have been identified. |
| Vegetation | Short-term: Existing vegetation removal is required to construct breaches and lower dikes. The removed trees would remain on site to provide structural habitat for salmon and upland invasive plants would be removed.<br><br>Long-term: Re-planting vegetation would occur on disturbed areas of the project to promote native recruitment and to ameliorate recruitment of invasive plants. |
| Benthic Organisms | Short-term: There would be short-term impacts from lowering dikes and digging out breaches, but those impacts would be minimized through BMPs.<br><br>Long-term: Benthic organisms would re-establish after the soil and sediment stabilize. |
| Fish | Short-term: Construction noise would likely displace fish. However, construction would be minimized through BMPs.<br><br>Long-term: Reconnecting floodplain habitat would provide better habitat for salmon in the future. |
| Birds | Short-term: Construction may cause temporary displacement primarily due to elevated noise and a possible reduction in prey resources.<br><br>Long-term: No long-term effects to birds have been identified. |
| Threatened and Endangered Species | Short-term: Construction noise would likely displace fish. However, construction would be minimized through BMPs.<br><br>Long-term: No long-term impacts to ESA listed species have been identified, other than a beneficial effect to juvenile salmonids. |
| Cultural Resources | Short-term: Unless a historic property is identified during project construction, no short-term effects to cultural resources have been identified. |

| Resource | Short-term and Long-term Consequences of the Recommended Plan |
|---|---|
| | Long-term: No long-term effects to cultural resources have been identified. |
| Recreation | Short-term: Temporary loss of recreation opportunities in the immediate vicinity of the construction footprint and increase noise from operation of equipment during construction could impact success of wildlife dependent recreation activities.<br><br>Long-term: No long-term impacts to recreation opportunities have been identified. Recreation would resume in a manner similar to the existing condition after construction is complete. |

The primary cumulative effect of this project is a positive contribution to the large-scale, ongoing effort to restore salmon habitat in the Snohomish Estuary. The actions of this project are not isolated; they are an integral part of a regional strategy to reverse historical habitat loss and benefit ESA-listed salmonids.

- Increased Habitat Connectivity: By breaching dikes and re-establishing floodplain connections, this project adds to the total acreage of critical rearing and refuge habitat available for juvenile salmon. When combined with other restoration projects (such as those at Smith Island, Qwuloolt, and others), it contributes to a growing network of functional tidal habitats. This network is more resilient and provides greater overall capacity for salmon populations than individual, isolated sites would.

- Restoration of Estuarine Processes: Cumulatively, this project and others like it help restore more natural hydrologic, sediment, and nutrient flow processes within the estuary. This incremental return to natural function helps rebuild the foundational processes that support the entire estuarine food web, providing a cumulative benefit that extends beyond the project's immediate footprint.

The primary adverse effect of this project would involve the removal of mature riparian habitat which also contributes to a cumulative impact when considered across the region.

- Loss of Riparian Habitat Function: This project contributes to a cumulative loss of mature, functional riparian habitat within the estuary. While the 5.4-acre replanting area would eventually provide habitat, there is a temporal loss of function that would last for decades. When added to vegetation removal from other development or restoration projects, this creates a cumulative reduction in the availability of mature riparian forest ecosystems. This could result in a cumulative stress on wildlife

populations, such as birds and terrestrial mammals, that depend specifically on this habitat type.

When viewed within the larger context of the Snohomish Estuary, the project is expected to have a net positive cumulative effect. The significant, long-term, and regionally important benefits of creating critical habitat for ESA-listed salmonids align with the overarching restoration goals for the entire ecosystem. This contribution to reversing decades of habitat degradation is considered to outweigh the project's adverse contribution to the cumulative loss of localized riparian habitat. Furthermore, in combination with the suite of other restoration actions in the Snohomish delta, this project is anticipated to produce substantial, synergistic positive ecosystem effects, where the total benefit to estuarine processes and habitat networks is greater than the sum of the individual projects. The project, therefore, acts in concert with numerous other actions to incrementally and synergistically improve the health and function of the Snohomish Estuary as a whole.

