

PORT GAMBLE BAY NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION

FINAL RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT

Port Gamble Bay, Kitsap County, Washington



AUGUST 2024

PORT GAMBLE BAY NATURAL RESOURCE TRUSTEE COUNCIL



Prepared by the Port Gamble Bay Natural Resource Trustee Council:

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Skokomish Tribe

Squamish Indian Tribe

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State of Washington/Department of Ecology

Cover page photo: Port Gamble Bay shoreline near former mill site – November 2018. Photo credit: J. Krausmann, USFWS, Lacey, Washington.

TABLE OF CONTENTS

| | |
|---|----|
| TABLE OF CONTENTS..... | 3 |
| ABBREVIATIONS AND ACRONYMS | 5 |
| EXECUTIVE SUMMARY | 6 |
| 1. INTRODUCTION | 9 |
| 1.1 Background to Port Gamble Bay NRDAR Final Restoration Plan and Environmental Assessment | 9 |
| 1.2 The Natural Resource Damage Assessment and Restoration Process | 11 |
| 1.3 Relationship Between NRDAR and Response Actions | 12 |
| 1.4 Purpose and Need for Restoration | 13 |
| 1.4.1 Restoration Goals and Objectives | 14 |
| 1.5 Summary of the Proposed Settlement..... | 15 |
| 1.6 Natural Resource Trustee Authority | 16 |
| 1.7 Public Participation..... | 16 |
| 1.7.1 Potentially Responsible Parties’ Participation..... | 17 |
| 1.7.2 Administrative Record | 18 |
| 1.8 Compliance with Other Authorities | 18 |
| 2.0 POTENTIAL INJURY TO NATURAL RESOURCES | 19 |
| 2.1 Injury Assessment Process for the Bay..... | 19 |
| 2.1.1 Assessment Area | 19 |
| 2.1.2 History of Operations & Releases | 20 |
| 2.2 Injury Determination..... | 20 |
| 2.2.1 Contaminants of Concern..... | 21 |
| 2.2.2. Natural Resources’ Exposure to Released Hazardous Substances | 21 |
| 2.2.3 Potential Injuries to Natural Resources | 22 |
| 2.3 Calculating Compensation | 24 |
| 2.3.1 Injury Quantification | 24 |
| 2.3.2 Damages Determination..... | 25 |
| 3. RESTORATION ALTERNATIVES | 27 |
| 3.1 Process Used to Identify Alternatives | 27 |
| 3.2 Alternatives Considered..... | 30 |
| 3.2.1 Alternative A: No Action Alternative (Natural Recovery) | 30 |
| 3.2.2 Alternative B: Southern Mill Site Shoreline Restoration | 30 |
| 3.2.3 Alternative C: Western Bay Nearshore Restoration..... | 32 |

| | |
|--|----|
| 3.2.4 Alternative D: Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration (Preferred Alternative) | 34 |
| 3.3 Evaluation of Alternatives Using Restoration Criteria | 35 |
| 4. ENVIRONMENTAL ASSESSMENT | 40 |
| 4.1 Affected Environment..... | 41 |
| 4.1.1 Physical and Biological Environment | 41 |
| 4.1.2 Cultural Resources | 43 |
| 4.1.3 Demographics and Socioeconomics..... | 44 |
| 4.2 Evaluation of the Alternatives and Their Environmental Consequences..... | 45 |
| 4.2.1 Hydrology and Water Quality Impacts..... | 46 |
| 4.2.2 Sediment Quality Impacts | 46 |
| 4.2.3 Vegetation | 47 |
| 4.2.4 Fish and Wildlife Habitat | 47 |
| 4.2.5 Special Status Species | 48 |
| 4.2.6 Floodplain and Flood Control | 49 |
| 4.2.7 Introduction of Non-Indigenous Species..... | 49 |
| 4.2.8 Aesthetic, Historic, Cultural, and Socioeconomic Impacts | 49 |
| 4.2.9 Noise Impacts | 51 |
| 4.2.10 Recreational Impacts | 51 |
| 4.2.11 Health and Safety | 52 |
| 4.2.12 Transportation, Utilities, and Public Services | 53 |
| 4.2.13 Environmental Justice | 53 |
| 4.2.14 Land and Shoreline Use | 54 |
| 4.2.16 Wetlands..... | 55 |
| 4.2.17 Air Quality..... | 56 |
| 4.4 Cumulative Impacts | 56 |
| 4.4.1 Potential Impacts of Climate Change on Restoration..... | 59 |
| 5. RESTORATION MONITORING, PERFORMANCE CRITERIA, MAINTENANCE, AND STEWARDSHIP..... | 63 |
| 5.1 Monitoring & Performance Criteria..... | 63 |
| 5.2 Adaptive Management | 64 |
| 5.3 Long-Term Maintenance, Monitoring, and Stewardship..... | 64 |
| 5.4 Reporting Requirements | 65 |
| 6. REFERENCES | 66 |

| | |
|---|----|
| 7. GLOSSARY | 72 |
| 8. LIST OF PREPARERS AND EDITORIAL ASSISTANCE | 74 |
| Appendix A | 75 |
| Appendix B | 79 |

ABBREVIATIONS AND ACRONYMS

CEQ-White House Council on Environmental Quality
 CERCLA-Comprehensive Environmental Response, Compensation, and Liability Act
 cPAHs- Carcinogenic Polyaromatic Hydrocarbons
 CWA-Clean Water Act
 DOI-U.S. Department of the Interior
 EA-Environmental Assessment
 Ecology-Washington State Department of Ecology
 EPA-U.S. Environmental Protection Agency
 ESA-Endangered Species Act
 HEA-Habitat Equivalency Analysis
 LAT-Lead Administrative Trustee
 MBTA-Migratory Bird Treaty Act
 MLLW-Mean lower low water
 MOA-Memorandum of Agreement
 MTCA-Model Toxics Control Act
 NEPA-National Environmental Policy Act
 NMFS-National Marine Fisheries Service
 NRDAR-Natural Resource Damage Assessment and Restoration
 PAH-Polycyclic aromatic hydrocarbons
 PCBs-Polychlorinated biphenyls
 PGST-Port Gamble S’Klallam Tribe
 PRP-Potentially Responsible Party
 RP/EA-Restoration Plan/Environmental Assessment
 SMS-Sediment Management Standards (SMS)
 SQS-Sediment Quality Standards (SQS)
 SEPA-State Environmental Policy Act
 USFWS-U.S. Fish and Wildlife Service
 WDNR-Washington State Department of Natural Resources
 WDFW-Washington State Department of Fish and Wildlife
 WSDOH-Washington State Department of Health

EXECUTIVE SUMMARY

Beginning in the mid-1800s through 1995, Port Gamble Bay was the site of extensive industrial activities that have resulted in the release of hazardous substances to the environment. Port Gamble Bay is in Kitsap County, Washington and encompasses more than two square miles of subtidal and shallow intertidal habitat. Sawmill and logging operations conducted by Pope & Talbot at various locations in and along Port Gamble Bay released hazardous substances including, but not limited to, polychlorinated dibenzodioxins and furans, polychlorinated biphenyls (PCBs), organochlorine pesticides, metals, perchlorate, tributyltin, and wood waste degradation products. Because of these releases, natural resources in Port Gamble Bay have been exposed to and adversely affected by hazardous substances which have been found in Port Gamble Bay sediments, biota, surface water, soils, and groundwater. The physical environment of the Port Gamble Bay has also been altered by other human activities such as filling of former aquatic areas, capping of contaminated sediment, installation of in-water structures, and dredging. Despite contamination in Port Gamble Bay, the site remains an important area used by natural resources such as salmonids, invertebrates, birds, shellfish, and other wildlife. Port Gamble Bay is also an important location for Tribal shellfish harvesting and fishing, and other resources.

Under the Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC §9601, et seq. (CERCLA) and the Clean Water Act, 33 USC §1251, et seq. (CWA) and related legal authorities, the Port Gamble Bay Natural Resource Trustees have been conducting natural resource damage assessment and restoration (NRDAR) activities to assess and address natural resource injuries in Port Gamble Bay caused by releases of hazardous substances. The natural resource trustees for the Port Gamble Bay are the Jamestown S'Klallam Tribe, the Lower Elwha Klallam Tribe, the Port Gamble S'Klallam Tribe (PGST), the Skokomish Indian Tribe, the Suquamish Indian Tribe of the Port Madison Reservation (Suquamish Tribe), the United States Department of the Interior (DOI) represented by the United States Fish and Wildlife Service (USFWS), and the State of Washington represented by the State of Washington Department of Ecology (Ecology) (collectively, the Trustees).

For the purposes of this NRDAR, the Trustees have defined the Port Gamble Bay Assessment Area (the Bay or Assessment Area) to include the entirety of Port Gamble Bay in Kitsap County, Washington just south of the Strait of Juan de Fuca (Figure 1). The Bay is those areas below the ordinary high-water mark, encompassing more than two square miles of subtidal and shallow intertidal habitat.

The Trustees collaborated to assess and address potential injuries to natural resources caused by hazardous releases adjacent to and in the Bay. Once the Trustees determined the extent of potential injuries caused by hazardous releases, they sought damages from potentially responsible parties to compensate for the injuries to natural resources and related lost services. The Trustees also evaluated actions that will restore, replace, or acquire the equivalent of the natural resources and related services potentially injured by the hazardous releases. To restore

injured resources and improve the Bay's ability to support these resources, the Trustees considered habitat creation and enhancement projects. Shoreline habitats are a top priority because of their high value to potentially injured natural resources such as migratory birds (osprey, bald eagle, assorted waterfowl, great blue heron, spotted sandpiper, belted kingfisher), anadromous and resident fish (forage fish included), shellfish, aquatic vertebrates, and aquatic plants (including eelgrass). Wetland and upland habitats, riparian and beach backshore habitat and subtidal habitats are also targeted because they support wildlife, filter runoff, and provide material inputs in the estuarine waters, groundwater, and surface water. The Trustees' primary focus was restoration of mudflats, shorelines, and submerged aquatic vegetation in integrated habitat complexes because these habitat features have been found to have the most direct benefits for those potentially injured resources in the Bay. The Trustees also considered other project types that show clear benefits to those natural resources potentially injured by hazardous releases in the Bay.

Consistent with applicable legal authorities, e.g., Section 111(i) of CERCLA, this Final Restoration Plan/Environmental Assessment (Final RP/EA) details the Trustees' planning and analysis to select actions to restore those natural resources potentially injured as the result of hazardous substance releases in the Bay. Additionally, as a federal agency, DOI is required under the National Environmental Policy Act, 42 U.S.C. § 4321, et seq. (NEPA), to identify and evaluate impacts to the environment that may occur due to federal actions. On June 20, 2024, the Trustees issued a Draft RP/EA for public comment (*See* 89 Fed. Reg. 51,903 (June 20, 2024)). No public comments were received during the 30-day comment period, and the Trustees then reviewed the Draft RP/EA to create this Final RP/EA. In this Final RP/EA, the Trustees describe the affected environment and evaluate the following restoration alternatives to identify and evaluate the likely impacts associated with each.

- No Action Alternative (Alternative A) – Under this alternative, the Trustees would take no action to restore potentially injured natural resources and would not accept restoration actions taken by potentially responsible parties.
- Southern Mill Site Shoreline Restoration (Alternative B) – Under this alternative, the Trustees would accept potentially responsible parties' implementation of a nine-acre project that would include laying back intertidal slopes of the southern portion of the former sawmill facility shoreline to restore near-natural beach grades. Restored intertidal caps would include a lower layer of angular cobble-sized armor, a middle layer of rounded cobble/gravel beach substrate, and an upper layer of sand/gravel habitat substrate to optimize habitat functions and concurrently prevent exposure to contaminated soils beneath the cap. Near-surface hardscape would be removed within a 150-foot shoreline buffer, followed by soil treatments and native plantings.
- Western Nearshore Restoration (Alternative C) - The Trustees would accept this project as implemented by potentially responsible parties, which would include placing a sand cover layer over a minimum of 11 acres of lower intertidal to shallow subtidal zones (approximately -2 to -15 feet mean lower low water [MLLW]) within former log rafting areas in the western Bay to restore benthic habitat functions and concurrently provide

suitable substrate in areas where eelgrass is absent or growing at very sparse densities. As practicable, the sand cover would be constructed using clean dredge material from the nearby Driftwood Key navigation channel, or other similar marine source which would be expected to contain eelgrass seed and maximize restoration potential.

- Preferred Alternative, Combined Southern Mill Site Shoreline and Western Nearshore Restoration (Alternative D)- The Trustees would accept potentially responsible parties' implementation of the two restoration projects described in Alternatives B and C, the Southern Mill Site Shoreline and Western Nearshore Restoration. Together, the two restoration projects would be likely to restore the equivalent of the natural resources injured and services lost due to releases of hazardous substances from the former Pope & Talbot operations in the Bay.

The Trustees' Preferred Alternative, Combined South Mill Site and Western Nearshore Restoration (Alternative D) presented in this Final RP/EA has been proposed by potentially responsible parties, Pope Resources, L.P., OPG Properties LLC, and OPG Port Gamble LLC (collectively, the PRPs). The PRPs will implement restoration projects under the Preferred Alternative to resolve their alleged natural resource damages liability for the Bay associated with their operations and ownership of the former Pope & Talbot, Inc. sawmill property. The Trustees and the PRPs have negotiated and signed a consent decree, currently lodged with the United States District Court for the Western District of Washington, under which the Trustees propose to accept implementation of the restoration projects to offset the PRPs' natural resource damages liability.

1. INTRODUCTION

1.1 Background to Port Gamble Bay NRDAR Final Restoration Plan and Environmental Assessment

This Final RP/EA has been prepared by the Trustees to analyze restoration actions to restore natural resources and related services potentially injured by releases of hazardous substances from logging and sawmill operations in the Bay (Figure 1). In 2014, the Jamestown S’Klallam Tribe, the Lower Elwha Klallam Tribe, the PGST, the Skokomish Tribe, the Suquamish Tribe, Washington represented by Ecology, and DOI formed the Port Gamble Bay Natural Resource Trustee Council to conduct joint NRDAR activities for the Bay. As established by CERCLA, CWA, and other legal authorities, NRDAR is the process by which state, Tribal, and federal natural resource trustees evaluate injuries to natural resources and losses of related services caused by releases of hazardous materials.¹ The result of a NRDAR is a calculation of the magnitude of natural resource injuries and, ultimately, the ecological restoration required to compensate the public for the injuries to natural resources. Because this NRDAR is being conducted pursuant to processes established under CERCLA, discussions throughout this document will focus primarily on CERCLA; however, the Trustees will comply with all applicable statutes.

Pope & Talbot, Inc. and its successors operated a sawmill on the northwest shore of the Bay from 1853 to 1995 (Mill Site), with log transfer and rafting activities occurring at various locations adjacent to and in the Bay. This was one of the first sawmills in Puget Sound. Log rafting ceased in 1995 when the sawmill closed. In 1985, Pope & Talbot, Inc. transferred ownership of its sawmill property in and adjacent to the Bay to Pope Resources L.P. Following this transfer, OPG Properties LLC, formerly known as Olympic Property Group I, LLC, operated the property from 1998 to 2020. In 2020, Pope Resources L.P. transferred its property ownership in and adjacent to the Bay to OPG Port Gamble LLC.

Releases of hazardous substances have been detected in the water, sediments, soils, and ground water of the Bay. Substances such as PAHs, metals, phenols, and sulfide are attributable to releases from the Mill Site’s Forest product manufacturing operations and log rafting. Over time, these releases have become commingled in the Bay. For a complete list of hazardous substances above injury thresholds detected in the Bay, see Section 2.2.1, “Contaminants of Concern.” There are many potential activities that caused the releases, including petroleum product storage, electrical transformer use, wood treatment/end painting, use of hog fuel boilers, and drum storage. Log rafting and timber processing operations resulted in accumulations of wood waste in the marine environment where degradation byproducts such as ammonia and sulfides have the potential to cause toxicity to aquatic receptors (Anchor QEA, LLC 2012 & 2019, State of Washington Department of Ecology 2012).

¹ In the context of NRDAR, services are defined as the physical and biological functions performed by a natural resource, including human uses of those functions. 43 CFR §11.14(nn).

Based on their assessment activities, which are described in more detail in Section 2.0, the Trustees have determined that natural resources and their supporting habitats are potentially injured by the releases of hazardous substances from the Mill Site. Potentially injured natural resources include, but are not limited to, the following: migratory birds such as osprey, bald eagle, assorted waterfowl, great blue heron, belted kingfisher, spotted sandpiper, and other shorebirds; anadromous and resident fish; and aquatic invertebrates. For a complete list of species including State listed, as well as Threatened and Endangered species, see Section 4.1, “Affected Environment.”

This Final RP/EA describes the Trustees’ restoration evaluation objectives and screening criteria, application of the criteria to evaluate alternatives, and the Trustees’ analysis of the alternatives’ likely impacts to the environment as well as the cumulative effects should the alternatives be implemented. Pursuant to legal mandates under both CERCLA and NEPA, the Trustees developed this Final RP/EA to document their restoration planning analysis and to seek public input on the Trustees’ selection of a restoration alternative. The Trustees comply with CERCLA requirements to describe to the public the Trustees’ proposed means to restore, and to compensate the public for, natural resource injuries caused by hazardous substance releases to the Bay. Under NEPA, the Trustees prepared this Final RP/EA to analyze the potential environmental impacts of the alternatives that the Trustees considered to restore, replace, rehabilitate, and/or acquire the equivalent of the injured natural resources. Additionally, the Final RP/EA informs the public of the Trustees’ Preferred Alternative, Combined Southern Mill Site Shoreline and Western Nearshore Restoration (Alternative D), and provides an opportunity for public comment. Following their analysis, which is set forth in this Final RP/EA, the Trustees have determined that implementation of the Preferred Alternative (Alternative D) is likely to restore those natural resources potentially injured by hazardous releases from the PRPs’ activities to the Bay. The Preferred Alternative (Alternative D) is the basis of a proposed settlement between the PRPs and the Trustees. The settlement is described in more detail in Section 1.5.

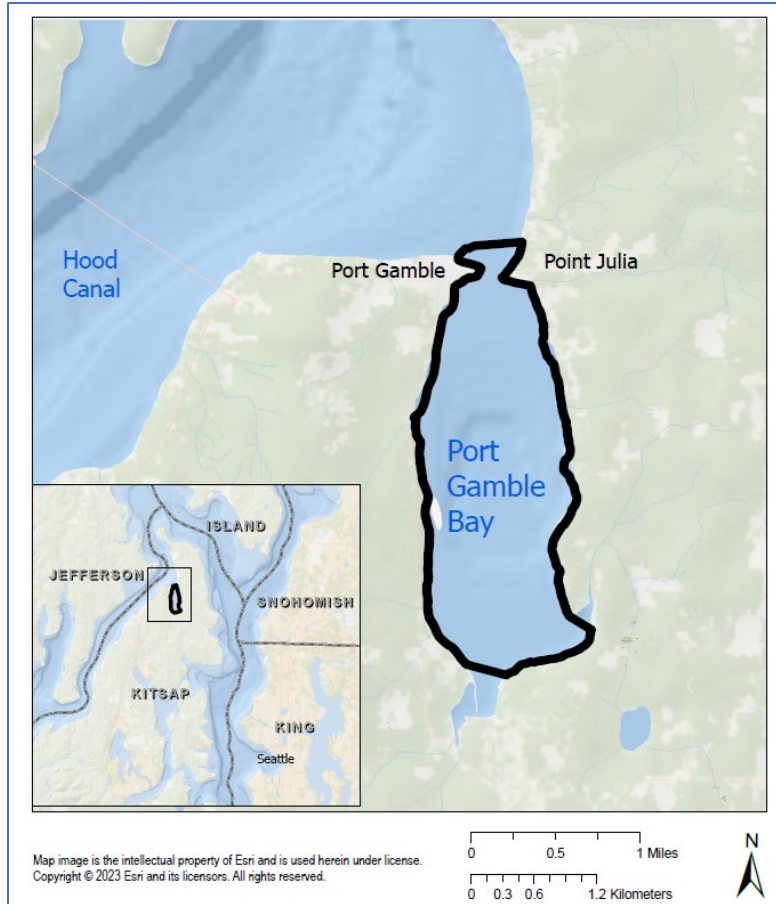


Figure 1: Port Gamble NRDAR Assessment Area map. Credit: Port Gamble Bay Natural Resource Trustee Council

1.2 The Natural Resource Damage Assessment and Restoration Process

This section provides a general overview of the NRDAR process to contextualize the Trustee’s activities for the Bay, which are described in more site-specific detail throughout this Final RP/EA. At its essence, the NRDAR process consists of the following three phases: 1) Preliminary Assessment; 2) Injury Assessment; and 3) Restoration Planning and Implementation. The purpose of the Preliminary Assessment Phase is to provide a rapid review of readily information allowing trustee decisionmakers to determine whether a natural resource damage assessment should be performed. During the Injury Assessment Phase, trustees identify those natural resources that have been injured by releases of hazardous substances and quantify the extent of those natural resource injuries and any related resource service losses. This process is done by conducting activities such as data and literature reviews as well as site-specific economic and scientific studies. In the Restoration Planning and Implementation Phase, trustees use injury determination and quantification results to plan for and implement actions that will restore those resources injured by releases of hazardous substances. Trustees pursue restoration actions that will provide sufficient ecological benefits to offset the lost services provided by the injured resources. Once implemented, the trustees monitor restoration actions for effectiveness. Throughout the NRDAR process, trustees seek public input.

1.3 Relationship Between NRDAR and Response Actions

When performing NRDAR activities, trustees coordinate with agencies responsible for cleanup and remedial actions, such as the Environmental Protection Agency (EPA) and Ecology. Removal and remedial actions (collectively, response actions) are conducted by the response agencies and focus on controlling exposure to released hazardous substances by removing, neutralizing, or isolating the substances to protect human health and the environment. An effective response action may reduce the amount of injury to a natural resource by stopping or reducing the resource's exposure to hazardous substances. Although response actions can reduce the need or amount of restoration, the restoration and response actions are separate and distinct. Trustees work with response agencies to understand the impacts of remedial actions to natural resources and consider the potential for impacts from response actions when planning restoration implementation.

For the Bay, the Trustees have and will continue to closely coordinate their NRDAR activities with Ecology, the agency leading response actions associated with hazardous releases from the PRPs' activities. The Bay is subject to ongoing cleanup activities under Ecology's Toxics Cleanup Program Puget Sound Initiative. Ecology divided the Mill Site into two zones for response actions: upland and aquatic. In the aquatic zone, five sediment management areas were identified: Mill Site North (SMA 1), Mill Site South (SMA 2), Central Bay (SMA 3), Former Lease Area (SMA 4), and Background (SMA 5) as depicted in (Figure 2). The Trustees reviewed and used data collected as part of the response activities to identify and quantify natural resource injuries in the Bay.

Between 2015 and 2017, the PRPs, under Ecology oversight, conducted the following response actions in the aquatic zone: removal of over 8,500 pilings (mostly creosote-treated) and one-acre of derelict structures, removal of over 110,000 cubic yards of wood waste and contaminated sediment, placement of over 200,000 tons of clean cap and habitat materials, and placement of over 113,000 cubic yards of sand to accelerate natural recovery of benthic habitat. Response actions were conducted over about 106 acres of the Bay. Approximately 3,400 feet of shoreline along the mill was improved but is steep and hard-armored following cleanup.

Response actions to address contamination remaining in the Mill Site upland are scheduled to begin mid-2024. Under Ecology oversight, the PRPs will excavate and transport soil from the most contaminated portions of the Site to an off-Site disposal facility. Clean soil will be brought in to fill excavation pits and to create a cap over areas of the Site with lower levels of contamination. Re-grading of the shoreline for restoration as part of the NRDAR process will require redesign of the existing intertidal sediment caps.

The PRPs are required to monitor the upland and aquatic Mill Site following response actions. Ecology uses monitoring data for periodic reviews in which it evaluates long-term compliance with Ecology-defined standards for soil, groundwater, and sediment. The PRPs will maintain remedial components such as soil and sediment caps, to ensure the remedy remains protective of human and ecological health.

The Trustees, Ecology, and the PRPs will continue to work together to ensure that potential restoration implementation in the Bay will be consistent with response requirements and resource needs. Under the Preferred Alternative, the PRPs will implement both the response and restoration actions in the same period. Given that the Preferred Alternative and response actions have overlapping physical footprints, the Trustees and Ecology reviewed response and restoration action designs and requirements to ensure that the actions are complimentary while still achieving expected performance. Moreover, the Trustees believe that performing response and restoration construction activities concurrently will result in the least disturbance and greatest benefit to resources.

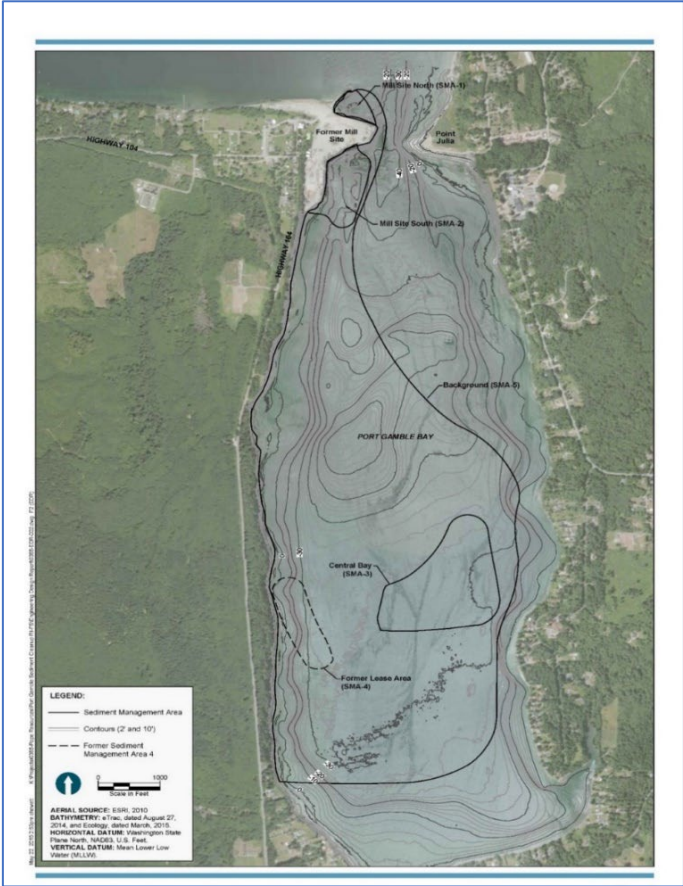


Figure 2: Sediment Management Areas (SMA’s) map from 2023 Engineering Design Report, Port Gamble Bay Cleanup. Credit: Ecology

1.4 Purpose and Need for Restoration

Under CERCLA, the Trustees are required to restore, replace, or acquire the equivalent of those natural resources injured by releases of hazardous substances. Accordingly, the purpose of the action is for the Trustees to restore natural resources in the Bay, including habitat and the services they provide, that were and continue to be potentially injured by releases of hazardous substances from the PRPs’ activities. The implementation of restoration actions will serve as the basis of a settlement between the Trustees and the PRPs to resolve the PRPs’ natural resources

damages liability associated with the releases of hazardous substances to the Bay from their activities at the Mill Site. The Trustees need to develop restoration actions that will provide ecological benefits that offset the natural resource injuries and service losses in the Bay caused by releases of hazardous substances by the PRPs.

Based on their analysis set forth in this Final RP/EA, the Trustees select Alternative D, Combined Southern Mill Site Shoreline and Western Nearshore Restoration, as the Preferred Alternative to restore potentially injured resources. Under this alternative, the PRPs will act under the Trustees' oversight to implement two habitat restoration projects in and adjacent to the Bay to benefit potentially injured resources, including but not limited to fish, shellfish, migratory birds, as well as eelgrass habitat. Both projects were designed by the PRPs with ultimate approval by the Trustees. The Preferred Alternative will include the PRPs and other landowners restricting the uses of the project properties. Additionally, the PRPs under the Preferred Alternative will perform and fund actions to maintain, monitor, and steward the projects so that they will benefit potentially injured natural resources in the Bay on a long-term basis.

1.4.1 Restoration Goals and Objectives

To restore those natural resources injured in the Bay as the result of hazardous substance releases from the PRPs' activities, the Trustees will restore important intertidal and riparian habitats that support potentially injured resources such as salmonids and other fish, migratory birds, shellfish, and benthic invertebrates. Intertidal and riparian habitats in and adjacent to the Bay are a fraction of their historic acreage, and this lack of habitat is a limiting factor for many potentially injured natural resources and related services within this system. To restore injured resources and improve the Bay's ability to support these resources, the Trustees analyzed restoration actions that rehabilitate, create, and enhance habitat.

The Trustees focused on restoration alternatives located in and adjacent to the Bay. Restoration in and adjacent to the Bay is constrained by industrial uses and other physical developments along the shorelines. Restoring to historical (pre-1850s) conditions is not possible in the Bay due to alteration from human activities. The Bay now supports multiple land use types, including industrial, commercial, and residential uses, and open space. Despite this, important opportunities exist in the Bay to restore ecosystem functions and processes to create and maintain natural habitats over time. Habitat restoration of shoreline processes and intertidal beach substrate enhancements in the Bay will benefit potentially injured fish, shellfish, and salmonids. Also, habitat restoration actions will create suitable substrate to restore benthic habitat functions and an opportunity for eelgrass restoration.

The Trustees' restoration objectives for the Bay are to:

1. Implement restoration with a strong nexus to natural resources injuries caused by releases of hazardous substances in the Bay.
2. Provide a net gain of habitat function beyond existing conditions for injured fish, shellfish, and wildlife by restoring important habitat types and the physical processes that sustain them.

3. Integrate restoration strategies to increase ecosystem structure and function of the Bay.
4. Preserve existing threatened functioning habitats while enhancing or creating new high-value habitats for fish, shellfish, and wildlife.
5. Coordinate restoration efforts with other planning and regulatory activities to maximize restoration potential in a cooperative agreement.
6. Ensure that restoration sites and associated habitat functions are preserved in perpetuity.

1.5 Summary of the Proposed Settlement

Per the terms of the proposed consent decree, a group of PRPs, Pope Resources, L.P., OPG Properties LLC, and OPG Port Gamble LLC, agree to implement the Preferred Alternative (Alternative D) to resolve their natural resource damages liability caused by hazardous substance releases from their ownership and operation activities to the Bay. The Preferred Alternative (Alternative D) consists of implementation of two restoration projects in and adjacent to the Bay: Southern Mill Site Shoreline Restoration and the Western Bay Nearshore Restoration.

Alternative D encompasses nearly 35 acres of intertidal slopes, shoreline, and subtidal zones of benthic habitat in two locations in the Bay. The fourteen-acre Southern Mill Site Shoreline Restoration at the former mill restores intertidal, backshore, and riparian forest. The Western Bay Nearshore Restoration is a twenty-one-acre intertidal project along the western bay that utilizes sand cover and eelgrass to restore lower intertidal and shallow subtidal habitat.

Collectively, these actions are likely to restore the shoreline, soil and native vegetation that will enhance the Bay ecosystems to benefit potentially injured wildlife, fish, and shellfish. Improving native shellfish habitat will help to stabilize and enhance the beach and overall water quality conditions. The planting of the eelgrass will provide habitat and food for wildlife and fish; support fish spawning; maintain water quality; produce oxygen; and absorb carbon.

The PRPs will also be required to fund adaptive management, maintenance and monitoring, and permanent stewardship for the restoration projects to ensure that the projects provide sufficient ecological benefits over time to offset natural resource injuries cause by the hazardous releases to the Bay. During the first ten years after shoreline restoration implementation completion², the PRPs will monitor and maintain the restoration projects. After the first ten years following shoreline restoration implementation completion, a designated Trustee or its representative will conduct long-term maintenance and monitoring as well as permanent stewardship for the restoration projects; however, the PRPs will continue to maintain the intertidal substrate and intertidal stability of the South Mill Beach Site for years 11 through 30 after the first ten years following shoreline restoration implementation completion. In return, the Trustees will release

² Under the terms of the consent decree, this ten-year period begins after the Trustees review and approve the PRPs' as-built drawings and construction completion report for the Southern Mill Site Restoration and placement of sand for the Western Bay Nearshore Restoration.

the PRPs from liability for natural resource damages in the Bay caused by releases of hazardous substances from the PRPs' prior operations and ownership.

On June 13, 2024, the United States Department of Justice filed the proposed consent decree with the United States District Court for the Western District of Washington (*United States, et al. v. Pope Resources, et al.*, Case No. 3:24-cv-5470 (W. Dist. Wash., June 13, 2024)). The proposed consent decree was then subject to a 30-day public notice and comment period concurrent with the public notice and comment period for the Draft RP/EA. A Notice of the Availability for the consent decree and the Draft RP/EA was published in the Federal Register on June 20, 2024 (89 Fed. Reg. 51,903 (June 20, 2024)). A copy of the proposed consent decree was available during the public notice and comment period here:

<https://www.justice.gov/enrd/consent-decrees>. The public comment period for both the proposed consent decree and Draft RP/EA opened on June 20, 2024 and ended on July 22, 2024. No comments were received on the proposed consent decree.

1.6 Natural Resource Trustee Authority

Under CERCLA and related legal authorities, natural resource trustees act on behalf of the public to assess injury to natural resources caused by releases of hazardous substances and seek compensation for such losses. Trustees determine how to restore and compensate the public for such injuries and seek funds to implement restoration projects from potentially responsible parties or reach settlements that require potentially responsible parties to implement restoration. Natural resource trusteeship is often shared among states, Tribes, and designated federal agencies.³

In 2014, the Trustees for the Bay established the Port Gamble Bay Natural Resource Trustee Council (Trustee Council) pursuant to a Memorandum of Agreement (MOA). The members of the Trustee Council are the PGST, the Skokomish Tribe, the Suquamish Tribe, the Jamestown S'Klallam Tribe, the Lower Elwha Klallam Tribe, Washington represented by Ecology, and DOI with the USFWS acting as the DOI lead. The PGST initially served as the Lead Administrative Trustee (LAT) succeeded by the current LAT, Ecology.

1.7 Public Participation

Public participation is an important part of the Trustees' restoration planning process and is also called for pursuant to CERCLA, e.g., 42 USC § 9611(i). Under NEPA, federal agencies are also required to comprehensively analyze the impacts of their proposed actions and make information related to their analyses publicly available 42 USC § 4332. The Trustees provided the Draft RP/EA to the public via announcement. The Draft RP/EA was available for public review and comment for 30 days beginning with the publication of the Notice of Availability in the Federal Register on June 20, 2024 (89 Fed. Reg. 51,903 (June 20, 2024)). During the public comment

³ The designation of natural resource trustees is explained in Section 107 of CERCLA (42 USC § 9607(f)) and the National Contingency Plan, 40 CFR subpart G.

period, the Draft RP/EA was accessible at: <https://www.fws.gov/wafwo/>. Ecology posted a blog story on its website to highlight the public comment period for both the Draft RP/EA and the proposed consent decree. Moreover, Ecology reached out to various news outlets, including those local to Port Gamble, regarding the lodged settlement and proposed restoration.

The public comment period for the Draft RP/EA ran through July 22, 2024. Both the Notice of Availability and Draft RP/EA contained instructions to submit written comments by email or mail. The Trustees did not receive any public comments on the Draft RP/EA. The Trustees then reviewed the Draft RP/EA and created this Final RP/EA. Due to a lack of comments, the Trustees did not make substantive changes from the Draft to the Final RP/EA. In this Final RP/EA, the Trustees analyze the restoration alternatives and document their decision to adopt the Preferred Alternative (Alternative D).

If the consent decree between the Trustees and the PRPs is entered by the Court, the Trustees will accept and oversee implementation of the Preferred Alternative described in this document. As the Trustees continue restoration planning, the Trustees may amend the Final RP/EA after it is issued if significant changes are made to the type, scope, or impact of the restoration actions. If there is a significant modification made to the Final RP/EA, the Trustees will provide another public review and comment opportunity related to the modification.

1.7.1 Potentially Responsible Parties' Participation

The PRPs (Pope Resources, OPG Properties LLC, and OPG Port Gamble LLC) participated in a cooperative NRDAR process with the Trustees that informed the proposed settlement between the Trustees and the PRPs.⁴ The PRPs for the Bay were initially identified as part of remedial due diligence. Early in the NRDAR process, the Trustees also conducted additional research into the PRPs' corporate ownership and history related to the Bay. In June 2017, the Trustees and the PRPs entered the first phase of a three-part phased cooperative NRDAR process for the Bay. For each phase of the cooperative NRDAR process, the parties' efforts were governed by a funding and participation agreement signed by all the PRPs and Trustees. The funding and participation agreement, with subsequent amendments, established scopes of work that the parties jointly pursued. Under the funding and participation agreement, PRPs funded the Trustees' participation in the cooperative NRDAR as well as a portion to the Trustees' unreimbursed costs for assessment activities in the Bay.

Together the PRPs and Trustees conducted the following activities under the phased cooperative assessment:

⁴ The CERCLA NRDAR regulations, 43 CFR § 11.32(a)(2), encourage natural resource trustees to invite PRPs to participate in the NRDAR process.

- Phase A — Developed a consensus list of contaminants, data, and assessment studies to identify injuries to natural resources in the Bay resulting from hazardous releases.
- Phase B — Modeled injury quantity and compensation using Habitat Equivalency Analysis (HEA), reviewed potential restoration projects to offset natural resource injuries in the Bay, and developed conceptual restoration project designs to create mutually agreeable restoration concepts for further refinement.
- Phase C — Drafted technical and legal documents, such as property protections, a technical scope of work, and financial assurances, to support restoration actions as the basis of a natural resource damages settlement between the Trustees and the PRPs.

This Final RP/EA along with the proposed consent decree that sets forth the settlement between the parties is the culmination of this cooperative assessment process. More information about the proposed settlement is found in Section 1.5.