**Table 5-4 List of Projects in the Snohomish Estuary**

| Project Name | Location | Type of Project | Construction Year | Agency |
|---|---|---|---|---|
| Spencer Island (this project) | Everett, WA | Restoration | Expected completion 2028 | USACE/WDFW |
| Chinook Marsh | Snohomish WA | Restoration | Expected completion 2028 or later | Snohomish County |
| Union Slough Levee | Everett, WA | Flood control | 2025 | USACE/City of Everett |
| Jetty Island Renourishment and Extension | Everett, WA | Restoration | 2020 | Port of Everett |
| Blue Heron Slough | Everett, WA | Restoration | 2019 | Port of Everett |
| Leque Island | Stanwood, WA | Restoration | 2019 | WDFW |
| Mid-Spencer Island | Everett, WA | Restoration | 2019 | Snohomish County |

| Project Name | Location | Type of Project | Construction Year | Agency |
|---|---|---|---|---|
| Smith Island | Everett, WA | Restoration | 2018 | Snohomish County |
| Howarth Park Beach Restoration | Everett, WA | Restoration | 2016 | Snohomish County |
| Everett Riverfront Wetland Complexes Reconnection | Everett, WA | Restoration | 2015 | City of Everett |
| Snohomish Nearshore Beach Nourishment | Everett, WA | Restoration | 2015 | Snohomish County |
| Qwuloolt | Marysville, WA | Restoration | 2012 | USACE/Tulalip Tribes |
| Union Slough | Everett, WA | Restoration | 2002 | City of Everett |

## 5.6 Mitigation for Adverse Environmental Effects*

No compensatory mitigation is proposed for this action because no long-term loss of wetlands would occur, adverse effects to ESA-listed species would be negligible and temporary, and no significant impacts to commercially important species or protected marine mammals would occur. The overall project purpose is for substantial ecosystem benefits to reverse the trend of negative human impacts. Several avoidance and minimization measures are proposed to ensure that project effects are insignificant; these include the following:

1. Construction and design work would avoid conifer trees wherever possible,
2. A planting plan would be implemented to offset the impacts of tree removal by replanting at a 1:1 ratio with native plant species that have already established on Spencer Island and adjacent areas. While the loss of riparian habitat is unavoidable due to the project's goal of restoring historically filled aquatic habitat, some existing riparian vegetation would need to be removed to prioritize aquatic habitat restoration. Riparian

vegetation, including trees and shrubs, would be replanted in the remaining upland area.

3. Invasive plant species would be removed and properly disposed of.
4. An adaptive management and monitoring plan would be implemented to ensure project success.

All these minor and temporary effects can be avoided and minimized through construction designs and standard best management practices (BMPs). Specific measurable and enforceable BMPs have been developed. USACE would require construction contractors to adhere to BMPs to protect water quality, manage invasive species, and decrease impacts to ESA-listed species (Section 5.1.1). Standard construction stormwater BMPs are incorporated into site designs, operational procedures, and physical measures on site. There are no legal requirements to mitigate for gas emissions; however, BMPs are available for fuel and material conservation during construction.

## 5.7 Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

The site is currently operated and maintained by WDFW and Snohomish County for passive recreational use. The restoration features (lowered dikes, dike breaches, channels, and filled ditches) would not require operations and maintenance. There are no structural or mechanical components included. The net result of the project would be fewer trails and bridges that would require maintenance. For these reasons the PDT does not expect this ecosystem restoration project to result in any new operations and maintenance requirements.

## 5.8 Monitoring and Adaptive Management

USACE Implementation Guidance for Section 1161 (Monitoring Ecosystem Restoration) of the Water Resources Development Act of 2016, and Section 2036 (Mitigation for Fish and Wildlife and Wetlands Losses) of the Water Resources Development Act of 2007 require monitoring sufficient to evaluate ecosystem restoration and mitigation success. USACE is required to consider adaptive management (or contingency plans) for ecosystem restoration projects and mitigation projects because they often involve uncertainty that can be reduced through an adaptive management approach. For this project, the PDT prepared a draft monitoring and adaptive management plan which is in Appendix E. USACE has outlined project success criteria and potential actions to take if those criteria are not met, as follows:

1. If more than 25% of the lowered levees and breaches are not successful, collect more information and determine if more grading and excavation work is needed.