1.7.2 Administrative Record

This Final RP/EA references documents prepared or relied on by the Trustees through the NRDAR process. These documents are part of the Administrative Record on file with the LAT and may be viewed at Washington Department of Ecology, 300 Desmond Dr. SE, Lacey, WA 98503 or on the following website:

<https://ecology.wa.gov/spills-cleanup/contamination-cleanup/cleanup-sites/puget-sound/port-gamble-baywide/natural-resource-damage-assessment-nrda1.8>

1.8 Compliance with Other Authorities

The Trustees need to consider many federal, state, Tribal, and local laws and regulations during the development of a restoration alternative, as well as regulatory requirements that are typically evaluated during federal and state permitting processes. Appendix A presents a review of the potentially applicable laws and regulations that govern the Trustees' restoration planning and implementation. When implementing the Preferred Alternative, the project managers will ensure that there is coordination among these programs where possible and that restoration implementation and monitoring follows all applicable laws and regulations.

2.0 POTENTIAL INJURY TO NATURAL RESOURCES

The Trustees reviewed data for the Bay that indicate that there are hazardous substances at levels in the Bay that are potentially injurious to exposed natural resources, including fish, shellfish, and migratory birds.⁵ Remedial investigations in the Bay found these hazardous substances, including but not limited to carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and cadmium, in the surface water, biota, and sediments of the Bay. The Trustees' assessment activities that identified and quantified these potential natural resource damage injuries are summarized below.

2.1 Injury Assessment Process for the Bay

This section describes the Trustees' natural resource damage assessment process for the Bay in more detail. Assessment activities to identify and quantify natural resource injuries in the Bay inform the type and magnitude of the restoration that the Trustees considered to compensate for natural resource injuries and associated service losses. As discussed in Section 1.7.1, the Trustees coordinated many of these assessment activities with the PRPs pursuant to a cooperative process. The restoration alternatives that the Trustees analyze in this Final RP/EA reflect the results of these assessment activities.

2.1.1 Assessment Area

At the commencement of the NRDAR process, the Trustees reviewed existing data to determine the geographic scope, i.e., Assessment Area, for their injury assessment activities.⁶ The levels of hazardous substances in sediment and surface water samples collected during remedial investigations indicated that releases of those substances from the PRPs' activities have come to be located in the Bay. Based on their review of that sampling data, the Trustees defined the Port Gamble Bay NRDAR Assessment Area (the Bay or Assessment Area) to be the area depicted in Figure 1, which includes the entirety of Port Gamble Bay in Kitsap County, Washington just south of the Strait of Juan de Fuca. The Bay is those areas below the ordinary high-water mark, encompassing more than two square miles of subtidal and shallow intertidal habitat.

⁵ For a complete list of special status species present or potentially present in the Bay, including State listed, Threatened and Endangered species, see Section 4.1, "Affected Environment."

⁶ CERCLA NRDAR regulations define the assessment area as "the area or areas in which natural resources have been affected directly or indirectly by the discharge of oil or release of a hazardous substance and that serves as the geographic basis for the injury assessment." 43 CFR § 11.14(c).



Photo 1: 2012 photo of Mill Site prior to clean up and removal of loading pier. Photo credit: J. Krausmann, USFWS.

2.1.2 History of Operations & Releases

From 1853 to 1995, Pope & Talbot, Inc. operated a sawmill along the northwest shore of the Bay. Raw timber was stored in floating rafts within the Bay before it was processed at the sawmill. Bark and wood particles sloughed off the timber and were released to the water column and sediments during temporary storage and transfer to the upland. Accumulations of wood chips and other wood debris from timber operations were several feet thick in some nearshore areas. The sawmill treated and incinerated wood. Related to these activities, the sawmill operations required chemical storage on site and the use of electrical transformers and hog fuel boilers. Infrastructure on and in the Bay was constructed for sawmill operations using creosote treated pilings. Landfilling using contaminated materials also occurred in and around the Bay as part of the sawmill infrastructure.

Remedial investigations found risks associated with cPAHs and cadmium in Bay shellfish exceeded Washington Model Toxic Control Act (MTCA)/Sediment Management Standard human health thresholds (Ecology 2012). Upon closure of the sawmill, thousands of creosote-treated pilings remained in the aquatic environment. Ecology identified the creosote pilings and overwater structures as a source of PAHs to the marine environment (Ecology 2012). Studies conducted by scientists at Washington Department of Fish and Wildlife (WDFW) and National Oceanic and Atmospheric Administration (NOAA) have shown PAHs were present in the sediment and in herring eggs at concentrations that have the potential to cause lethal and sublethal effects (West et al. 2014).

2.2 Injury Determination

To determine potential natural resource injuries, the Trustees reviewed site-specific data to identify those natural resources that were exposed to hazardous substances released to the Bay

from the Mill Site and, as a result, were and continue to be potentially injured by the releases.⁷ The Trustees analyzed data to identify those hazardous substances present in the Bay and confirmed a pathway by which those substances from the Mill Site came to be located in the Bay. The Trustees determined that natural resources were and continue to be exposed to hazardous substances in the Bay at potentially injurious levels. Further information on quantifying these injuries is located in Section 2.4.

2.2.1 Contaminants of Concern

The Trustees' injury assessment considered the following hazardous substances that are present and above known injury thresholds in the Bay:

- High and low molecular weight polycyclic aromatic hydrocarbons (PAHs)
- Metals, including arsenic, antimony, cadmium, chromium, copper, lead, nickel, silver and zinc
- Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs), including 2,3,7,8-tetrachlorodibenzo-p-dioxin and 2,3,7,8-tetrachlorodibenzofuran
- Sulfide
- Ammonia
- Benzoic acid
- Total PCBs
- Phenols, including phenol, pentachlorophenol, and 4-methylphenol, 2,4-dimethylphenol
- Phthalates, including Butyl Benzyl Phthalate and Diethyl Phthalate

In addition to the above hazardous substances, wood waste is a deleterious substance under MTCA. The PRPs' activities generated wood waste, some of which remains in the Bay.

2.2.2. Natural Resources' Exposure to Released Hazardous Substances

After reviewing activities at the Mill Site that are described in Section 2.1.2, the Trustees have found that those activities resulted in releases of the hazardous substances listed in Section 2.3.1 into the Bay through the standard operational practices used by the former mill and the associated docks. Combustion and atmospheric distribution of particulates and storm water and process wastewater discharge resulted in the movement of heavy metals and organic contaminants from land-based activities at the mill into the water column and marine sediments or comingled with wood waste. The distribution of hazardous substances corresponds with the locations of historical sawmill activities and wastewater discharge sites in the Bay.

⁷ More information regarding site-specific injury determination methods can be found in the CERCLA NRDAR regulations Type B assessment procedures. *See* 43 CFR §§ 11.60 -11.64.

2.2.3 Potential Injuries to Natural Resources

Sediment samples contain hazardous substances at concentrations that exceed State of Washington standards and federal guidelines, and are known to cause injury in benthic organisms, fish, shellfish, birds, and other resources. Chemical analysis of fish and shellfish tissue have identified metals, dioxin/furans, PCBs, and PAHs at levels with the potential to cause adverse effects.

Scientific literature, technical data, and applicable regulatory standards were reviewed to determine the effects of varying sediment contaminant concentrations on key species or species groups. A series of concentration levels were established for each contaminant, expressed as a percent reduction in ecological services. These were based on the observation that as concentrations of hazardous substances increase, both the number of species adversely affected, and the severity of effects also increase.

Sediment chemistry data were selected to obtain the best representation of the spatial extent of contamination and maximum areal coverage of the Port Gamble Bay area. A protocol was developed for reviewing qualified data, aggregating contaminants, and addressing multiple samples from the same station. To determine the potential for injury to natural resources, contaminant concentrations were preliminarily evaluated based on threshold concentrations developed for the Hylebos Waterway in Commencement Bay (Wolotira 2002).

These threshold concentrations represent contaminant levels associated with reduction in ecological services. Thresholds for metals, such as arsenic, cadmium, chromium, copper, lead, and mercury, are based on benthic community effects and invertebrate bioassays from the Washington State Sediment Management Standards (SMS) and Sediment Quality Standards (SQS). Thresholds for total PAHs and total PCBs are based on biological effects of these chemicals on fish and apparent effects threshold information on invertebrates from the Washington State SMS and SQS.

PAHs at levels observed in the Bay are injurious to natural resources. From oil or stormwater sources, documented effects of PAHs exposure to Pacific herring (*Clupea pallasii*) embryos are cardiac arrhythmia and reduced growth (Incardona et al. 2009, West et al. 2014, Harding et al. 2020). Fish injury from total PAHs is based on effects observed in English sole studies. English sole is a well-studied fish species for pollution biomonitoring since it is a shallow-water bottom-dwelling flatfish that is particularly likely to take up sediment-associated contaminants through direct contact and diet. Since this species is relatively sedentary and shows high fidelity with the site in which it resides, biological effects in English sole are generally accurate reflections of PAH exposures at sites at which they are collected (Wolotira 2002). Numerous studies show that English sole from PAH-contaminated embayments are highly susceptible to the development of liver cancer and related lesions, and also appear to be prone to several other adverse health effects, such as reproductive abnormalities, immune dysfunction, and alterations in growth and development (Myers et al. 1994, 1998b; Arkoosh et al. 1996; and Johnson et al. 1998).

Fish injury from total PCBs is based on effects observed in juvenile salmonids (Meador et al. 2002). Invertebrate injury from total PCBs is supplemented by studies on toxic effects observed

in organisms exposed to PCBs and various DDT congeners in the Southern California Bight (MacDonald 1994).

Based on these findings the Washington State Department of Health (WDOH) initiated a closure of a portion of the western shoreline of the Bay because of chemical contamination observed in sediments sampled in 2000 near the landfills. The closure ran along the western shoreline from south of the Mill Site to the northern border of the former leased area and includes shellfish from intertidal sediments to a depth of minus 18 feet. In 2002, the PGST requested that the western shoreline be certified for commercial harvest. In response, WSDOH recommended tissue sampling and analysis for confirmation was conducted by Pope and Talbot, Inc.'s contractor. Data from samples collected mostly by the PGST from 2008 to 2011 and by Ecology in 2011 were used to assess the ongoing closure of the western shoreline. In February 2014, WSDOH reopened the western shoreline to commercial shellfish harvest, however WSDOH advises not to consume shellfish at subsistence levels from this area (WSDOH 2015 Walker 2014, Dunagan 2014).

In the marine environment, wood waste is degraded by bacteria and releases degradation by-products such as sulfides and ammonia, which in sufficient concentrations can result in toxicity to benthic invertebrates and inhibit the growth of eelgrass (*Zostera marina*). Reduced light and low oxygen levels in the water column prevent eelgrass from compensating for the sulfide (Podger 2013). If *Zostera* is in areas with high levels of oxygen in the water column and high photosynthesis rates (clear water, no shading), it can deliver oxygen to the roots and mitigate for sulfide at low levels. However, reduced photosynthesis makes even low concentration levels of sulfide toxic to eelgrass. The presence of sulfide as a wood waste by-product may result in reduced plant growth or plant death (Elliot 2006).

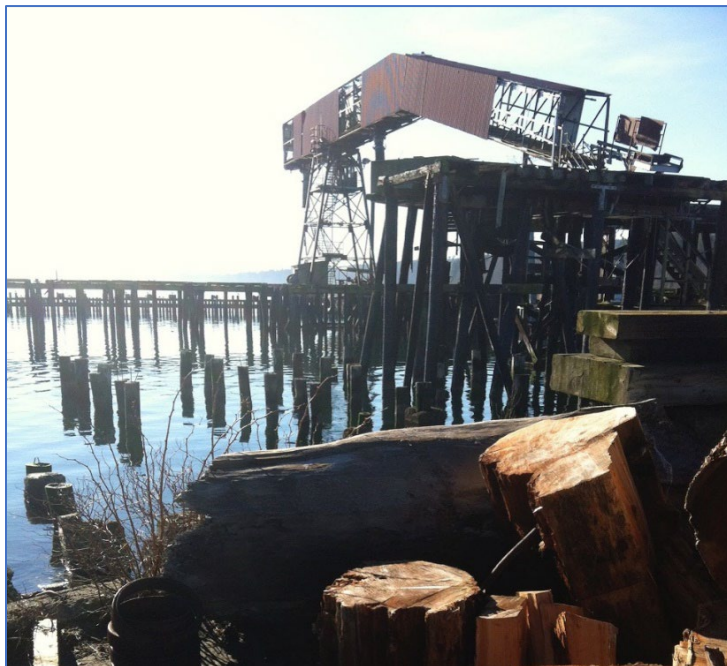


Photo 2: Former Mill Site in 2012 prior to removal of over-water structures and pilings. Photo credit: M. Carlson, USFWS

2.3 Calculating Compensation

To quantify the magnitude and extent of natural resource injuries and calculate compensation, i.e., determine “damages,”⁸ the Trustees used a methodology called a habitat equivalency analysis (HEA). HEA is an example of a service-to-service approach to determine the scale of restoration projects that will ensure that the present discounted value of natural resource service gains equals the present discounted value of interim natural resource service losses (NOAA, 2006). The HEA method is used in cases of habitat injury when the service of the injured area is ecologically equivalent to the service that will be provided by the replacement habitat.⁹ This is called a service-to-service approach.

Specific to this NRDAR process, a HEA allowed the Trustees to apply a consistent quantification approach, relying on available scientific information, and utilizing existing data sets collected by Ecology, Pope & Talbot, Parametrix, Anchor, Hart Crowser, PGST, and NewFields from 2002 to 2017 (See Appendix B). Because a HEA can assess both injury impacts and beneficial restoration effects, a HEA enabled the Trustees to calculate the necessary amount of restoration to produce sufficient benefits that compensate for the ecological losses caused by the hazardous releases from the PRPs’ activities. For the Bay, the Trustees used discounted service acre years (DSAYs) as the metric to measure the total amount of ecological services provided by one acre of habitat over a single year. The Trustees calculated both the ecological services lost due to hazardous releases and those ecological services likely to be generated by restoration in DSAYs. Using a common metric helped the Trustees ensure that total compensation provided by the PRPs was commensurate with the potential losses to natural resource and their services associated with hazardous releases from the PRPs’ activities.

Sections 2.3.1 and 2.3.2 provide more details about how the Trustees employed a HEA to calculate the amount of natural resource injuries in the Bay and the damages to compensate for those injuries. Information about inputs to the HEA will be discussed as well as the Trustees’ rationale for the selection of these inputs.

2.3.1 Injury Quantification

The Trustees’ HEA for the Bay incorporated site-specific information to quantify natural resource injuries. Injury quantification was inclusive of impacts caused by unpermitted

⁸The CERCLA NRDAR regulations define “damages” as the “amount of money sought by the natural resource trustees as compensation for the injury, destruction, or loss of natural resources as set forth in section 107(a) or 111(b) of CERCLA.” 43 CFR § 11.14(l).

⁹Habitats typically provide many and varied types of ecological services (Strange et al. 2002) and promote a sustainable ecosystem through complex interactions among plants and animals and their habitat (Holmlund and Hammer 1999). Examples of ecological services provided by habitats include providing places for shelter, feeding, and resting for fish and birds.

hazardous releases in the Bay from the PRPs' activities beginning after the enactment of CERCLA in 1980¹⁰ through 2017, when in-water remedial activities were completed.

Sediment contamination was present at the sampling locations throughout the Bay. To estimate the likely distribution of contaminants over the whole Assessment Area, during the cooperative assessment the Trustees and PRPs interpolated between sampling points using a Geographic Information System (GIS). The Trustees' methods resulted in a map of the estimated area of contaminants in the Bay. The Trustees then converted concentrations of contaminants in Bay surface sediments into an estimated percent of natural resource services lost. Trustees based these service loss models on observations of how different aquatic organisms respond to exposure from contaminants at different concentrations. In general, low contaminant concentrations result in little or no loss of ecological services. As concentrations increase so do the natural resource service losses, which are expressed as a percentage of lost ecological services.

For this assessment, the Trustees used ecological service loss models developed from two Superfund sites in Puget Sound: Commencement Bay (Wolotira, 2002) and the Lower Duwamish River (NOAA, 2013). These models describe injuries caused by different sediment concentrations of mercury, zinc, cadmium, PCBs, PAHs, 4-methylphenol, and phenol. In addition, due to the presence of wood waste and its byproducts in the Bay, the effects of sulfides were included in the Trustees' injury quantification modeling (Podger 2013). The degraded habitat conditions present in the Bay were also considered when calculating habitat service loss. Degraded habitat conditions reduce the ecological services that habitat provides prior to contamination. Therefore, contamination of degraded habitats results in lower estimated injuries than if contamination were to occur in high quality habitats. The Trustees' HEA also considered the compounding value of damages over time and discounts the value of future promised restoration by using a 3% discount rate. Using these inputs, the HEA calculated that the total ecological injury caused by releases of hazardous substances to the Bay was approximately 400 DSAYs.

2.3.2 Damages Determination

To calculate the amount of restoration needed to compensate for the natural resource injuries in the Bay, i.e., damages, the Trustees employed a HEA, using the same assumptions described in Section 2.3.1. Because the goal of NRDAR is to compensate for natural resource losses, the Trustees' acceptance of the proposed restoration-based settlement is conditioned on the proposed settlement requiring restoration that is likely to produce ecological service gains that are equivalent to the calculated ecological service losses.

¹⁰ CERCLA prohibits natural resource trustees from recovering damages that wholly occurred before the enactment of CERCLA in December 1980. 42 USC § 9607(f)(1).

To quantify damages and calculate how much compensation is required, the Trustees developed estimates for the duration and level of ecological service losses caused by hazardous releases from the Mill Site to the Bay until the potentially injured resources recover to baseline.¹¹ Similar to the injury quantification method described in Section 2.3.1, the Trustees also used a HEA to quantify damages. The Trustees' HEA calculated the likely amount of ecological services to be provided by the proposed restoration projects over the lifetime of the projects, which in this case were designed to be in perpetuity. To determine the amount of benefit that the proposed restoration actions will potentially provide, the Trustees compared the amount of ecological services currently provided by the existing habitat and compared it to the amount of ecological services that habitat would be capable of providing following implementation of restoration actions. The delta between the services provided by the existing habitat and the proposed, restored habitat was then scaled by the Trustees to calculate the damages. For the Bay, the Trustees measured the damages in DSAYs to allow them to compare the total benefits from restoration to the total injury that the Trustees quantify as described in Section 2.3.1. Under this analysis, the Trustees determined the size and scale of the restoration actions that will be needed to produce the amount of ecological services equal to the total losses of ecological services, approximately 400 DSAYs, resulting from the hazardous releases to the Bay. As further described in Section 3, the Trustees evaluated restoration alternatives to determine which actions could generate sufficient ecological benefits to offset the total ecological service losses. The Trustees' selection of the Preferred Alternative is informed by the total estimated DSAYs the action is likely to generate.

¹¹ Specific to the NRDAR context, baseline is "the condition or conditions that would have existed at the assessment area had the discharge of oil or release of hazardous substance under investigation not occurred." 43 CFR §11.14(e).