2. If more than 50% of the tidal channel have erosional features in them, tide channel widening would be implemented.
3. If survival of planted vegetation is less than 80% by the end of year 1 additional plantings would be planted. In planted areas, 80% percent cover would be achieved by year 10.
4. If there any invasive plant species upland, a more stringent methods would be applied.

## 5.9 Risk and Uncertainty

USACE used a risk-based strategy in its approach to formulating and evaluating alternatives. The main risk or uncertainty for this project is the uncertainty of achieving benefits. As with any ecosystem restoration project, there is a degree of uncertainty that the desired ecosystem benefits would indeed be achieved over the study period of analysis. In this case, there is uncertainty that the site would continue to evolve post-construction resulting in conditions that approximate the target reference conditions. These target conditions include ground surface elevations, hydraulic connections to the bordering sloughs, and the number and extent of connected channels with the area of the present-day island. There is the greatest amount of uncertainty with regards to the third item (number and extent of connected channels). This uncertainty is mitigated in Alternative 8 (the Tentatively Selected Plan) by the inclusion of interior channel excavation and filling of drainage ditches as part of this alternative.

# 6 Compliance with Environmental Statutes*

This chapter summarizes how the Tentatively Selected Plan (agency Preferred Alternative) complies with all applicable Federal environmental laws, statutes, and executive orders.

## 6.1 National Environmental Policy Act

NEPA (42 U.S.C. § 4321 et seq.) commits Federal agencies to considering, documenting, and publicly disclosing the environmental effects of their actions. It requires that an Environmental Impact Statement (EIS) be included when a recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. Major Federal actions determined not likely to have significant adverse effects on the quality of the human environment may be evaluated through an environmental assessment. This draft IFR/EA evaluates the environmental effects requiring NEPA compliance with the proposed Project.

USACE is releasing this draft IFR/EA and draft FONSI (Appendix F) for the proposed Project for a 30-day public review and comment period. Comments and responses will be included in the final IFR/EA. USACE would consider all submissions received during the comment period. The nature or scope of the proposal may be changed upon consideration of the comments received and would be reflected in the final IFR/EA. If significant effects on the quality of the human environment are identified and cannot be mitigated, USACE would initiate an EIS and afford all the appropriate public participation opportunities attendant to an EIS. Comments and responses will be included in an appendix to the final IFR/EA.

## 6.2 Endangered Species Act of 1973

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, Federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species and their critical habitats.

USACE evaluated the proposed action's potential effects to ESA-listed species and their critical habitat. USACE determined that the proposed action would likely adversely affect (LAA) Puget Sound Chinook salmon, Puget Sound steelhead, and Coastal/Puget Sound bull trout, and the respective critical habitat of these species. Additionally, the proposed action would likely adversely affect Southern Distinct Population Segment (DPS) of eulachon, but not the critical habitat of this species because it is not designated in the Snohomish River or Puget Sound. The likely adverse effects would be associated with construction-related disturbance to habitat that

would be short term. Once construction is complete, habitat conditions would improve for these species and the species would benefit from the proposed action in perpetuity. Table 6-1, below, is a list of ESA-listed and proposed species and their critical habitat that occur within the action area[3]:

**Table 6-1. ESA Listed Species Found within the Vicinity of Spencer Island**

| Species | Listing | Critical Habitat | Species Effect Determination* | Critical Habitat Determination |
|---|---|---|---|---|
| Puget Sound Chinook salmon (*Oncorhynchus tshawytscha)* | Threatened | Designated | LAA | LAA |
| Puget Sound steelhead (*Oncorhynchus mykiss)* | Threatened | Designated | LAA | LAA |
| Coastal/Puget Sound bull trout *(Salvelinus confluentus)* | Threatened | Designated | LAA | LAA |

[3] Per the Federal Endangered Species Act, the action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

| Species | Listing | Critical Habitat | Species Effect Determination* | Critical Habitat Determination |
|---|---|---|---|---|
| Pacific eulachon (southern DPS) (*Thaleichthys pacificus)* | Threatened | Designated; does not occur in the action area | LAA | No Effect |
| Green sturgeon (southern DPS) (*Acipenser medirostris)* | Threatened | Designated; does not occur in the action area | NLAA | No Effect |
| Southern Resident killer whale *(Orcinus orca)* | Endangered | Designated; does not occur in the action area | NLAA | NLAA |
| Yelloweye Rockfish (Sebastes ruberrimus) | Threatened | Designated, does not occur in action area | NLAA | NLAA |

| Species | Listing | Critical Habitat | Species Effect Determination* | Critical Habitat Determination |
|---|---|---|---|---|
| Bocaccio Rockfish (*Sebastes paucispinis*) | Endangered | Designated, does not occur in action area | NLAA | NLAA |
| Northwestern Pond Turtle (*Actinemys marmorata*) | Proposed Threatened | Not Designated | No Effect | No Effect |
| Marbled murrelet (*Brachyramphus marmoratus*) | Threatened | Designated; none occurs in the action area | NLAA | NLAA |
| Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*) | Proposed Endangered | Not Designated | No Effect | No Effect |

*NLAA = Not Likely to Adversely Affect & LAA = Likely to Adversely Affect.

USACE determined that the proposed action would not likely adversely affect (NLAA) marbled murrelet, green sturgeon, yelloweye rockfish, bocaccio, Southern Resident killer whale, and the respective critical habitat of these species. These species are unlikely to occur in the vicinity of the project and it would be unlikely for these species to be exposed to construction-related disturbance and the respective critical habitat does not occur within the Snohomish River. Southern Resident killer whales would indirectly benefit from by the proposed action insofar as

the proposed action would contribute to increased salmon production from the Snohomish River and result in increased numbers of returning adult fish available as prey for the whales.

In summary, any negative effects to ESA-listed species and critical habitat would be temporary, and no long-term, negative effects would result from the proposed action. Puget Sound Chinook salmon and Puget Sound steelhead would be expected to directly benefit from this proposed action in the long term.

USACE consulted with USFWS and NMFS under the Programmatic Biological Opinion (BiOp) for Fish Passage and Restoration Projects (FPRP III). USACE received confirmation from both agencies in July 2025 that the proposed action is consistent with FPRP III. Confirmation from the USFWS and NMFS concluded ESA consultation.

## 6.3 Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972, as amended, prohibits the taking of marine mammals except under certain conditions (16 U.S.C. 1361). Marine mammals enter the Snohomish River estuary from Puget Sound seeking food and occasionally haul out sites. There are no species likely to occur within the immediate project vicinity. USACE has determined that the Preferred Alternative would not substantially disturb any marine mammal behavioral patterns or cause any harm, and thus it is not necessary to pursue an incidental harassment authorization under the MMPA. The rationale for this determination is the following:

1. Spencer Island lacks suitable habitat for marine mammals,
2. The behavior of marine mammals does not indicate their presence,
3. And their migration corridors do not overlap (Smultea et al., 2022).

## 6.4 Clean Water Act of 1972

The Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.) is more commonly referred to as the Clean Water Act (CWA). This act is the primary legislative vehicle for Federal water pollution control programs and the basic structure for regulating discharges of pollutants into waters of the U.S. The CWA was established to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The CWA sets goals to eliminate discharges of pollutants into navigable waters, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment.

This EA evaluates possible impacts to water quality, primarily with respect to water temperature and turbidity. The proposed restoration work requires work below the OHWM and in the water for lowering dikes and establishing breaches. BMPs would be employed to

minimize turbidity and erosion and avoid discharge of pollutants into the waterway (see section 5.1.1).

Three sections of the CWA are pertinent to the proposed action: Section 401 covers water quality and evaluation of the effects a discharge would have on water quality standards; Section 402 addresses non-point discharges including, but not limited to, stormwater runoff from construction sites, as well as the amount of acreage associated with ground disturbing activities. Section 404 addresses discharge of fill into Waters of the U.S. Requirements of these CWA sections are discussed below.

### *Section 401 and 404*

USACE is responsible for administration of Section 404 of the CWA. USACE does not issue Section 404 permits to itself for its own civil works activities, but USACE accepts responsibility for the compliance of its civil works projects with Sections 404 under the CWA for jurisdictional activity. The proposed restoration work requires placing fill below the OHWM and there are jurisdictional wetlands throughout the project area that would be protected under the CWA. The project would be constructed in accordance with Nationwide Permit 27, Aquatic Ecosystem Restoration, Enhancement, and Establishment Activities, thus meeting the Section 404(b)(1) requirements. The project would be constructed in compliance with all general and regional conditions associated with the nationwide permit.