3. RESTORATION ALTERNATIVES

Before identifying the Preferred Alternative, the Trustees reviewed multiple restoration concepts and further analyzed four restoration alternatives:

- No Action Alternative (Alternative A).
- Southern Mill Site Shoreline Restoration (Alternative B).
- Western Nearshore Restoration (Alternative C); and
- Preferred Alternative, Combined Southern Mill Site Shoreline and Western Nearshore Restoration (Alternative D).

CERCLA restoration regulations direct trustees to consider a reasonable range of alternatives before selecting a preferred alternative(s) to implement. 43 CFR §11.82(b).¹² Section 3 describes the Trustees' CERCLA restoration alternative selection process in more detail.

3.1 Process Used to Identify Alternatives

Using a binned criteria selection process, the Trustees considered various restoration alternatives and eliminated all but the most highly rated to conduct additional detailed analyses. The preferred selection criteria applied to the alternatives are defined as follows:

1. **Preferred Location** is the extent to which the alternative is either in or near to where the injury occurred, improves landscape connectivity of preferred habitats, or addresses areas that have limiting factors regarding habitat.
2. **Preferred Habitat** is the extent to which the restoration alternative addresses either one or multiple potentially injured natural resources by providing habitats identified as beneficial to those resources, i.e., beach, intertidal mudflat, marsh, or riparian buffer habitat types.
3. **Sustainability/Success** is the extent to which the alternative is based on physical processes, causes no collateral injury, and is expected to function in the long term with little intervention.
4. **Feasibility** is the likelihood that the restoration alternative can be engineered and permitted and causes no harm to human health and safety.
5. **Needs Additional Funding** is the extent that the alternative still requires additional funding to fully implement. Initially, funding sources for these restoration alternatives were not fully identified or finalized until later in the review process.

Table 1 displays the results of the Trustees' application of the five preferred selection criteria to restoration alternatives. The Trustees ranked an alternative as "high" when it clearly met a

¹² Similarly, under NEPA, federal agencies are required to evaluate a reasonable range of alternatives "that are technically and economically feasible and meet the purpose and need of the proposal." 42 USC § 4332(C)(i). The Trustees are simultaneously meeting NEPA and CERCLA NRDAR regulatory requirements by analyzing a range of restoration alternatives in this Final RP/EA.

criterion, and the text is highlighted green in Table 1. The Trustees ranked an alternative as “medium” where the alternative only partially met a criterion, and the text is highlighted in yellow in Table 1. Finally, where the Trustees determined that an alternative failed to meet a criterion, they ranked the alternative as “low” and that text is highlighted in red in Table 1.

Table 1: Application of Preferred Selection Criteria to Restoration Alternatives

| Alternative | Preferred Location | Preferred Habitats | Sustainability/Success | Feasibility | Needs Additional Funding |
|--|--------------------|--------------------|------------------------|-------------|--------------------------|
| Jetty Removal | High | High | High | Low | High |
| Southern Mill Site Shoreline Restoration | High | High | Medium | High | High |
| Landfill Cleanup and Riparian Replanting | Medium | Medium | High | High | Low |
| Western Bay Nearshore Restoration | High | High | High | High | High |
| Olympia Oyster Restoration | Low | High | High | High | High |
| Ladine-Decouteau Creek Culvert Removal and Replacement | Low | Low | High | High | High |
| Gamble Block Wetlands Preservation and Enhancement | Low | Low | High | High | Low |
| Gamble Creek Culvert Removal | Low | Low | High | High | High |
| Port Gamble Marine Center | Low | Low | Medium | Low | High |
| Purchase Forested Upland Parcels | Low | Medium | High | High | High |
| Herring Study | Low | Medium | Medium | High | High |
| Forage Fish Rebuilding | High | Low | High | High | High |

Based on their application of the preferred selection criteria, the Trustees selected the two highest rated restoration alternatives, Southern Mill Site Shoreline Restoration (Alternative B)

and the Western Bay Nearshore Restoration (Alternative C), for further development and then evaluation in this Final RP/EA.

Accordingly, in this Final RP/EA the Trustees further analyze the following four restoration alternatives for the Bay:

- Alternative A: No Action Alternative (Natural Recovery)
- Alternative B: Southern Mill Site Shoreline Restoration
- Alternative C: Western Bay Nearshore Restoration
- Alternative D: Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration (Preferred Alternative)

The Trustees used restoration criteria specific to the Bay to further evaluate whether and how each alternative could meet the Trustees' requirements under CERCLA to restore natural resources and services harmed by releases of hazardous substances to the Bay. These criteria are:

- The likelihood that the restoration alternative will restore those natural resources injured by releases of hazardous substances to the Bay consistent with the Trustees' objectives described in Section 1.4.1; and
- The potential for the restoration alternative to provide benefits to multiple natural resources and increase ecological services.

Per the CERCLA NRDAR regulations, 43 CFR §11.82(d), the Trustees also applied the following factors to evaluate each restoration alternative. The Trustees' preferred selection criteria and restoration objectives for the Bay also incorporate these CERCLA NRDAR restoration factors.

1. Technical feasibility;
2. The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources;
3. Cost effectiveness as that term is used in the CERCLA NRDAR regulations;¹³
4. The results of any actual or planned response actions;
5. Potential for additional injury resulting from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources;
6. The natural recovery period determined in 43 CFR §11.73(a)(1);
7. Ability of the resources to recover with or without alternative actions;
8. Potential effects of the action on human health and safety;
9. Consistency with relevant federal, state, and Tribal policies; and

¹³Section 11.14(j) of the CERCLA NRDAR regulations defines cost-effectiveness as selecting the least costly activity when considering two or more activities that provide the same or a similar level of benefits. 43 CFR § 11.14(j).

10. Compliance with applicable federal, state, and Tribal policies.

The four alternatives are evaluated below under the Trustees' criteria, objectives, and the restoration factors set forth in the CERCLA NRDAR regulations at 43 CFR § 11.82(d). Table 3 provides a combined summary of the Trustees' analysis of each alternative.

3.2 Alternatives Considered

3.2.1 Alternative A: No Action Alternative (Natural Recovery)

As required by CERCLA and NEPA regulations, the Trustees analyzed a No Action Alternative as part of their restoration planning. 42 USC § 4332(C)(iii); 43 CFR § 11.82(c)(2). The No Action Alternative would result in the Trustees not working to or coordination with others to restore natural resources and associated services that were lost because of releases of hazardous substances to the Bay. If the Trustees selected the No Action Alternative, the Trustees would not undertake or accept any NRDAR restoration projects. The No Action Alternative is the least costly alternative. Under the No Action Alternative, the PRPs would not implement any restoration actions in the Bay or elsewhere to resolve their natural resource damages liability with the Trustees. The additional habitat to be created under the other alternatives would not be implemented as part of the NRDAR process. There would be no shoreline and intertidal habitat creation and improvement in the vicinity of the Mill Site under the No Action Alternative. Moreover, the PRPs would not cap wood waste or establish eelgrass beds in the western nearshore portion of the Bay. Habitat in the Bay that supports fish and migratory birds would continue to be limited and degraded, with no actions required pursuant to the NRDAR process to benefit injured resources. Any actions to benefit resources injured by hazardous releases to the Bay would take place outside the NRDAR process.

While there would presumably be a natural recovery of injured resources under the No Action Alternative to or near to the baseline conditions that would exist if these releases had not occurred, there would be no restoration actions to compensate for past and ongoing interim losses occurring until resources' recovery to baseline. The lack of restoration would also result in the injured natural resources in the Bay taking longer to recover to baseline.

The Trustees would not meet their mandate under CERCLA to obtain compensation to offset injuries to natural resources caused by the releases of hazardous substances. This No Action Alternative does not address the purpose and need for restoration of lost natural resources and services. Because interim losses of natural resources and services have occurred and continue to occur during the period of recovery, and technically feasible alternatives exist to compensate for these losses, the Trustees determined that restoration actions are required, and the No-Action Alternative is not proposed as the Preferred Alternative.

3.2.2 Alternative B: Southern Mill Site Shoreline Restoration

The Southern Mill Site Shoreline Restoration Alternative would result in the PRPs implementing a shoreline restoration project on and in the vicinity of the southern portions of the Mill Site with design parameters as pictured in Figure 3. The Trustees calculated that this alternative would

likely generate approximately 250 DSAYs of ecological value. Habitat restoration objectives for this restoration project would include returning natural shoreline processes and enhancement of habitat for forage fish, shellfish, and juvenile salmonids. Intertidal beach substrate specifications would support resident shellfish species including cockles, littleneck clams, manila clams, mussels, and oysters. Under the Southern Mill Site Shoreline Restoration Alternative, the restoration footprint would be permanently protected under a conservation easement deed. This protective mechanism would ensure that the restored habitat provides the intended ecological benefits to the Bay's resources into the future.

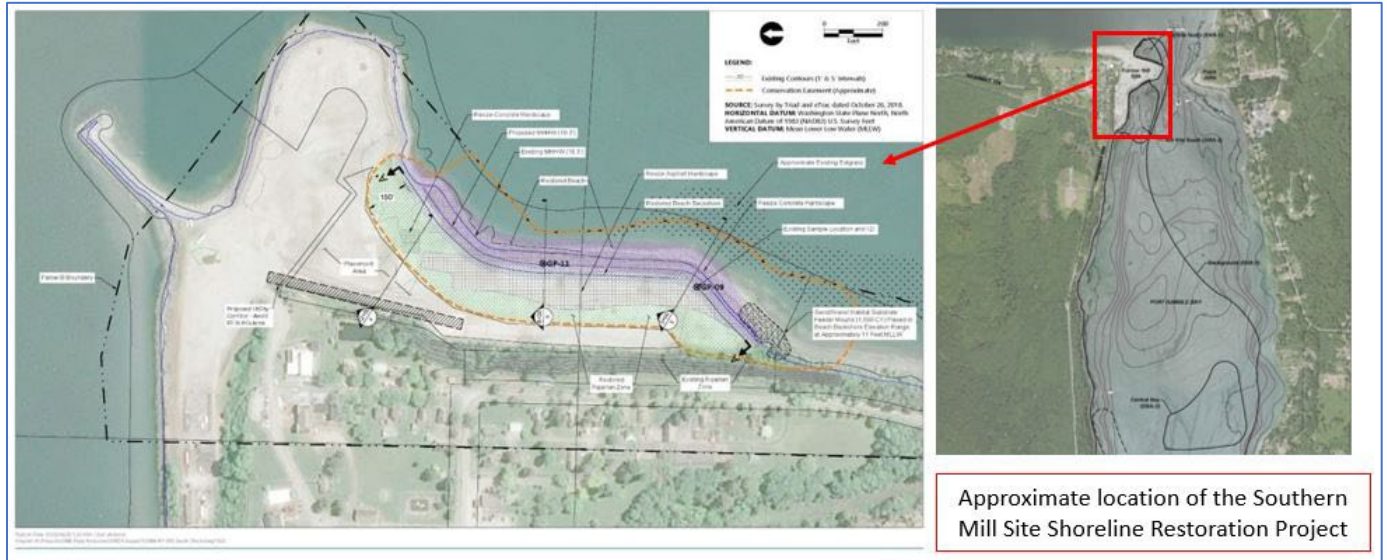


Figure 3: The Southern Mill Site Shoreline Restoration Project Plan View. Figure of left shows a map of the Bay with the project location and habitat focus areas. Figure on the right shows a map of the Bay with the project location highlighted. Credit: Anchor QEA

Shoreline restoration under Alternative B would commence in the first year and be completed over three to four months. This shoreline restoration would include laying back intertidal slopes over approximately 1,450 lineal feet of the Southern Mill Site shoreline to achieve an average slope of approximately 8 horizontal to 1 vertical (8H:1V) thereby restoring natural or near-natural beach grades. During design, slopes would be refined to optimize dioxin/furan removal, and to achieve smooth tie-ins with adjacent grades. The intertidal cap and habitat layers would be constructed in three layers, with each layer being a minimum one foot thick. The bottom layer would be angular cobble-sized armor, the middle layer rounded cobble/gravel beach substrate, and the upper layer sand/gravel habitat substrate. The intertidal cap would be designed to optimize habitat function and to remain permanent and protective of human and ecological health. The shoreline restoration would also be supplemented with a sand feeder berm placed on the south end of the project area. Slopes of 8H:1V are anticipated to continue to accumulate sands transported into to the area of the Mill Site from the south during storm events, further sustaining shoreline processes and habitat functions. As described in Section 5.2, the PRPs would conduct adaptive management activities for ten years following restoration implementation completion to maintain habitat functions to support potentially injured resources.

3.2.3 Alternative C: Western Bay Nearshore Restoration

Under Alternative C, the PRPs would implement a two-part restoration project near the western shoreline of the Bay. Alternative C consists of the PRPs first covering the wood waste with clean sand and then transplanting eelgrass within the portions of the sand cover area most promising for eelgrass establishment. The goal of this restoration alternative would be to provide suitable substrate to restore potentially injured benthic habitat functions and provide an opportunity for eelgrass restoration in the Bay. Eelgrass is beneficial to benthic ecosystems because it maximizes water quality, provides habitat and food for wildlife, produces oxygen, and absorbs warming carbon. Alternative C would likely generate approximately 150 DSAYs of ecological value. Each component of Alternative C is described in more detail below.

Wood Debris Capping

Alternative C would consist of the PRPs covering surface wood debris deposits in shallow subtidal areas with clean sand as generally depicted in Figure 4. The cover would restore benthic habitat functions potentially injured by hazardous releases in the Bay and concurrently provide suitable substrate in areas where eelgrass is currently either absent or growing at very sparse densities. In the Bay, limiting factors for eelgrass include suitable substrate (negatively affected by woody debris), energy (wind and current) and light (affected by algal bloom-induced turbidity). To implement Alternative C, the PRPs first would survey and delineate the current extent of eelgrass in these areas depicted in Figure 4. Subject to refinement based on the surveys, two separate 10-acre areas, including near the former Washington State Department of Natural Resources (WDNR) log-booming lease area south of the former mill site would be selected for restoration (Table 2). In total, approximately 21 acres will be conserved under conservation easement and a minimum of 11 acres will have an average of six inches of clean material would be placed over a minimum of 11 acres of the western Bay nearshore area depicted in Figure 4 and, summarized below (within the -2 to -15 feet MLLW elevation range). This would occur and be completed within the first year of the project. The sand cover capping would be constructed using clean dredge material from the nearby Driftwood Key navigation channel, or other similar marine source which would be expected to contain eelgrass seed and maximize restoration potential. The in-water restoration footprint would require permanent protection under a conservation easement deed, restrictive environmental covenant, or similar restriction with WDNR. This protective mechanism would restrict uses of the restoration footprint to ensure that the restored habitat provides the intended ecological benefits to potentially injured aquatic resources in the Bay into the future.

Eelgrass Restoration

Under Alternative C, following the completion of the sand cover, the PRPs would transplant eelgrass into the locations along the western shore of the Bay that have the most potential for successful eelgrass establishment. These locations for eelgrass restoration would include wood waste areas covered with sand as well as adjacent areas without any added substrate, where little or no eelgrass is currently growing (Table 2). The PRPs are still further developing the specifics of the eelgrass planting with DNR, which will be memorialized in the Port Gamble Bay Habitat

Restoration: Western Bay Nearshore Eelgrass Transplanting and Thin Layer Sand Cover Scope of Work. With the Trustees' approval, the PRPs would begin eelgrass planting about one year after the wood waste cover is completed to allow substrate to consolidate and avoid eelgrass failure due to turbidity. Within the Bay, three 8.6 square meter (100 square feet) transplant plots would each be planted in Year 1 at a density of approximately 70 shoots/m² using the rebar or similar method (eelgrass shoots tied to steel rebar). The overall schedule and level of adaptive management of eelgrass planting is anticipated to be as follows, and as more specifically directed by the final planting plan for each planting event:

- Year 1: 1,800 shoots planted in 3 plots
- Year 3: 4,200 shoots planted in 7 plots
- Year 6: 3,000 shoots planted in 5 plots
- Year 9 1,800 shoots planted in 3 plots

Eelgrass transplanting and adaptive management methods described in Section 5.2 would be used like those successfully employed in the early 2000s at the Drayton Harbor eelgrass mitigation site, which had similar conditions as those present in the Bay. Eelgrass would be sourced from local donor beds subject to approval by WDNR. If those donor beds initially identified by the Trustees and PRPs would be unable to provide sufficient eelgrass material or if WDNR would not approve harvesting of the amount of eelgrass shoots needed, other donor beds in the vicinity of the Bay would be located and utilized.

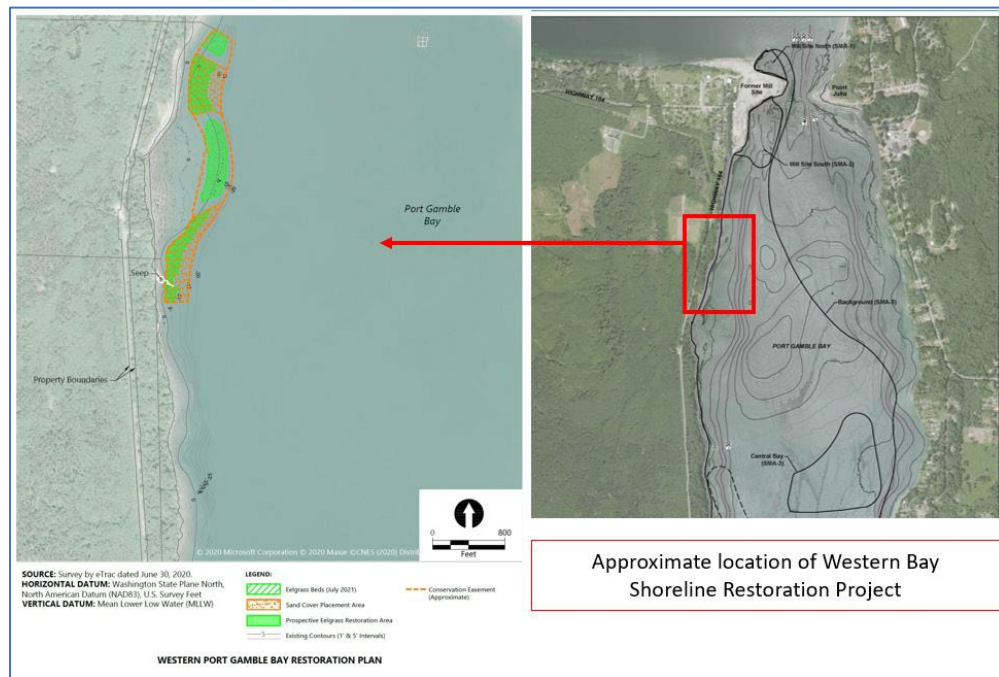


Figure 4: The Western Bay Shoreline Restoration Project Plan View. Figure to left shows a map of the Bay with the project location and habitat focus area. Figure on the right shows a map of the Bay with the project location highlighted. Credit: Anchor QEA

3.2.4 Alternative D: Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration (Preferred Alternative)

The Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration Alternative (Alternative D) is the Trustees' Preferred Alternative. Implementation of Alternative D will require the PRPs to take or fund all actions associated with Alternatives B and C as described in Sections 3.2.2 and 3.2.3 of this Draft RP/EA. The restoration that the PRPs will implement under Alternative D will create or enhance the most habitat of any of the four restoration alternatives analyzed in depth by the Trustees in this Final RP/EA (Table 2).