Section 401 water quality certification from Washington Department of Ecology would be required for the project.

### *Section 402*

Section 402 of the CWA is triggered when a construction site would have greater than 1 acre of ground disturbance, which is the case for this proposed project. To manage stormwater and minimize potential for erosion during construction, USACE would require the contractor to develop a Stormwater Pollution Prevention Plan and seek coverage for the work under the National Pollutant Discharge Elimination System Construction General Permit administered by the Environmental Protection Agency.

## 6.5 Coastal Zone Management Act of 1972

The Coastal Zone Management Act (CZMA) of 1972 as amended (16 U.S.C. §1451-1464) requires Federal agencies to conduct activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved State Coastal Zone Management (CZM) Program, which includes certain state laws. USACE would determine if this project is substantively consistent with the enforceable polices of the State of Washington, including the Washington Clean Air Act, Water Pollution Control Act, and the Shoreline

Management Act (SMA). USACE is planning to submit a CZMA Consistency Determination to Ecology to request concurrence that the proposed restoration work is consistent to the maximum extent practicable with the enforceable policies of the approved CZM Program.

## 6.6 Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act (FWCA) of 1934 as amended (16 U.S.C. §661-667e) ensures that fish and wildlife conservation is given equal consideration as is given to other features of water-resource development programs through planning, development, maintenance, and coordination of wildlife conservation and rehabilitation. This law provides that whenever the waters of any stream or other body of water are proposed to be impounded, diverted, deepened, or otherwise controlled or modified, USACE shall consult with the NMFS USFWS as appropriate, and the agency administering the wildlife resources of the state. Recommendations provided by the USFWS in Coordination Act Reports must be specifically addressed in USACE feasibility reports.

USACE has coordinated with the USFWS regarding the proposed action. Full compliance with FWCA was achieved during the PSNERP feasibility study (USFWS 2016).

## 6.7 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), (16 U.S.C. §1801 et. seq.) requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). The objective of an EFH assessment is to determine whether the proposed action(s) "may adversely affect" designated EFH for relevant commercial, Federally managed fisheries species within the proposed study area. The assessment also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action. Adverse effects to EFH may result from actions occurring within outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

USACE determined that the proposed action may adversely affect EFH designated for Chinook, coho and pink salmon (Table 7.2). There could be temporary impacts during construction to include increased noise, vibration, turbidity, and removal of vegetation. There would be a period where the re-planted vegetation would need to mature to re-establish its ecological functions. The project results in improved riparian and aquatic habitat conditions by restoring hydrologic conditions and through re-planting vegetation.

Table 6-2. Presence of Essential Fish Habitat for Chinook, Coho, and Pink Salmon

| Scientific Name | Common Name | Adult | Juvenile | Larvae | Egg |
|---|---|---|---|---|---|
| *Oncorhynchus tshawytscha* | Chinook salmon | X | X | | |
| *Oncorhynchus kisutch* | Coho Salmon | X | X | | |
| *Oncorhynchus gorbuscha* | Pink Salmon | X | X | | |

## 6.8 National Historic Preservation Act of 1966

The NHPA of 1966 (54 U.S.C. § 30010), as amended through 2014 (Public Law 113-287), establishes preservation as a national policy and directs the Federal Government to provide leadership in preserving, restoring, and maintaining the nation's historic and cultural environment. Section 106 of NHPA requires Federal agencies to account for the direct and indirect effects of their undertakings on historic properties (i.e., archaeological sites, Traditional Cultural Properties, buildings, structures, objects, districts, and landscapes listed in or eligible for listing in the NRHP). Section 106 and its implementing regulations at 36 C.F.R. § 800 establish procedures for Federal agencies to follow in identifying historic properties and assessing and resolving effects of an undertaking on them, in consultation with State Historic Preservation Officers (SHPO), Indian tribes, Native Hawaiians, and the Advisory Council for Historic Preservation (ACHP), as appropriate. Other parties may participate in the Section 106 consultation process, including but not limited to applicants for Federal assistance, permit and license applicants, certified local governments, and other groups or individuals with an economic, social, or cultural interest in the project.