Under Alternative D, the PRPs would implement the restoration as well as perform maintenance, monitoring, and adaptive management for at least ten years after the shoreline restoration implementation completion. Close coordination between the PRPs, Trustees, and WDNR would be required to ensure these tasks are being satisfactorily conducted. After the ten years following shoreline restoration implementation completion, the PRPs would then be responsible for maintaining the intertidal stability and substrate at the South Mill Site for an additional 20 years. Long-term monitoring, maintenance, and permanent stewardship for the other habitat elements of the South Mill Site restoration would be performed by the PGST or its contractor. The physical footprint of Alternative D restoration would be subject to conservation easement deeds that would permanently restrict the uses of the area to those that are protective of the restoration habitat. The PRPs under Alternative D would be required to fund all these actions and the Trustees' oversight of the restoration implementation. Collectively, these actions would help ensure that habitat restored under Alternative D continues to function and provide ongoing ecological benefits to offset potential natural resource injuries in the Bay.

Accordingly, the Trustees have determined that Alternative D is also likely to provide greater ecological benefits to potentially injured resources than Alternatives A, B, and C. The Preferred Alternative would likely generate approximately 400 DSAYs of ecological services, thereby providing sufficient compensation to offset the ecological services lost due to the PRPs' releases to the Bay as described in Section 2.3.

Table 2: Habitat Restoration Areas by Alternative

| Habitat Type | Elevation Range (feet MLLW*) | Southern Mill Site Shoreline Restoration (Alternative B) Construction Footprint/Conservation Easement (acres) | Western Bay Nearshore Restoration (Alternative C) Construction Footprint/Conservation Easement (acres) | Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration (Alternative D) Construction Footprint/Conservation Easement (acres) |
|---------------------|------------------------------|--|---|---|
| Vegetative Riparian | Above +12 | 6.8/7.6 | 0/0 | 6.8/7.6 |
| Backshore | +12 to +10 | 0.4/0.5 | 0/0 | 0.4/0.5 |

| | | | | |
|------------------|-----------|-----------------|--------------|------------------|
| Intertidal | +10 to -4 | 1.5/5.1 | 1/2 | 2.5/7.1 |
| Shallow Subtidal | -4 to -15 | 0.0/0.6 | 10/19 | 10/19.6 |
| Deep Subtidal | Below -15 | 0.0/0.3 | 0/0 | 0/0.3 |
| Totals: | | 8.7/14.1 | 11/21 | 19.7/35.1 |

**MLLW: mean lower low water*

3.3 Evaluation of Alternatives Using Restoration Criteria

An evaluation of each alternative under the Trustees' restoration criteria and the CERCLA NRDAR restoration factors set forth in 43 CFR §11.82(d) is presented in Table 3, below. The Trustees have evaluated each alternative under each of the restoration factors in 43 CFR §11.82(d).

Table 3: Restoration Alternatives Evaluation. Trustee Restoration Criteria is denoted with a gray background.

| CRITERIA | ALTERNATIVE A-NO-ACTION (NATURAL RECOVERY) | ALTERNATIVE B-SOUTHERN MILL SITE SHORELINE | ALTERNATIVE C-WESTERN BAY NEARSHORE | ALTERNATIVE D-COMBINED PROJECTS ALTERNATIVE |
|---|--|---|--|---|
| <p>Potential to meet Trustees' objective to restore injured natural resources in the Bay</p> | <p>This Alternative does not meet the Trustees' objective or obligations under CERCLA. Under a No-Action Alternative there would be no compensation for interim losses. Remedial actions and natural recovery would take much longer to return potentially injured natural resources to baseline conditions.</p> | <p>This Alternative would restore habitat at the site of injury in the Bay and support resources potentially injured by releases of hazardous substances. This Alternative would not restore natural resources and services in the amount calculated by the Trustees to offset natural resource losses.</p> | <p>This Alternative would restore habitat in the Bay, where injury occurred, and support resources potentially injured by releases of hazardous substances. This Alternative would not restore natural resources and services in the amount calculated by the Trustees to offset natural resource losses.</p> | <p>This Alternative would meet the Trustees' objective because it would restore habitat in the Bay, where injury occurred, and would support resources potentially injured by releases of hazardous substances. This Alternative is likely to restore ecological services of a type and amount to provide sufficient compensation to offset natural resource injuries cause by hazardous releases in the Bay. Restoration would be subject to property protections and ongoing actions to ensure ongoing habitat function to benefit potentially injured resources.</p> |
| <p>Potential to provide benefits to multiple natural resources and services in the preferred habitat</p> | <p>Under this Alternative, no actions would be taken so there would be no benefits provided to any resources.</p> | <p>This Alternative would be likely to restore riparian, upland, and intertidal habitat that would provide benefits to a suite of resources including habitat for birds, salmon, forage fish and other fish, and benthic prey organisms potentially injured by releases of hazardous substances.</p> | <p>This Alternative would likely restore intertidal habitat that would primarily benefit aquatic resources, such as salmon and other fish, injured by hazardous releases. Under this alternative, other potentially injured resources, such as birds, would realize fewer direct benefits than under Alternatives B and D.</p> | <p>This Alternative would likely restore riparian, upland, and intertidal habitat that would provide benefits to a greater number of resources injured by releases of hazardous substances compared to Alternatives A, B, or C. This Alternative would likely benefit a suite of resources including habitat for birds, salmon, forage fish and other fish, and benthic prey organisms potentially injured by releases of hazardous substances.</p> |

| CRITERIA | ALTERNATIVE A-NO-ACTION (NATURAL RECOVERY) | ALTERNATIVE B-SOUTHERN MILL SITE SHORELINE | ALTERNATIVE C-WESTERN BAY NEARSHORE | ALTERNATIVE D-COMBINED PROJECTS ALTERNATIVE |
|---|---|--|--|---|
| Technical feasibility | The No Action Alternative would be technically feasible. | Activities included in this Alternative would be technically feasible and likely to result in the restoration of the suite of resources potentially injured or similar to those injured by releases of hazardous substances. | Activities included in this Alternative would be technically feasible and likely to result in the restoration of the suite of resources injured or similar to those injured by releases of hazardous substances. | Activities included in this Alternative would be technically feasible and likely to result in the restoration of the suite of resources potentially injured or similar to those potentially injured by releases of hazardous substances. |
| Cost to implement the alternative | This Alternative would not restore, replace, or acquire the equivalent of those resources and services injured or lost due to releases of hazardous substances; therefore, the No Action Alternative would not incur any costs. | The costs to carry out this Alternative are estimated to total approximately \$4 million which would create and enhance habitat that is likely to partially restore resources potentially injured by hazardous releases. | The costs to implement this Alternative are estimated to total approximately \$1 million which would in part create and enhance habitat that is likely to partially restore resources potentially injured by hazardous releases. | The costs to carry out this Alternative are estimated to total approximately \$5 million which would create and enhance habitat that is likely to support resources potentially injured by hazardous releases in an amount to sufficiently compensate for ecological losses caused by hazardous releases. |
| Source control and recontamination potential | This Alternative would not implicate source control measures, nor would it result in recontamination. Environmental and human health risks would likely remain the same as they currently are now. | All source control and onsite remedial actions would be complete and precede implementation of this Alternative. This Alternative would not increase risks to human health or the environment. | All source control and onsite remedial actions would be complete and precede implementation of this Alternative. This Alternative would not increase risks to human health or the environment. | All source control and onsite remedial actions would be complete and precede implementation of this Alternative. This Alternative would not increase risks to human health or the environment. |

| CRITERIA | ALTERNATIVE A-NO-ACTION (NATURAL RECOVERY) | ALTERNATIVE B-SOUTHERN MILL SITE SHORELINE | ALTERNATIVE C-WESTERN BAY NEARSHORE | ALTERNATIVE D-COMBINED PROJECTS ALTERNATIVE |
|---|---|---|---|--|
| Consistency with laws and policies | This Alternative would not comply with or be consistent with relevant laws and policies because it does not restore, replace, or acquire the equivalent of the resources and services injured by releases of hazardous substances as required by CERCLA, the CWA, and other relevant natural resource damage authorities. | This Alternative would not meet the goals and requirements of CERCLA because it would not sufficiently compensate the public by restoring, replacing, or acquiring the equivalent of those resources injured by releases of hazardous substances. The amount of resource benefits likely to be produced by this Alternative would not fully offset the resource injuries caused by releases to the Bay. | This Alternative would not meet the goals and requirements of CERCLA because it would not sufficiently compensate the public by restoring, replacing, or acquiring the equivalent of those resources injured by releases of hazardous substances. The amount of resource benefits likely to be produced by this Alternative would not fully offset the resource injuries caused by releases to the Bay. | This Alternative would meet the requirements and goals of CERCLA and the CWA to compensate the public by restoring, replacing, or acquiring the equivalent of resources injured by releases of hazardous substances. The Trustees would comply with all applicable legal requirements. |
| Time to provide resource benefits | Under the No Action Alternative, it would take longer to provide natural resource benefits than if the Trustees were to pursue the other Alternatives. The No Action Alternative would rely on natural recovery to provide benefits to potentially injured natural resources. | The time for this Alternative to provide natural resource benefits would be less than the No Action Alternative because this Alternative would include affirmative habitat creation and enhancement, which would likely start benefiting resources potentially injured by hazardous releases in a relatively short timeframe. | The time for this Alternative to provide natural resource benefits would be less than the No Action Alternative because this Alternative would include affirmative habitat creation and enhancement, which would likely start benefiting resources potentially injured by hazardous releases in a relatively short timeframe. | The time for this Alternative to provide natural resource benefits would be less than the No Action Alternative because this Alternative would include affirmative habitat creation and enhancement which would likely start benefiting resources potentially injured by hazardous releases in a relatively short timeframe. |

| CRITERIA | ALTERNATIVE A-NO-ACTION (NATURAL RECOVERY) | ALTERNATIVE B-SOUTHERN MILL SITE SHORELINE | ALTERNATIVE C-WESTERN BAY NEARSHORE | ALTERNATIVE D-COMBINED PROJECTS ALTERNATIVE |
|---|---|--|--|--|
| Potential effects on human health and safety | The No Action Alternative would not cause further resource injury or pose additional risks to human health and the environment. Environmental and human health risks as they currently exist would likely remain the same under the No Action Alternative | All effects on human health and safety are expected to be short-term and minor construction-related impacts. | All effects on human health and safety are expected to be short-term and minor construction-related impacts. | All effects on human health and safety are expected to be short-term and minor construction-related impacts. |

4. ENVIRONMENTAL ASSESSMENT

As required by NEPA, (42 USC § 4321, et seq.), and its implementing regulations (40 CFR §§ 1500-1508), in this section of the Final RP/EA, the Trustees evaluated the potential impacts of each restoration alternative to the human environment in the vicinity of the Bay to determine whether the alternatives will significantly affect the human environment.¹⁴ DOI through the USFWS is acting as the lead federal agency for NEPA compliance for this Final RP/EA. To understand the potential impacts of each alternative to the environment, the Trustees' analysis focused on biological, socio-economic, and cultural impacts. Seeking public input to inform their analysis, the Trustees released a Draft RP/EA for a 30-day public notice and comment period. More information about the public comment process for the Draft RP/EA is in Section 1.7. Based on their analysis, the Trustees now determine that Alternative D, Combined Southern Mill Site Shoreline and Western Bay Nearshore Restoration, is the Preferred Alternative. If a Finding of No Significant Impact is reached for the Preferred Alternative, the Trustees will require the PRPs to implement the Preferred Alternative.

The following definitions will be used to describe the environmental impacts evaluated in this Final RP/EA:

- Short-term or long-term impacts: These characteristics are determined on a case-by-case basis and do not refer to any rigid time. Short-term impacts are those impacts that would occur only with respect to a specific activity or a finite period. Long-term impacts are those that would more likely persist or be chronic.
- Direct or indirect impacts: A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later or be farther removed in distance but still be a reasonably foreseeable outcome of the action.
- Negligible, minor, moderate, or major impacts: These relative terms are used to characterize the magnitude of an impact. Negligible impacts are generally not quantifiable and do not have perceptible impacts on the environment. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively inconsequential effect. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet thresholds for the significance set forth in by NEPA regulations (40 CFR §1508.27) and thus warrant heightened attention and examination for potential means for mitigation to fulfill NEPA requirements.

¹⁴ The NEPA process for this Final RP/EA commenced before the 2024 NEPA regulation revisions were finalized. Legal citations to the NEPA regulations in this Final RP/EA refer to the White House Counsel on Environmental Quality's 2020 revision of the NEPA regulations.

- Adverse or beneficial impacts: An adverse impact is one having adverse, unfavorable, or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.
- Cumulative effects: Cumulative effects are defined as “the effects on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR § 1508.1(g)(3)). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period within a geographic area.

4.1 Affected Environment

For purposes of this Final RP/EA, the Trustees focused on Port Gamble, an unincorporated community on northwestern shore of Kitsap peninsula, located in Kitsap County, Washington. This area encompasses the Bay as well as adjacent shoreline areas, which are the locations of the restoration alternatives.

4.1.1 Physical and Biological Environment

The Bay is located south of the Strait of Juan de Fuca at the north end of the Kitsap Peninsula and covers more than two square miles of intertidal and subtidal habitat. The Bay is bounded by Admiralty Inlet and Hood Canal to the north as they come off the strait and by the Kitsap Peninsula to the east, south, and west. Port Gamble Bay is generally shallow with depths up to 60 feet. The climate in and around the Bay is west coast marine type, characterized by cool wet winters and mild summers.

The natural conditions and environment of Port Gamble and the Bay have been increasingly altered over time, beginning with colonial settlements, and followed by industrialization in the nineteenth century. The Pope & Talbot Inc. sawmill operated on the western shore of the Bay from the mid-1800s until 1995 and was dismantled in 1997. As part of its sawmill operations, Pope & Talbot, Inc. also used portions of the western Bay for log storage and rafting. In 2007, Pope & Talbot, Inc. declared bankruptcy, and Pope & Talbot Inc.’s assets and liabilities were transferred to Pope Resources and the Olympic Property Group. Today the area is primarily used for residential, municipal, small commercial, open space, and recreational purposes.

Natural resource species affected or potentially affected by the restoration activities in and adjacent to the Bay include but are not limited to: Aquatic-dependent mammals (such as seal, sea lion, and species they depend on as prey items), migratory birds (including osprey, bald eagle, assorted waterfowl, great blue heron, spotted sandpiper), belted kingfisher, and other shore birds. Federally listed species under the Endangered Species Act, 16 USC § 1531, et seq., are known to occur in or may be found in the vicinity of the Bay and include Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Hood Canal summer chum salmon (*Oncorhynchus keta*), bocaccio

(*Sebastes paucispinis*), bull trout (*Salvelinus confluentus*) and marbled murrelet. The Bay has been included in the area designated as critical habitat for Hood Canal Summer Chum, Puget Sound Chinook salmon, southern resident killer whale (*Orcinus orca*), and Puget Sound Steelhead trout (*Oncorhynchus mykiss*) in the Hood Canal Subbasin. Under the Magnuson-Stevens Act Fishery Conservation and Management Act, 16 USC §1801, et seq., NOAA identified essential fish habitat in the Bay and its vicinity for pink salmon (*Oncorhynchus gorbuscha*), Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*T. Symmetricus*), northern anchovy (*E. Mordax*), market squid (*Doryteuthis opalescens*), krill (*Euphausiacea*), Pacific tunas, swordfish, sharks, and billfish. State-listed species include steller sea lion (*Eumetopias jubatus*), tufted puffin (*Fratercula cirrhata*), marbled murrelet (*Brachyramphus marmoratus*), fisher (*Pekania pennanti*), southern resident killer whale, and western gray squirrel (*Sciurus griseus*) as threatened and endangered species. Nearshore and intertidal habitats of the Bay are critical to the health of Hood Canal as part of Puget Sound and its marine life. These habitats provide shelter and are used as spawning, rearing, and feeding grounds for species that live in and around the Sound (PSAT 1998).

Other species in and near the Bay that may potentially be affected by implementation of the restoration alternatives include reptiles, amphibians, and aquatic invertebrates. Additional resources in and in the vicinity of the Bay that are likely to be impacted by implementation of the alternatives include aquatic plants (including eelgrass), wetland and upland habitats (including riparian and beach backshore, plants, and habitat), groundwater, and surface water. The current ecological services provided by these natural resources include habitat for various biological resources, which provides these resources with food, shelter, breeding, foraging, and rearing areas, and other factors essential for survival of species.



Photo 3: Bay submerged aquatic vegetation and intertidal habitat conditions, photographed in 2012. Photo credit: M. Carlson, USFWS

The project locations for the Preferred Alternative (Alternative D) are in the intertidal and tidal areas of the Bay along the western shoreline and in the shoreline, tidal, and intertidal areas of the southern portion of the Mill Site. Figures 3 and 4 depict the Preferred Alternative implementation areas. Because Alternatives B and C are components of the Preferred Alternative, the physical and biological setting for Alternatives B and C are included in a discussion of the Preferred Alternative. The Preferred Alternative would restore and protect approximately 35.1 acres of tidal, intertidal, and riparian habitat along the western shoreline and nearshore areas of the Bay. The Preferred Alternative would create or enhance habitat that would benefit potentially injured natural resources. Habitat creation and enhancement under the Preferred Alternative would:

- Increase total acres of intertidal habitat in the Bay;
- Restore shorelines within the project footprint with gentler slopes and more natural intertidal substrates to provide habitat for forage fish, shellfish, and juvenile salmonids;
- Establish riparian habitat with native vegetation;
- Cover wood debris areas in the Bay to restore functional shallow subtidal habitat; and
- Transplant eelgrass to intertidal and subtidal areas where it is currently absent.

Under the Preferred Alternative, the restoration would be subject to adaptive management, monitoring, and maintenance to be performed by the PRPs for the first ten years after shoreline restoration implementation completion. Subsequently, the restoration at the southern Mill Site would be subject to additional maintenance and monitoring for another 20 years followed by permanent stewardship. The physical footprints of the Preferred Alternative would be placed under property restrictions that would limit the uses of the underlying properties to those uses that would not impair the ecological benefits that the restored habitat was designed to provide. Collectively, these measures would ensure that the Preferred Alternative would provide long-term habitat that would benefit potentially injured resources in the Bay.

4.1.2 Cultural Resources

The proposed consent decree requires the PRPs to undertake activities to address cultural resource issues at the Preferred Alternative projects sites, including, as appropriate, consulting with the State of Washington Department of Archeology and Historic Preservation and federally recognized Tribes. The area of the project sites is claimed by the Lower Elwha Klallam Tribe, the Jamestown S’Klallam Tribe, the Port Gamble S’Klallam Tribe, the Skokomish Indian Tribe, and the Suquamish Tribe. Each group offers their own account of pre-contact and historic period land use in Port Gamble (Elmendorf 1992; Miller and Snyder 1999; Port Gamble S’Klallam Tribe 2012; Wisniewski 2014) and each Tribal government has Adjudicated Usual and Accustomed Fishing Rights in the Bay.