To fulfill the agency's responsibilities under the NHPA, USACE took action to identify historic properties that may be affected by the proposed undertaking. USACE sent an initial letter to document the APE to the Washington SHPO on March 1, 2023, and February 6, 2024. The SHPO agreed with the USACE APE determination on February 6, 2024 (Appendix D). USACE also requested knowledge and concerns about the project from the Sauk-Suiattle Indian Tribe, the Snoqualmie Indian Tribe, the Swinomish Indian Tribal Community, the Stillaguamish Tribe of Indians, the Tulalip Tribes, and the Confederated Tribes and Bands of the Yakama Nation on March 1, 2023, February 6, 2024, and October 9, 2025. To date, USACE has not received a response from any Tribes.

USACE completed a cultural resources survey of the APE and recorded five cultural resources: an archaeological site (SN00042), Spencer Island Levee and Ditch Complex, Jackknife Bridge, Smith Island Dike and Ditch Complex, and an historic tractor. Upon evaluating the cultural resources, USACE determined that all five cultural resources are not eligible for the NRHP. Based on these determinations of eligibility, USACE submitted a finding of no historic properties

affected consultation letter and cultural report to the Washington SHPO on March 7, 2024, and October 9, 2025. SHPO provided concurrence with USACE's finding of no historic properties affected with the stipulation of an inadvertent discovery plan on June 4, 2024, and October 20, 2025(Appendix D). SHPO also concurred with USACE's determination that all five cultural resources identified within the APE are not eligible for the NRHP.

## 6.9 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. § 703-712) protects more than 800 bird species and their habitat and commits the U.S. to take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. EO 13186 directs Federal agencies to evaluate the effects of their actions on migratory birds, with emphasis on species of concern, and inform USFWS of potential negative effects to migratory birds.

Birds inhabit the riparian area of Spencer Island all year, and the proposed restoration work may overlap with some nesting seasons. Nesting seasons vary by species; however, the majority of local bird species nest between February through July (BES 2022). USACE must complete the proposed heavy equipment work between June 1, 2026, and October 31, 2026, and between June 1, 2027, and October 31, 2027.

A portion of the trees that may provide nesting to migratory birds would be removed. However, trees identified for removal would be inspected for nests prior to removal. Not all trees would be removed and USACE would plant new trees and shrubs to offset vegetation removal and to provide adequate nesting habitat as the plantings mature. Implementation of the Preferred Alternative would not have any direct, affirmative, or purposeful negative effect to migratory birds. The project would have incidental effects to a small number of individual birds that may be present in the project area.

## 6.10 Native American Tribal Treaty Rights

The Federal trust responsibility to Native American Tribes arises from the treaties signed between the Federal Government and the Tribes. Under Article VI, Clause 2 of the U.S. Constitution, treaties with the Tribes are superior to State laws, and equal to Federal laws. In these treaties, the U.S. made a set of commitments in exchange for Tribal lands, including the promise that the U.S. would protect the Tribes' people. The U.S. Supreme Court has held that these commitments create a trust relationship between the U.S. and each treaty Tribe and impose upon the Federal Government "moral obligations of the highest responsibility and trust". The scope of the Federal trust responsibility is incumbent upon all Federal agencies.

USACE is closely coordinating with the Tulalip Tribes of Washington as a sovereign nation; the Tribe has usual and accustomed (U&A) fishing grounds in the study area. Prior to construction, USACE would coordinate with the Tribe to ensure access to its U&A sites and other Tribal trust assets are not impacted.

## 6.11 Executive Order 13175 Consultation with Indian Tribal Governments

Executive Order 13175 (November 6, 2000) reaffirmed the Federal Government's commitment to a government-to-government relationship with Indian Tribes and directed Federal agencies to establish procedures to consult and collaborate with Tribal governments when new agency regulations would have Tribal implications. USACE has a nation-to-nation consultation policy to facilitate the interchange between decision makers to obtain mutually acceptable decisions. In accordance with this Executive Order, USACE has engaged in regular and meaningful consultation and collaboration with the Tulalip Tribes.