The earliest documented Native American occupation of the Port Gamble area is from pre-contact archaeological site 45KP252, identified below historic fill deposits at the Mill Site (Rinck 2016; Rinck et al. 2018). Stratified shell midden deposits occur between 2.1 and 3.1 meters below the contemporary ground surface, with the oldest cultural material dating between AD 29 and 614 (Rinck 2016:23). Three thin cultural strata indicate the area was a seasonal camp that was reoccupied multiple times over hundreds of years. Faunal material recovered from borings includes mammal bone, ratfish (*Hydrolagus colliei*), flatfish (*Order Pleuronectiformes*), butter clams (*Saxidomus gigantea*) littleneck clams (*Leukoma staminea*), cockles (*Clinocardium nuttallii*), razor clams (*Siliqua patula*), macoma clams (*Macoma spp.*), geoduck (*Panopea generosa*), gastropods, and mussel (*Mytilus spp.*) (Rinck et al. 2018:68). These species are harvested today by contemporary Tribal groups. A radiocarbon date from lower stratigraphic levels of the Little Boston archaeological Site (45KP21) on Point Julia had an age range between AD 1203 and 1430 (Hess 1991:8). Shellfish species similar to those at 45KP252 were identified in the archaeological deposits at the site, as well as fish, artiodactyl, and bird bone (Hess 1991:8-9).

Clams, oysters, crab, fin fish, and other marine resources are integral components of Tribal culture, subsistence, and spirituality. All five Tribal governments have reserved rights to these resources in the Bay, guaranteed in treaties signed in 1855. The Suquamish Tribe is a signatory to the Treaty of Point Elliott and the Lower Elwha Klallam Tribe, the Jamestown S’Klallam Tribe, the Port Gamble S’Klallam Tribe, and the Skokomish Tribe are signatories to the Point No Point Treaty. Tribal access to, and use of, the marine resources have been compromised by long-term operation of the Port Gamble Mill. Mill operations introduced PAHs, PCBs, dioxins, heavy metals, woody debris, dioxins/furans, and other contaminants into the watershed, compromising traditional activities such as clamming and fishing. Shellfish are important culturally and economically and are readily susceptible to contamination. Species such as Manila Clams (*Lajonkairia lajonkairii*), horse clams (*Tresus nuttallii*), geoducks (*Panopea generosa*), cockles (*Clinocardium nuttallii*), butter clams (*Saxidomus gigantea*) were affected negatively by mill operations; shellfish habitat was not only destroyed by mill operations, but the remaining shellfish were also rendered unhealthy for human consumption due to high concentrations of contaminants.

4.1.3 Demographics and Socioeconomics

A summary of demographic data for the area in the vicinity of the Preferred Alternative (Alternative D), including the Census Block Group, County, and State level is provided in Table 4. Because all the alternatives are in Kitsap County, Washington, the following analysis of demographic and economic impacts for Alternative D applies to Alternatives A, B, and C, too. The unincorporated community of Port Gamble has 5,621 residents. (<https://www.census.gov/programs-surveys/acs/data.html>). Kitsap County population grew 0.8% between April 1, 2020, to July 1, 2022.

Table 4: Demographic Data

| Demographic Category | Census Block Group ¹⁵ | Kitsap County ¹⁶ | Washington State |
|---|----------------------------------|-----------------------------|-------------------------|
| Population | 5,621 | 275,611 | 7,864,400 ¹⁷ |
| People of color (%) | 20% | 18.4% | 27.7% ¹⁸ |
| Median Annual Household Income | \$91,736 | \$94,755 | \$91,306 ¹⁹ |
| Estimated Percentage of Persons Below Poverty Level | 2.8% | 9.9% | 10.0% ²⁰ |

4.2 Evaluation of the Alternatives and Their Environmental Consequences

The Trustees found that adverse environmental impacts from the Trustees’ selection of the Preferred Alternative, Alternative D, Combined Southern Mill Site Shoreline Restoration and Western Bay Nearshore Restoration, are expected to be minor in scale and short-term in duration and would result primarily from construction activities. Accordingly, the magnitude of environmental impacts associated with the Preferred Alternative would generally be a function of the extent and duration of construction. The use of best management practices during construction activities for the Preferred Alternative is anticipated to minimize these short-term negative impacts. Adverse impacts associated with construction would therefore be expected to be minor. The Trustees determined that the long-term impacts resulting from the Preferred Alternative would be beneficial to the Bay’s natural resources by providing additional fish habitat, protecting and improving water quality, and increasing riparian, tidal, and intertidal habitat function in and adjacent to the Bay. The Preferred Alternative would be developed and implemented to comply with all applicable local, state, Tribal, and federal requirements. Alternatives B and C are parts of the Preferred Alternative, but each involve less restoration implementation than the Preferred Alternative. Accordingly, Alternatives B and C would result in similar, albeit lesser, impacts as compared to the Preferred Alternative. In contrast to the other

¹⁵ Statistics for Census Block Group (530350902021) were obtained from the United States Census Bureau <https://www.census.gov/programs-surveys/acs/data.html> .

¹⁶ Statistics for Kitsap County, Washington were obtained from the [U.S. Census Bureau QuickFacts: Washington](https://www.census.gov/quickfacts/fact/table/kitsapcountywashington,WA/PST045222) <https://www.census.gov/quickfacts/fact/table/kitsapcountywashington,WA/PST045222> .

¹⁷ Washington Office of Financial Management 2022 data accessed at <https://ofm.wa.gov/washington-data-research/statewide-data/washington-trends/population-changes/population-race>.

¹⁸ Id.

¹⁹ 2020 census information from the U.S. Census Bureau accessed at <https://data.census.gov/profile/Washington?g=040XX00US53> .

²⁰ Id.

proposed restoration alternatives, Alternative A, No-Action Alternative, would have no such short-term adverse construction-related impacts nor would it have the long-term beneficial impacts to natural resources in the Bay.

Pursuant to NEPA requirements, the Trustees' analysis of each restoration alternative and its likely impacts on the environment is presented in further detail below.

4.2.1 Hydrology and Water Quality Impacts

Alternative A-No Action Alternative: Alternative A would not result in any additional hydrological or water quality impacts so the status would remain as-is. Alternative A therefore would negatively impact water quality.

Alternative B-Southern Mill Site Shoreline Restoration: Alternative B would likely have short-term minor adverse impacts to water quality in the Bay during construction such as an increase in turbidity. The project has received CWA 401 water quality certification that details the best management practices the PRPs must undertake to reduce any impacts. Long-term minor beneficial impacts to water quality would likely result from beach backshore habitat creation.

Alternative C-Western Bay Nearshore Restoration: This alternative would not result in any long-term negative hydrological impacts. Alternative C would likely have short-term minor adverse impacts during construction such as an increase in turbidity. Negative water quality impacts under Alternative C would be potentially greater in magnitude to those for Alternative B because of increased dredged material placement in the intertidal and subtidal environments. Long-term minor beneficial impacts to water quality would likely result from eelgrass planting.

Alternative D-Combined Projects (Preferred Alternative): Hydrological and water quality impacts under the Preferred Alternative are inclusive of the water quality and hydrology impacts under Alternatives B and C. The beneficial and negative impacts, both short and long-term, to water quality and hydrology are likely the sum of the impacts under Alternatives B and C and the avoidance of the negative impacts expected if the No Action alternative is adopted.

4.2.2 Sediment Quality Impacts

Alternative A-No Action Alternative: Alternative A would not result in any additional beneficial sediment quality impacts but does result in negative impacts. Alternative A would keep polluted sediment in the ground and therefore continue to harm sediment quality and lead to a larger area of continued contaminated sediment if the sediment shifted over time or materials in the sediment leached to other areas of the way.

Alternative B-Southern Mill Site Shoreline Restoration: The site for Alternative B is in a developed/disturbed/filled-in area; therefore, construction of habitat would provide a minor long-term benefit in the quality of soils and sediments.

Alternative C-Western Bay Nearshore Restoration: Alternative C is in an area with some wood waste in the sediments: therefore, construction of habitat would result in minor long-term

beneficial impacts to sediment quality because a sand cover would be placed to provide a new substrate, more similar to a naturally occurring substrate.

Alternative D-Combined Projects (Preferred Alternative): The Preferred Alternative is likely to provide an overall minor long-term beneficial impact to sediment quality because it is the sum of both Alternatives B and C and their likely beneficial impacts.

4.2.3 Vegetation

Alternative A-No Action Alternative: Alternative A would not result in any additional impacts to vegetation, nor likely benefit or harm injured habitat including impacted vegetation.

Alternative B-Southern Mill Site Shoreline Restoration: Under Alternative B, long-term minor beneficial impacts would be expected with the planting and establishment of native plantings and recruited plant species, which would produce food and protective cover for wildlife.

Alternative C-Western Bay Nearshore Restoration: Long-term minor beneficial impacts would be expected under Alternative C because eelgrass plantings would benefit fish, wildlife, and bird species by providing food and shelter.

Alternative D-Combined Projects (Preferred Alternative): The Preferred Alternative would be expected to provide long-term minor benefits for vegetation as described for both Alternatives B and C. The combination of vegetation types that would be planted and established under the Preferred Alternative would provide potentially injured resources with food, shelter, nesting, and perching cover.

4.2.4 Fish and Wildlife Habitat

Alternative A-No Action Alternative: Alternative A would not result in any additional beneficial or adverse impacts to fish and wildlife habitat because no restoration actions would be taken.

Alternative B-Southern Mill Site Shoreline Restoration: Implementation of this alternative would increase the amount of habitat in and adjacent to the Bay. The increase in riparian and gently sloped intertidal habitat would provide a significant increase in fish and wildlife habitat for foraging and rearing. Accordingly, Alternative B would result in minor long-term beneficial impacts to the Bay's fish and wildlife habitat. There would be short-term minor negative impacts to wildlife during the construction period and potentially during maintenance actions due to noise and other disturbances associated with construction.

Alternative C-Western Bay Nearshore Restoration: Alternative C would result in long-term minor beneficial impacts to the Bay's fish and wildlife habitat because it would likely increase the amount of habitat in the Bay with the planting of eelgrass. Alternative C is expected to provide foraging and rearing habitat for many species of shellfish and fish. There would be a short-term minor negative impact to wildlife during the construction period and maintenance activities due to noise and other disturbances associated with these actions.

Alternative D-Combined Projects (Preferred Alternative): Implementation of Alternative D would be expected to have long-term beneficial impacts to the fish and wildlife habitat in and adjacent to the Bay. The types of habitats being created by the Preferred Alternative will support ESA species, fish, birds, and other wildlife in the Bay. The permanent stewardship under the Preferred Alternative would ensure that beneficial impacts for fish and wildlife habitat associated with the Preferred Alternative would likely continue into the future. Short-term minor negative impacts to fish and wildlife habitat would be expected during the performance of construction and maintenance activities due to increased noise and other disturbances.

4.2.5 Special Status Species²¹

Alternative A-No Action Alternative: The No Action Alternative would not result in any positive or negative impacts to special status species.

Alternative B-Southern Mill Site Shoreline Restoration: Alternative B would result in minor long-term beneficial impacts to special species because it would likely provide additional habitat for Chinook salmon and Puget Sound steelhead in the Bay and would benefit other listed species in the area. Through selective scheduling of the construction period to minimize impacts to salmonids and implementation of methods to minimize in-water turbidity, short-term negative impacts to listed species would be minor.

Alternative C-Western Bay Nearshore Restoration: Special status species impacts of Alternative C would be similar in type and scale to those that would be likely to result from Alternative B.

Alternative D-Combined Projects (Preferred Alternative): The Preferred Alternative would likely result in minor long-term beneficial impacts to special status species. Under the Preferred Alternative, restoration actions would provide additional habitat for Chinook salmon and Puget Sound steelhead in the Bay and would benefit other listed species in the area. Through selective scheduling of the construction period to minimize impacts to salmonids and implementation of methods to minimize in-water turbidity, short-term negative impacts to listed species would be minor and limited to construction and maintenance activities. Because the Preferred Alternative is a combination of Alternatives B and C, beneficial and negative impacts associated with the Preferred Alternative would likely be greater in magnitude than Alternatives B and C but still minor. The PRPs have already completed the required consultations under federal laws and regulations pertaining to fish and wildlife and essential fish habitat required for restoration actions under the Preferred Alternative.

²¹ “Special Status Species” refers to species listed as threatened or endangered or candidate for Federal protection under the ESA or listed as endangered, threatened, or sensitive under Washington State law.

4.2.6 Floodplain and Flood Control

Alternative A-No Action Alternative: There would be no impacts from the No Action Alternative on the floodplain and flood control.

Alternative B-Southern Mill Site Shoreline Restoration: Alternative B would provide a minor, long-term benefit for flood control by providing an ecological buffer between the Bay and the development in the town of Port Gamble. The revegetation and ecological buffer under Alternative B would increase permeability with areas changing from pavement to riparian habitat.

Alternative C-Western Bay Nearshore Restoration: There would be no impacts on the floodplain and flood control.

Alternative D-Combined Projects (Preferred): Floodplain and flood control impacts of Alternative D would likely be similar in magnitude and kind as Alternative B.

4.2.7 Introduction of Non-Indigenous Species

No non-indigenous species would likely be introduced as part of the implementation of any of the alternatives. Under Alternatives B, C, and D, existing invasive and non-native plant species would be replaced with native species in accordance with the monitoring program and site-specific vegetation plans. There would be no similar replacement of existing non-indigenous species under the No Action Alternative; however, the No Action Alternative would not introduce non-indigenous species to the Bay.

4.2.8 Aesthetic, Historic, Cultural, and Socioeconomic Impacts

Alternative A- No Action Alternative: Under Alternative A, degraded habitat in the Bay would likely continue and negatively impact cultural practices of nearby tribes—including tribal fishing and shellfish harvesting in the Bay—as well as recreation and tourism opportunities. The No-Action Alternative leaves contamination to continue to leach into shellfish beds and continue to degrade the fish habitat, and as a result a No-Action Alternative would negatively impact the Tribal cultural connection to the Bay and Tribes' use of the area.

Alternative B - Southern Mill Site Shoreline Restoration: Alternative B would be unlikely to result in job losses in the Bay and its vicinity. There would likely be minor short-term beneficial socioeconomic benefits due to employment and expenditures associated with the construction of Alternative B. Although existing remedial requirements and shoreline development regulations limit future development within the physical footprint of Alternative B, additional use restrictions under Alternative B would further restrict future development in and adjacent to the Bay, resulting in minor negative socioeconomic impacts.

During the construction phase of Alternative B, the Bay would have less pleasing aesthetics from disturbed soils, piles of debris, and other construction-related untidiness, resulting in short-term minor negative impacts. Construction could also have short-term negative effects on the cultural

practices of nearby tribes, including that construction could cause noise, turbidity, and an increase in vessels in the Bay, which could negatively affect tribal fishing, shellfish harvesting, and other tribal ceremonies or cultural practices in the Bay and adjacent shorelines. Soil excavations could disturb archaeological and cultural resources located within the footprint of the Southern Mill Site Shoreline. Any sediment movement can release harmful particles and cause closure of shellfish areas within the Bay. Sediment displacement caused by soil excavations may result in finfish avoiding the vicinity due to low visibility and noise impacts. Communication with local tribes and development of a vessel management plan during construction could help to minimize impacts to tribal fishing activities, ceremonies, and cultural practices.

With respect to historical and cultural impacts of Alternative B, there is an archeological site adjacent to the boundary of Alternative B. Best practices to reduce the negative impact is to include a tribal cultural resource monitor of ground disturbing work, cultural resource training for the contracted workers, and a monitoring and inadvertent discovery plan.

Following construction, Alternative B would likely improve the Bay's aesthetics by replacing riprap and other shoreline structures with marsh and riparian vegetation. Habitat improvements and containment of toxic materials under Alternative B would also provide cultural benefits for local tribes by creating a habitat for, and reducing contamination of, marine resources, which would benefit tribal fishing and shellfish harvesting. Long-term minor beneficial socioeconomic impacts would potentially also be realized under Alternative B with improved aesthetics resulting in increased recreation and tourism in the Bay and related expenditures. These cultural and aesthetic benefits would likely be longer-term, persisting for many years after the implementation of Alternative B.

Alternative C - Western Bay Nearshore Restoration: Impacts to the socioeconomic and aesthetic elements of the Bay's environment would likely result from Alternative C would be similar in both nature and magnitude to those impacts anticipated for Alternative B. Construction of Alternative C could have short-term negative impacts on fishing, shellfish harvesting, and other cultural practices of nearby tribes, similar to Alternative B. Tribal fishing and shellfish harvesting in the area near the Western Bay Nearshore Restoration may also be limited or restricted during the sand layer placement and during subsequent planting and monitoring of eelgrass under Alternative C. Following construction, Alternative C would likely have long-term benefits on habitat for benthos, forage fish, shellfish, and juvenile salmonids, resulting in long-term benefits to tribal fishing.

Alternative D - Combined Projects (Preferred Alternative): The Preferred Alternative would likely result in similar types of socioeconomic, cultural, and aesthetic impacts as Alternatives B and C. Because the Preferred Alternative would incorporate more restoration activities and property restrictions than Alternatives B or C, the cumulative magnitude of the likely aesthetic, cultural, and socioeconomic impacts of the Preferred Alternative would be greater. In particular, the aesthetic and cultural beneficial impacts of the Preferred Alternative would likely be greater due to the larger geographical area and higher level of effort to implement the Preferred

Alternative, but the socioeconomic impacts would likely still be minor. The short-term, adverse aesthetic, cultural, and socioeconomic impacts would be the same as the anticipated impacts of Alternative B plus those short-term, adverse aesthetic, cultural, and socioeconomic impacts anticipated for Alternative C. Likewise, the long-term, beneficial aesthetic, cultural, and socioeconomic impacts of the Preferred Alternative are the sum of the anticipated, long-term benefits to the Bay's aesthetics and socioeconomics for Alternatives B and C.

4.2.9 Noise Impacts

Alternative A - No Action Alternative: The No Action Alternative would not result in any noise impacts because no restoration actions would be taken.

Alternative B- Southern Mill Site Shoreline Restoration: Implementation of Alternative B would result in short-term moderate adverse noise impacts in a small area around the project location from the use of heavy equipment during the construction phase of the project. This noise could cause impacts to Tribal use of the area, and cause wildlife to avoid the area. Outside of the immediate project area, the increase in noise would be short-term, negligible, and adverse. The project would comply with local noise ordinance permitting requirements.

Alternative C - Western Bay Nearshore Restoration: Noise impacts associated with Alternative C would be similar in type and magnitude to those for the Alternative B.

Alternative D - Combined Projects (Preferred Alternative): Noise impacts under the Preferred Alternative would result in short-term minor adverse impacts with increased noise during the implementation and maintenance of the Preferred Alternative. Any impacts would be limited to periods when construction and maintenance would be actively performed at the restoration sites within the Bay. The project would comply with local noise ordinance permitting requirements. Noise impacts under the Preferred Alternative would likely be the combined impacts under Alternatives B and C, which are the components that make up the Preferred Alternative.

4.2.10 Recreational Impacts

Alternative A – No Action Alternative: Under the No-Action Alternative, there would be negative impacts to the future recreational uses in the Bay as there would be continued contamination of the water and fish resources as well as the substrate. The contamination would continue to leach into additional areas, potentially causing shellfish closure areas. Human resource use in and in the vicinity of the Bay include hunting, fishing, and non-consumptive uses such as wildlife viewing, photography, swimming, beach walking, and boating.

Alternative B - Southern Mill Site Shoreline Restoration: It is anticipated that this alternative would result in minor long-term beneficial impacts to the recreation opportunities in the Bay. Currently, kayaking, and boating take place in the Bay and would be enhanced over the long term by the creation of more natural habitat along the shoreline. Because the Trustees are focused on ecological service gains to offset natural resource injuries, active recreation would be discouraged within the upland restoration footprint under this alternative. Any restrictions on

active recreation within the upland restoration would be located at an area currently closed to recreation, therefore, Alternative B would cause long-term negligible adverse impacts to upland recreation. Although there would be some minor long-term beneficial impacts to recreation under this alternative, there may also be negligible long-term adverse impacts.

Alternative C - Western Bay Nearshore Restoration: Under Alternative C, there would likely be minor, long-term beneficial impacts to recreation. Restoration would cover areas of in-water wood waste and eelgrass planting, improve aesthetics, and have minor, long-term benefits for boaters. Property protections for the in-water restoration areas under Alternative C may restrict long-term anchoring within the physical restoration footprint which may cause long-term, negligible adverse impacts because long-term anchoring is not currently a common activity in the area.

Alternative D - Combined Projects (Preferred Alternative): Overall, impacts to recreation under Alternative D would likely be minor, long-term, and beneficial, similar to the combined impacts described in Alternatives B and C above. Restoration actions associated with Alternative D would create or enhance habitat areas adjacent to or in the Bay that would improve aesthetics for recreators. Some negligible long-term adverse impacts to recreators are also associated with Alternative D because habitat areas under this alternative would be subject to use restrictions that may limit recreation use as described in the impacts analyses for Alternatives B and C.

4.2.11 Health and Safety

Alternative A - No Action Alternative: The No Action Alternative would result in negative health and safety impacts because no restoration actions would be taken and subsequently no benefit would be obtained. As a result, contaminated sediment would continue to impact the benthic resources as well as the surrounding environment and community.

Alternative B - Southern Mill Site Shoreline Restoration: Any adverse health and safety impacts from Alternative B would likely be short-term and minor construction-related impacts. Risks would be primarily to the PRPs' construction contractors while operating on the Mill Site and to local residents when heavy machinery transits through town. Contaminated soil/sediment excavated from the shoreline would be temporarily stockpiled on the Mill Site until it is characterized for disposal. The PRPs' contractors would be required to develop and implement a project-specific health and safety plan. Thereafter the alternative will provide long-term, minor benefits to humans and natural resources in and around the Bay. Alternative B is expected to result in removal and off-site disposal of contaminated soil/sediment from the shoreline that would otherwise not occur.

Alternative C - Western Bay Nearshore Restoration: Health and safety impacts under Alternative C would be short-term and minor construction-related impacts, primarily to the PRPs' contractors during the placement of the clean sand cover and eelgrass transplanting.

Alternative D - Combined Projects (Preferred Alternative): Negative health and safety impacts associated with the Preferred Alternative would still likely be short-term and minor. Alternative D provides long-term minor benefits to the areas' human population and natural resources

because increased natural areas can directly be linked to overall positive benefits to population health. (USDA 2018).

4.2.12 Transportation, Utilities, and Public Services

Alternative A - No Action Alternative: The No Action Alternative would have no impacts on transportation, utilities, and public services because no restoration would be implemented under this alternative.

Alternative B - Southern Mill Site Shoreline Restoration: During construction of this alternative, there would be short-term adverse minor impacts to transportation or utilities, such as increased vehicle traffic during construction phases, although the impacts would be limited to small areas for brief time periods. In the long-term, implementation of Alternative B would not burden or increase demand for transportation, public services, and utilities.

Alternative C - Western Bay Nearshore Restoration: Transportation, utility, and public service impacts associated with Alternative C are similar to those for Alternative B.

Alternative D - Combined Projects (Preferred Alternative): Transportation, utility, and public service impacts that would result from the Preferred Alternative would be greater in magnitude than impacts associated with Alternatives B and C. Under the Preferred Alternative, there would be short-term minor adverse impacts to transportation, utilities, and public services because there would be increased demand on infrastructure, e.g., increased traffic, during the implementation of the restoration and subsequent maintenance activities. These impacts are expected to be isolated to those periods during active restoration implementation and maintenance.

4.2.13 Environmental Justice

Executive Order 12898 requires each federal agency to identify and address, as appropriate, disproportionately high, and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations (Exec. Order No. 12,898, 59 Fed. Reg. 7,629 (Feb. 16, 1994)). In the memorandum to heads of departments and agencies that accompanied Executive Order 12898, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum states that “each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by [NEPA]” (Memorandum on Executive Order on Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations (Feb. 11, 1994)). The memorandum particularly emphasizes the importance of NEPA’s public participation process, directing that “each federal agency shall provide opportunities for community input in the NEPA process” (Id). Agencies are further directed to “identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices” (Id). Moreover, Executive Order 14096 requires each federal agency, as appropriate and consistent with law, “to identify, analyze, and address disproportionate and

adverse human health and environmental effects (including risks) and hazards of Federal activities, including those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns.” (Exec. Order No. 14,096, §3(i), 88 Fed. Reg. 25,251 (April 21, 2023)). The White House Council on Environmental Quality (CEQ) has oversight of the federal government’s compliance with Executive Orders 12898 and 14096 as well as NEPA.

After reviewing the demographic data for Kitsap County, the census tract containing the Bay, and Washington State, and then analyzing the environmental justice issues associated with the Proposed Preferred Alternative, the Trustees determined that the Preferred Alternative would be unlikely to have disproportionately high or adverse effects on low income, minority, or disproportionately burdened communities. A comparison of Port Gamble and Kitsap County demographic data to the demographics for the State, is in Section 4.1.4 of this Final RP/EA. The Preferred Alternative would be implemented in an area with a slightly higher median income than the state-wide average and a lower percentage of non-white residents than the state-wide average. See Table 4. As described in Section 4 of this Final RP/EA, the Trustees did not identify any major adverse impacts in or adjacent to the Bay and nearby communities associated with the Preferred Alternative.

The forgoing demographic data for the census tract and county where the Preferred Alternative is located as compared to Washington State census data does not fully capture the environmental justice issues associated with the Preferred Alternative. The Trustees describe in Section 4.1.2 of this Final RP/EA that the Preferred Alternative would be implemented in an area claimed by the Lower Elwha Klallam Tribe, the Jamestown S’Klallam Tribe, the PGST, the Skokomish Indian Tribe, and the Suquamish Tribe. Each Tribal government has Adjudicated Usual and Accustomed Fishing Rights in the Bay and the Port Gamble Reservation is located on the eastern shore of the Bay. As part of the Final RP/EA, the Trustees analyzed the impacts of the alternatives to Tribal cultural uses in and near the Bay. Per their analyses set forth in Section 4.2.8, the Trustees determined that construction implementation would cause minor, short-term negative impacts to Tribal cultural uses; however, the Preferred Alternative would likely create long-term, positive impacts for Tribal uses such as fishing and shellfish harvesting because habitat creation and enhancement would benefit fish, shellfish, and related habitats.

As set forth in this Final RP/EA, the Trustees determined that the Preferred Alternative would not cause any significant adverse impacts to the environment or communities in and around the Bay. Rather, as described in Section 4.2.8, the Trustees found that the Preferred Alternative would benefit communities and Tribes in the vicinity of the Bay and therefore be consistent with environmental justice goals.

4.2.14 Land and Shoreline Use

Alternative A –No Action Alternative: The No Action Alternative would have no impact on land and shoreline use because no restoration would be implemented on the shorelines and land adjacent to the Bay. The current land and shoreline use would remain.

Alternative B - Southern Mill Site Shoreline Restoration: This alternative would result in a conversion of unvegetated upland to riparian and intertidal habitat. This is a beneficial impact for resources present near and in the Bay, and would be minor and long-term because of the relatively small physical footprint of Alternative B. The conversion of currently unused land into habitat would remove these areas from potential future uses such as housing or industrial development. Additional permanent protections would restrict future uses to those consistent with habitat conservation values.

Alternative C - Western Bay Nearshore Restoration: Alternative C would be unlikely to change the shoreline or land use because restoration actions would be implemented in subtidal areas of the Bay. Off-shore intertidal areas with restoration actions under this alternative would be subject to enduring use restrictions allowed by law that would limit uses to those consistent with conservation values. Any impacts to land or shoreline use would likely be minor and long-term given the relatively small physical footprint of the alternative within the Bay and the expectation that use restrictions would be in place for decades.

Alternative D - Combined Projects (Preferred Alternative): The Preferred Alternative consists of the restoration actions in Alternatives B and C; therefore, the Preferred Alternative will likely result in similar minor, long-term impacts as Alternatives B and C. The magnitude of the Preferred Alternative's impacts to shoreline and land use would likely be the sum of Alternatives B and C, but the impacts would remain minor. The relatively small physical area of the Preferred Alternative, approximately 35.1 acres under property restrictions, would not cause major changes to land uses in and adjacent to the Bay.

4.2.16 Wetlands

Alternative A - No Action Alternative: The No Action Alternative would have no impacts on wetlands because no restoration would be done. The current condition of wetlands in and around the Bay would remain as-is.

Alternative B - Southern Mill Site Shoreline Restoration: Alternative B would likely result in beneficial minor long-term impacts to wetlands by increasing nearshore emergent vegetation and creating habitat conditions to support preexisting eelgrass. Eelgrasses provide food, shelter, and essential nursery areas to commercial and recreational fishery species and to countless invertebrates living in eelgrass communities.

Alternative C - Western Bay Nearshore Restoration: Alternative C would likely result in beneficial long-term minor impacts to wetlands with the planting of eelgrass.

Alternative D - Combined Projects (Preferred Alternative): Impacts of the Preferred Alternative are potentially greater in magnitude than those associated with Alternatives B and C. Under the Preferred Alternative, restoration would provide long-term minor beneficial impacts to wetlands by establishing protected nearshore emergent vegetation including eelgrass.

4.2.17 Air Quality

Alternative A –No Action Alternative: The No Action Alternative would not result in any air quality impacts because no restoration would occur under this alternative.

Alternative B - Southern Mill Site Shoreline Restoration: During the construction phase of this alternative there would be minor short-term adverse effects to air quality due to increases in exhaust and dust from use of construction equipment. No major or long-term impacts to air quality would be expected to result from implementation of this alternative. For areas in which vegetated habitat will replace riprap or structures, the vegetation would take up carbon dioxide, which would result in negligible beneficial air quality impacts.

Alternative C - Western Bay Nearshore Restoration: Air quality impacts of this alternative would be similar in nature and magnitude to those for Alternative B.

Alternative D - Combined Projects (Preferred Alternative): The Preferred Alternative would result in short-term minor adverse impacts to the air quality resulting from physical disturbances during construction and maintenance affecting air quality at the restoration implementation sites. All impacts would be limited to periods when construction or maintenance would be performed. Negligible long-term beneficial impacts to air quality would be associated with the Preferred Alternative because vegetation would take up carbon dioxide.

4.4 Cumulative Impacts

The Trustees determined that the Preferred Alternative (Alternative D) would enhance and create habitat in and adjacent to the Bay to address potential injuries to natural resources and address lost ecological services. The Trustees further determined that the Preferred Alternative's combination with the restoration implementation the cumulative effects to the environment in the Bay and its vicinity would be long-term, minor to moderate, and beneficial. The cumulative effects analysis in this Final RP/EA is commensurate with the degree of direct and indirect effects anticipated by implementing the Preferred Alternative which is inclusive of the two other action alternatives, Alternatives B and C, considered by the Trustees. This section sets forth the Trustees' cumulative impacts analysis in further detail.

The Preferred Alternative would restore shoreline processes and enhance habitat for benthic invertebrates, forage fish, shellfish, and juvenile salmonids in the Bay. The Trustees' restoration objectives would be met by increasing the functional value of habitat for these resource species by 1) increasing the amount of intertidal habitat acreage; 2) restoring shorelines in the southern portion of the former sawmill facility to more natural intertidal substrates and more gently sloped conditions supported by riparian vegetation to provide habitat for forage fish, shellfish, and juvenile salmonids; and 3) restoring functional shallow subtidal habitat substrate in woody debris areas and transplanting eelgrass in the western Bay. The Preferred Alternative would create or enhance and then permanently protect approximately 35 acres of riparian, intertidal, and subtidal habitats in and adjacent to the Bay. These actions associated with the Preferred Alternative would result in long-term minor to moderate benefits for flood control, fish and wildlife habitat, aesthetics, water quality, special status species, vegetation, and wetlands.

Moreover, the cumulative impacts associated with the Preferred Alternative would be long-term because the restored areas would be subject to property protections that would restrict the uses of areas in and around the physical restoration footprints to allow ongoing habitat functions that are the source of the minor to moderate beneficial impacts. Initial maintenance and ongoing stewardship of the Preferred Alternative would continue to generate beneficial impacts on a long-term basis. Because Alternatives B and C are also habitat creation and enhancement actions in and adjacent to the Bay, albeit it on a smaller scale than the Preferred Alternative, both alternatives are anticipated to provide similar cumulative long-term benefits to a lesser degree than the Preferred Alternative.

Implementation of the Preferred Alternative, and the related benefits associated with the creation and protection of new marsh, intertidal, and riparian habitat (e.g., improved water quality, fishing, and other recreational use opportunities), may result in indirect, minor, long-term beneficial impacts to communities with environmental justice concerns, including Tribal sovereigns with Treaty Rights related to resources in the Preferred Alternative project areas. After short-term, minor negative impacts associated with disturbances caused by restoration implementation, Tribal cultural uses in and adjacent to the Bay would experience minor long-term benefits because the Preferred Alternative would benefit fish and other natural resources associated with those uses. The visual impact of the created and enhanced habitat related to the Preferred Alternative may result in minor, long-term benefits for recreational boaters and fishers in the Bay. There is the potential for direct and indirect, short-term, minor beneficial impacts to socioeconomics resulting from the employment opportunities for workers, and the local businesses they support, during the Preferred Alternative construction.

Adverse impacts would be a result of the Preferred Alternative as well. Short-term minor adverse impacts to air quality, sediment, water quality, noise, aesthetics, and transportation would be caused by the Preferred Alternative to the portions of the Bay subject to restoration during implementation and maintenance activities. These adverse impacts would likely be limited in time span and spatial extent. Long-term adverse impacts associated with the Preferred Alternative would be the result of permanent property restrictions that could limit the uses of restoration footprints in and near the Bay to uses that are consistent with habitat conservation. Adverse impacts related to Alternatives B and C would be similar in nature and duration to those described for the Preferred Alternative and more minor in impact due to the narrower scope of activity under these alternatives. Given the short-term nature of the majority of the adverse impacts, and the minor effects of the few long-term adverse impacts, the more numerous, long-term beneficial impacts of the Preferred Alternative would exceed the adverse impacts.

Although impacts from the Preferred Alternative to natural resources under the Trustees' jurisdiction, and impacts in general, may occur in the larger Puget Sound region, the potential for the Preferred Alternative to result in substantial cumulative effects to the human environment in and adjacent to the Bay would be unlikely. In this Final RP/EA the Trustees analyzed action alternatives that are intended only to compensate for potential injury to natural resources under the Trustees' jurisdiction caused by hazardous releases in the Bay. As stated above, the Preferred Alternative is anticipated to have predominantly beneficial impacts because the

Preferred Alternative would address existing harms to those resources in the Bay with few, long-term adverse impacts. The physical area of the Preferred Alternative is relatively small at approximately 35 acres, and the actions are intended to benefit habitat. Because of its size and character, the Preferred Alternative would likely result in short-term minor negative impacts to associated with construction and maintenance as well as long-term minor negative impacts by restricting land use within the limited physical footprint. The cumulative impacts analysis for the Preferred Action appropriately focuses on the incremental effects of the action in the context of other ongoing actions in the Bay.

The cumulative impacts analysis for the Preferred Action appropriately focuses on the incremental effects of the action in the context of other ongoing actions in the Bay. As described in Section 1.3 of this Final RP/EA, the Bay and the adjacent Mill Site are also undergoing remedial actions under MTCA. In this case, the Trustees' Preferred Alternative would implement restoration complimentary to MTCA remedial actions in the Bay; therefore, the potential for cumulative impacts is considered in the context of remedial and restoration activities in the Bay. Remedial actions in and adjacent to the Bay would contribute to the cumulative effects of the Preferred Alternative and could result in increased long-term beneficial impacts such as improved water, air, and sediment quality, and aesthetics. Remedial activities in the Bay could also contribute to the cumulative short-term adverse impacts of the Preferred Alternative such as noise and decreased water quality associated with construction disturbances.

Some minor, temporary adverse cumulative impacts to marine fauna and flora could also occur but impacts to these and other resources in and adjacent to the Bay would be minimized by use of best management practices. Cleanup activities and other, non-NRDAR habitat projects that may occur contemporaneously in the vicinity of the Preferred Alternative would incorporate required best management practices, such as dust control and soil and erosion practices. As discussed above, the overall physical footprint of the Preferred Alternative would be a relatively small area of the Bay and areas adjacent thereto. Consequently, the minor and temporary impacts of the Preferred Alternative on air quality, soils and sediments, and water quality has a low potential to result in cumulatively significant impacts to and around the Bay.

Approximately 18.41 acres of the Mill Site are also subject to an existing conservation easement granted to PGST. This easement prohibits development of the easement area for residential, industrial, and commercial uses, and it protects and preserves the shoreline for habitat restoration and public recreation. The easement area overlaps with the area of the Preferred Alternative and also includes adjacent areas of the Mill Site, including areas where MTCA remedial actions will occur. This conservation easement provides that PGST will develop a restoration and stewardship plan for the easement area, and PGST is currently in the process of completing the designs for this plan, which will provide for habitat restoration as well as low-impact recreational activities and cultural activities. This restoration and stewardship plan has been developed to harmonize with and complement the habitat restoration work contemplated under the Preferred Alternative.

PGST's conservation easement and its restoration and stewardship plan are intended to result in long-term improvements to the habitat, recreational uses, cultural uses, and aesthetics of the shoreline area, and these long-term beneficial impacts are complementary to the long-term beneficial impacts of the Preferred Alternative. The cumulative impacts would likely include substantial and lasting improvements to the overall aesthetic appearance of the Mill Site and to the ecological functioning of the shoreline habitats. Construction under the restoration and stewardship plan could contribute to the cumulative short-term adverse impacts of the Preferred Alternative, particularly with regard to noise and soil disturbances, but these impacts are likely to be minor and temporary, and these impacts could be decreased by best management practices, as discussed above. Construction under the PGST's restoration and stewardship plan is also planned to be coordinated with Preferred Alternative and the MTCA remedial actions, which could help to reduce the overall duration of these short-term adverse impacts.