## 6.12 Executive Order 11988 Floodplain Management

EO 11988 (USACE 1984) requires Federal agencies to avoid to the extent possible the short-term and long-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. This ecosystem restoration project as designed would have no adverse impacts to the Snohomish River floodplain and would not support floodplain development.

## 6.13 Executive Order 11990 Protection of Wetlands

EO 11990 encourages Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. The project area is dominated by wetlands, but the purpose of the project is to restore hydrologic connection and reestablish water connectivity which would benefit wetland ecosystem functions.

# 7 Public Involvement, Review, and Consultation

Public involvement activities and agency coordination are summarized in this chapter.

## 7.1 Tribal Government Consultation and Coordination Process

Upon initiation of this limited-scope feasibility study since completion of PSNERP in 2016, USACE sent informational letters to potentially affected Tribes in the study area. The letters are dated June 27, 2023. The purposes of the letters were to provide an update since completion of PSNERP, provide specific information about the proposed action for Spencer Island, and to request any information and concerns regarding the proposal for restoration at the site. The Tribes and their agents contacted are the following:

- Sauk-Suiattle Indian Tribe
- Snoqualmie Indian Tribe
- Skagit River System Cooperative
- Stillaguamish Tribe of Indians of Washington
- Tulalip Tribes of Washington
- Confederated Tribes and Bands of the Yakama Nation

Prior to publishing the Draft FR/EA for a 30-day public comment period, USACE again notified Tribes listed above of the proposed action, providing additional opportunities to discuss project design.

## 7.2 Public Involvement Process

The Spencer Island Ecosystem Restoration Project exemplifies a robust collaborative approach, integrating input from a diverse range of stakeholders, including local residents and expert groups. Throughout the PSNERP process and the feasibility phase, key organizations like WDFW, Snohomish County, and USACE have actively engaged the community through numerous meetings. This ongoing dialogue has been crucial in shaping a design that balances ecological integrity with social needs.

The Technical Working Group, comprising representatives from the Tulalip Tribes of Washington, Northwest Fisheries Science Center, WA Dept. of Ecology, City of Everett, and Snohomish County, plays a vital role in this process. Their expertise ensures that the project is informed by a broad spectrum of perspectives and knowledge.

For a detailed overview, a summary of the meeting dates can be found in Table 7-1, highlighting the commitment to transparency and collaboration throughout the project's development.

Table 7-1 Meeting Dates: Technical Working Group and WDFW/Snohomish County.

| Technical Working Group Meetings | WDFW/Snohomish County Meetings |
|---|---|
| 1/26/2023 | 3/16/2023 |
| 3/20/2023 | 11/27/2023 |
| 7/7/2023 | 1/2/2024 |
| 10/11/2023 | 2/5/2024 |
| 10/12/2023 | 2/29/2024 |
| 7/2/2024 | 4/18/2024 |
| | 8/27/2024 |

USACE will continue to actively engage project partners, stakeholders, and residents throughout this project and will post this draft IFR/EA for public review for 30 days. The public review period will be from February 3, 2026 to March 5, 2026.

## 7.3 Agencies and Persons Consulted*

The following list of agencies and individuals were consulted during the plan formulation and environmental compliance of this feasibility study and preparation of the integrated FR/EA.

- U.S. Environmental Protection Agency
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- Tulalip Tribes of Washington
- Washington Department of Fish & Wildlife
- Washington Department of Ecology
- Snohomish County
- City of Everett

# 8 Summary of Environmental Impacts

There would be short-term, mid-range, and long-term impacts from the proposed restoration work. Immediate, negative impacts are likely, but over time, ecological processes would be restored, and the site would result in better ecological functions.

In the short term, following construction, the PDT expects negative impacts from lowering dikes and creating breaches throughout Spencer Island. These earthwork activities would require removal of vegetation and earth work with construction equipment which would generate gas emissions (Section 4.4). Vegetation removal would negatively impact riparian habitat due to construction activities (see Section 4.6 for additional info). Approximately 400 trees would be removed, but most of these are fast-growing, deciduous species. To mitigate the impacts, new native vegetation would be planted along the enhanced walking path on the Union Slough dike (Section 3.2.2), with around 308 trees and 3,008 shrubs to offset the loss. The negative impacts of vegetation removal are expected to be short-term, as most of the woody vegetation being removed consists of deciduous trees. Approximately 46 conifer trees would be preserved wherever feasible. However, the project prioritizes significant improvements to aquatic habitat to restore the site to its prior condition. For this site, aquatic habitat is considered higher value than the riparian vegetation that is being lost. Riparian habitat would be revegetated as best as possible There would be disturbed land throughout the project, but the planting plan would shorten the period of revegetation and help offset gas emissions. In-water work would be required and would result in increased turbidity and generate some noise during construction. However, these impacts would be limited through BMP's and equipment would operate under constrained work windows. Additionally, invasive plant species would be removed and properly disposed of as outlined in the planting plan in Appendix E.

Based on the planting plan outlined in the planting plan section of Appendix E and evidence derived from an adjacent, previously restored restoration site, the PDT expects natural recruitment to re-colonize disturbed areas within 3 to 10 years after construction. Native trees and shrubs would be planted in disturbed upland areas, and it is expected that shrubs would establish within 7 years and trees would establish 15 to 20 years after construction is complete. A nearby restoration project that began in 2008 found that natural recruitment of intertidal marsh plants reach 74% cover three years after construction and no invasive species were present (ICF International 2014). Therefore, no negative impacts are expected from intertidal invasive species or lack of vegetation past year three. Upland invasive plants would be actively controlled as outlined in the invasive plant removal section of Appendix E. Turbidity would likely not be present after year 3 since established plant roots would help keep the soil and sediment intact.

Over time, the PDT expects better ecological functions as a result of the proposed restoration work. Trees would begin maturing 15 to 20 years after construction and would provide more shade, leaf litter, and insects for fish (Compson et al., 2013). There would also be more native plants as indicated by adjacent restoration projects (ICF International 2014). Water connectivity would help establish functional habitat for fish and mature trees would provide habitat for wildlife.

# 9 Recommendations

The following text outlines USACE's recommendations for project approval and authorization for implementation.

I concur with the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that aquatic ecosystem restoration be implemented at Spencer Island, Washington, in accordance with the reporting officers' recommended plan. The estimated project first cost of the recommended plan is $13,167,000. The Federal portion of the estimated project first cost is $8,558,550. The Non-Federal Sponsors' portion of the required cost share of estimated project first costs is $4,608,450. My recommendation is subject to cost sharing and other applicable requirements of Federal laws, regulations, and policies. Federal implementation of the project for ecosystem restoration includes, but is not limited to, the following required items of local cooperation to be undertaken by the Non-Federal Sponsor in accordance with applicable Federal laws, regulations, and policies:

a. Provide the Non-Federal share of project costs including 35 percent of construction costs allocated to ecosystem restoration, as further specified below:

    i. Provide, during design, 35 percent of design costs in accordance with the terms of a project partnership agreement entered into prior to commencement of design work for the project;

    ii. Provide all lands, easements, and rights-of-way, including those required for relocations and placement areas, and perform all relocations determined by the Federal Government to be required for the project; and

    iii. Provide, during construction, any additional contribution necessary to make its total contribution equal to 35 percent of construction costs.

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Ensure that the project or lands, easements, and rights-of-way required for the project shall not be used as a wetlands bank or mitigation credit for any other project;

d. Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal Government, in a manner compatible with the

project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal Government;

e. Hold and save the Federal Government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Federal Government or its contractors;

f. Perform, or ensure performance of, any investigations for HTRW that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9601-§9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal Government determines to be necessary for construction, operation, and maintenance of the project;

g. Agree, as between the Federal Government and the Non-Federal Sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal Government;

h. Agree, as between the Federal Government and the Non-Federal Sponsor, that the Non-Federal Sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that would not cause HTRW liability to arise under applicable law; and

i. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. §4630 and §4655) and the Uniform Regulations contained in 49 C.F.R. Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect

program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Northwestern Division as a proposal for approval and implementation funding. However, prior to transmittal to the Northwestern Division, WDFW (the Non-Federal Sponsor) would be advised of any significant modifications and would be afforded an opportunity to comment further.

Kathryn P. Sanborn, PhD, PE, PMP
Colonel, Corps of Engineers
District Commander

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