Excluding the planned MTCA remedial actions and PGST's stewardship and restoration actions under its conservation easement, the Trustees cannot predict with certainty what other actions may be undertaken by other entities within and in the vicinity of the Bay that could combine with NRDAR restoration actions to produce cumulative impacts. The Trustees anticipate that future actions in and adjacent to the Bay would be expected to have at least short-term negative impacts from construction activities, but some future actions could have long-term negative impacts if the construction is prolonged. As discussed, as required by the Preferred Alternative, certain uses and any construction associated with those uses would be prohibited in the areas under property protections. It is possible that some future actions may result in long-term adverse impacts to habitats or species in and adjacent to the Bay, although presumably mitigation measures would be used to minimize such impacts and habitat mitigation could be required.

Potential cumulative impacts to the Bay under Alternatives B and C would likely be the same impacts that are discussed above for the Preferred Alternative. Because Alternatives B and C are smaller in scale than the Preferred Alternative, the likely cumulative impacts to the Bay from either Alternatives B or C would be less than those cumulative impacts anticipated for the Preferred Alternative.

There would be no cumulative impacts to the Bay and adjacent environment under Alternative A, the No Action Alternative. Under Alternative A, restoration efforts would only occur if implemented under other legal frameworks or programs, and there would be no impacts associated with a NRDAR process under CERCLA and MTCA.

4.4.1 Potential Impacts of Climate Change on Restoration

The climate in Hood Canal and Admiralty Inlet is west coast marine type, characterized by cool wet winters and mild summers. There are no long-term temperature and precipitation monitoring stations on the Bay. However, five monitoring stations near the Bay (e.g., Forks, Port Angeles, Port Townsend, Cushman Powerhouse 2, Everett) indicate at least a 1°F annual warming trend. Generally, the Bay is cooler and less precipitous than the rest of Puget Sound because the region is partially protected from Pacific storms and Arctic air by the Olympic Mountains (USHCN

2019, PGST 2017). Rising temperatures are very likely to intensify and continue well into the next century with subsequent adverse effects, which could have major effects on restoration outcomes because of ecological conditions that may change over vast ranges. Hence, climatic changes will cause the ranges of individual species to shift.

4.4.1.1 Potential Shoreline Effects

Streamflow and Temperature

Glaciers in the Olympic Mountains, west of Hood Canal (Figure 1), lost 34% of their area between 1980 and 2009. The snow in the Olympics is melting earlier in the year leading to higher winter stream flows and lower summer stream flows. Lower summer/fall stream flows and warmer water temperatures stress salmon and hinder migration (USHCN 2019, PGST 2017). Restoring intertidal, tidal, and riparian habitat in and adjacent to the Bay will provide site specific shading and localized cooler water temperatures.



Photo 4: View looking west from Bay opening to Hood Canal and Olympic Mountains, photographed in 2012.
Photo credit: M. Carlson, USFWS

Sea Level Rise

Sea level rise is of particular concern in coastal areas, including the Bay. Factors influencing local sea level rise include global sea level rise, local land movement (such as tectonic land movement), and changes in wind patterns (University of Washington and Washington Department of Ecology 2008). Sea level at the Seattle tide gauge, the longest running tide gauge in the Puget Sound region, rose +8.6 inches between 1900 and 2008 (+0.8 inches or +20

mm/decade). The average rate of change in sea level at Port Townsend, a nearby monitoring station to the Bay, is comparable to Seattle (+0.7 inch or +17.78 mm/decade) (PGST 2016)

The latest sea level rise projections for Washington project a median increase of 1.6 ft for a low greenhouse gas scenario, and an increase of 2.0 ft for a high greenhouse gas scenario, for 2100 relative to 1991-2010. Storms that produce coastal flooding are not projected to change in the future. However, sea level rise will increase the height and extent of storm surge and waves even if the storms themselves do not change (Miller et al., 2019; Mauger and Vogel 2020).

Ultimately, sea level rise is likely to lead to a high risk of inundated restoration sites in and adjacent to the Bay.

Because the Preferred Alternative would include tidal and estuarine habitat with adjacent riparian habitat, the Trustees considered the estimated sea level rise. To ensure survival of the plant and animal communities, the habitat must have room to migrate upslope and stay at the same intertidal elevation required for the specific organisms. For example, if the water level increases over time, but there is no space upslope for a tidal marsh to migrate (i.e., located against a steep slope), the wetland will not be able to survive in the long term. The Trustees endeavored to locate and develop restoration projects in such a way as to maximize the opportunity for restored habitats to migrate upslope.

4.4.1.2 Potential Eelgrass Restoration Impacts

Ocean Temperature

The strong influence of El Niño- Southern Oscillation and the Pacific Decadal Oscillation are believed to be largely responsible for warming global ocean temperatures including those for the Bay. Between 1950 and 2009, water temperatures for monitoring stations located in the vicinity of the Bay, the Admiralty Inlet, Point Jefferson, and Hood Canal stations, increased +0.8 to +1.6°F depending on the location (USHCN 2019). Currently, there are no monitoring stations directly in the Bay for monitoring water temperature. Eelgrass shoot survival depends on three factors: temperature, light and density. Higher ocean temperatures can adversely affect eelgrass survival (Thom et al. 2014).

Ocean Acidification

Although ocean acidification is not caused by warmer temperatures, it is caused by increasing levels of carbon dioxide in the atmosphere. Additional carbon dioxide changes the ocean's pH and reduces the availability of carbonate ions. Washington's marine waters are particularly susceptible to ocean acidification because of the influence of regional upwelling, which transports offshore, carbon-rich water to the continental shelf (WA DoE 2012).²² In urbanized

²² The increase in the hydrogen ion concentration reduces the amount of calcium carbonate of marine organisms like mollusks to build and maintain body parts dependent on calcium carbonate. Thus, ocean acidification also impacts shellfish, one of the potentially injured resources in the Bay for which restoration under the Preferred Alternative may benefit.

estuaries and restricted inlets of Puget Sound (such as Hood Canal), runoff containing nutrients and organic carbon from land sources also influences pH levels. Added nutrients and organic carbon stimulate algal growth (WA Blue Ribbon Panel on OA 2012, Feely et al 2010), ultimately increasing potential harmful algal blooms and blocked sunlight for eelgrass restoration planned for the Bay.



Photo 5: Moon Snail (*Euspira lewisii*) eggs in sand collar casing in 2012 with pilings that have since been removed in background. Photo Credit: M. Carlson, USFWS

5. RESTORATION MONITORING, PERFORMANCE CRITERIA, MAINTENANCE, AND STEWARDSHIP

The Trustees value restoration monitoring as a critical component of the Preferred Alternative (Alternative D). Monitoring will be a mechanism for the Trustees to determine whether restoration has met its performance criteria and will guide adaptive management actions and maintenance. The Trustees have developed performance criteria specific to the Preferred Alternative. These performance criteria are metrics that reflect whether the restoration is functioning as designed to provide ecological benefits for potentially injured resources in the Bay, thereby meeting the Trustees' goals and CERCLA requirements. During the first ten years after shoreline restoration implementation completion, monitoring results will inform adaptive management of the restoration to ensure ongoing habitat function. After the initial ten years, the South Mill Shoreline Restoration will be subject to ongoing maintenance, monitoring, and stewardship. Each of these aspects of the Preferred Alternative are described in more detail in this section.

5.1 Monitoring & Performance Criteria

Under the Preferred Alternative, the PRPs will conduct maintenance and monitoring of the restoration actions for the first ten years following restoration implementation. The specific parameters that will be monitored for the Preferred Alternative reflect both the physical structure and biological components of the restored habitat. The Trustees developed the selected parameters and monitoring plan to assess how the system and its ecological processes are functioning. Consistent with the technical statement of work for the Preferred Alternative, the PRPs will monitor the following physical and biological parameters to determine whether the Preferred Alternative is performing as intended and providing the anticipated ecological benefits to potentially injured resources in the Bay. In addition, eelgrass monitoring from year to year will dictate the planting locations for the next year.

Physical parameters

- Total intertidal area, including area of low and high marsh and mudflats.
- Slope stability and erosion.
- Soil/sediment structure and quality.
- Porewater sulfide protection.
- Sediment accumulation patterns.
- Surface elevation gradients
- Photosynthetically available radiation (PSAR), temperature, and depth

Biological parameters

- Vegetation survival, density, and areal coverage.
- Herbivore control effectiveness.
- Invasive species cover and presence.

- Presence of desired fish and wildlife species.
- Fish or wildlife use of site.
- Benthic community structure.
- Primary productivity levels.

5.2 Adaptive Management

During the first ten years following shoreline restoration implementation completion, the PRPs will be responsible for performing adaptive management actions in consultation with the Trustees.

To inform appropriate adaptive management actions, the Trustees will require the PRPs to conduct periodic habitat monitoring. Feedback from the monitoring will be compared to the performance criteria described in Section 5.1 to determine what attributes are not on target for project success and what actions, including overall course corrections due to site conditions, will need to be taken to achieve project success. Working with the Trustees, the PRPs will implement adaptive management actions to address performance failures. Adaptive actions may include replanting species, changing plant species or densities, adding mulch, or further amending soils, adjusting, or augmenting herbivore exclusion devices, and/or installing irrigation. The Trustees will consider lessons learned from previous restoration efforts in and adjacent to the Bay when evaluating whether (and what kinds of) adaptive management actions are appropriate. Because the PRPs will be performing adaptive management actions, adaptive management plans that detail these actions for the Preferred Alternative must be reviewed and approved by Trustees prior to the PRPs implementing adaptive management.

Monitoring data collection and analysis will be critical in the first few years after the Preferred Alternative is implemented because that is the time during which adaptive management actions are often most effective. Eradicating or controlling invasive species before the population is too large or planting different species because the hydrology or salinity of the site is different than what was originally anticipated are examples of adaptive management actions that are more successful when taken earlier in a restoration project's lifespan.

5.3 Long-Term Maintenance, Monitoring, and Stewardship

To ensure the ongoing success of the Preferred Alternative, long-term maintenance and monitoring requirements for the Southern Mill Site Riparian Vegetation Area and Southern Mill Site Beach Area (depicted in Figures 3 and 4) will be conducted for years 11 through 30 after shoreline restoration implementation completion. A permanent stewardship plan will be developed to be implemented after year 30 to detail actions for preventing degradation of habitat and associated ecological services from invasive species, debris, and other impacts. Activities such as inspections, maintenance, monitoring and management will be identified by schedules, funding, and assigned responsibilities in conducting permanent stewardship. Between years 11 and 30, the PRPs will undertake all long-term maintenance and monitoring activities to address intertidal stability and substrates at the South Mill Site Beach Area. The PRPs will also be

responsible for funding all additional long-term maintenance, monitoring, and stewardship activities. A designated Trustee or its contractor will use the PRP funding to conduct long-term maintenance and monitoring for the South Mill Site Riparian Vegetation Area between years 11 and 30 after shoreline restoration implementation completion, transitioning to permanent stewardship activities thereafter. Collectively, these efforts when paired with permanent restrictions on the uses of the properties underlying the restoration, will support ongoing functioning habitat to benefit those natural resources in the Bay potentially injured by hazardous releases.

5.4 Reporting Requirements

Within 60 days of completion of the upland and in-water construction activities, excluding eelgrass transplanting, the PRPs will prepare a construction completion report that describes the as-built condition of the restoration projects. Monitoring plans along with identified adaptive management actions that need to be taken must be completed once a year for the first three years after implementation completion and according to the approved monitoring schedule thereafter. The primary objective of the initial monitoring plan is to establish monitoring activities to verify that the goals and objectives of the habitat projects are being achieved. The PRPs will submit eelgrass and sensor deployment work plans to the Trustees for review and approval prior to implementation. The PRPs will submit permanent stewardship plans to Trustees for review and approval prior to permanent stewardship implementation, which is expected to begin 30 years after shoreline restoration implementation completion.

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7. GLOSSARY

Adaptive management- an explicitly experimental approach to managing natural resource projects by integrating design, management, and monitoring to systematically test assumptions to adapt and learn.

Anadromous- a species, such as salmon, that is born in freshwater, spends a large part of its life in the sea, and returns to freshwater rivers and streams to spawn.

Baseline- the condition that would exist but for the releases of hazardous substances.

Benthic- relating to the bottom of a sea or lake or to the organisms that live there.

Bioassay- a procedure for determining the biological activity of a substance (e.g., a drug or pollutant) by measuring its effect on an organism, tissue, or cell, compared to a standard preparation.

Chinook salmon (ocean-type)- one of two types (races) of Chinook salmon that typically migrate to sea within the first three months of life but may spend up to a year in freshwater prior to emigration to the sea. They also spend their ocean life in coastal waters. Ocean-type Chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. Ocean-type Chinook salmon tend to use estuaries and coastal areas more extensively than other pacific salmonids for juvenile rearing.

Ecological services- the processes by which the environment produces resources that we often take for granted such as clean water, timber, habitat for fisheries, and the decomposition of wastes.

Ecosystem processes- the physical, chemical, and biological actions or events that link organisms and their environment. Ecosystem processes include decomposition, production of plant matter, nutrient cycling, and fluxes of nutrients and energy.

Intertidal- occurring within, or forming, the area between the high and low tide levels in a coastal zone.

Invasive species- native or non-native species that heavily colonize a particular habitat, displacing desirable native species and adversely affecting the ecosystem.

Limiting factor- controls a process, such as organism growth or species population size or distribution. The availability of food, predation pressure, or availability of shelter are examples of factors that could be limiting for a species population in a specific area. For example, in the Bay, limiting factors for juvenile salmon include a lack of resting and feeding areas in the estuarine portion of the river as the juveniles acclimate from freshwater to saltwater.

Marsh- an area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Mean lower low water- the average height of the lower of the daily low waters over a 19-year period.

Natural resource services- the physical and biological functions provided by the resource that serve the ecological and human uses of the environment. Examples of ecological services include plant and animal habitat, food supply, etc.

Nexus- the degree of the linkage between the injured natural resource and the restoration actions. The strength of a nexus is determined, in part, by the location of the restoration in comparison to the location of the injured resources.

PAHs (polycyclic aromatic hydrocarbons)- a group of chemicals naturally found in coal, coal tars, oil, wood, tobacco, and other organic materials. There are more than 100 different PAHs. PAHs are the waxy solids found in asphalt, crude oil, coal, coal tar pitch, creosote, and roofing tar. Some types of PAHs are used in medicines and to make dyes, plastics, and pesticides. PAHs can be divided into the following two groups based on their physical, chemical, and biological characteristics:

- PAHs, Low Molecular Weight-PAHs with 2 to 3 rings, such as naphthalene, fluorenes, phenanthrenes, and anthracenes, that have significant acute toxicity to aquatic organisms. In general, low molecular weight PAHs are more soluble and volatile and have less affinity for surfaces than do high molecular weight PAHs.
- PAHs, High Molecular Weight-PAHs with more than 3 rings (such as chrysene). Several members of the high molecular weight PAHs are carcinogenic. In general, high molecular weight PAHs are less soluble and volatile than low molecular weight PAHs.

PCBs (polychlorinated biphenyls)- any of a family of industrial compounds produced by chlorination of biphenyl, noted primarily as an environmental pollutant that accumulates in animal tissue with resultant pathogenic and teratogenic effects.

Rearing habitat- an area where larval and juvenile fish find food and shelter.

Riparian habitat- areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands.

Service loss- *see* Ecological service loss.

Subtidal- areas below the low tide that are continuously submerged.

8. LIST OF PREPARERS AND EDITORIAL ASSISTANCE

The following individuals and organizations were involved in development of this Environmental Assessment and Restoration Plan.

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Appendix A

Point No Point Treaty. The Lower Elwha Klallam Tribe, the Jamestown S’Klallam Tribe, the Port Gamble S’Klallam Tribe, and the Skokomish Tribe are signatories to the 1855 Point No Point Treaty, which guarantees the signatory Tribes’ rights to natural resources in Port Gamble Bay. Under the Supremacy Clause of the United States Constitution, treaties are superior to any conflicting state laws or constitutional provisions.

Treaty of Point Elliott. The 1855 Treaty of Point Elliott sets forth articles of agreement between the United States and the Suquamish Indian Tribe, and other federally recognized Tribes within the Puget Sound area. Under the Supremacy Clause of the United States Constitution, treaties are superior to any conflicting state laws or constitutional provisions.

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 USC § 9601, *et seq.*, and National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300. CERCLA, also known as Superfund, is a federal law that provides the basic legal framework for clean-up and restoration of the nation’s hazardous substances sites. CERCLA establishes a hazard ranking system for assessing the nation’s contaminated sites, with the most contaminated sites being placed on the National Priorities List. Trustees are responsible, under CERCLA, for restoring injuries to natural resources and losses of natural resource services.

Model Toxics Control Act (MTCA), Ch. 70A.305 RCW (formerly Ch. 70.105D RCW [1989]) and Ch. 173-340 WAC (1992). Washington’s toxic clean-up law is the state equivalent of the federal CERCLA law and is managed by the Washington Department of Ecology. The statewide regulations establish clean-up standards and requirements for managing contaminated sites.

National Environmental Policy Act (NEPA), as amended, 42 USC § 4321, *et seq.*; 40 CFR Parts 1500-1508. NEPA was enacted in 1969 to establish a national policy for the protection of the environment. CEQ was established to advise the president and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Federal agencies are obligated to comply with the NEPA implementing regulations promulgated by CEQ (40 CFR Parts 1500-1508). These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA.

Sediment Management Standards (SMS), Chapter 173-204 WAC. The Sediment Management Standards establish standards for sediment quality in State of Washington and provide regulations regarding use of the sediment standards for managing and reducing sources of pollutants, and cleanup of contaminated sediments. The standards include numeric criteria for contaminant concentrations in sediment, biological criteria for sediment laboratory bioassays and benthic community abundance, and narrative criteria for human health, other aquatic organisms, and other toxic substances.

State Environmental Policy Act (SEPA), Chapter 43.21C RCW and Chapter 197-11 WAC. SEPA sets forth the state's policy for protection and preservation of the natural environment. Local jurisdictions must also implement the policies and procedures of SEPA. Each project will undergo a public comment period under SEPA requirements and the SEPA checklist; the permit application, the permit, and the public comments will become a part of the administrative record for each project.

Clean Water Act (Federal Water Pollution Control Act), 33 USC § 1251, *et seq.* The Clean Water Act is the principal law governing pollution control and water quality of the nation's waterways. It requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Discharges of material into navigable waters are regulated under Sections 401 and 404 of the Clean Water Act. The U.S. Army Corps of Engineers has the primary responsibility for administering the Section 404 permit program. Under Section 401, projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards.

Rivers and Harbors Act, 33 USC § 401, *et seq.* This Act regulates development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests U.S. Army Corps of Engineers with authority to regulate discharges of fill and other materials into such waters. Actions that require Section 404 Clean Water Act permits are also likely to require permits under Section 10 of this Act.

Endangered Species Act of 1973 (ESA), 16 USC § 1531, *et seq.*, 50 CFR Parts 17, 222 & 224. The ESA directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authorities to further these purposes. Under the Act, the National Marine Fisheries Services (NMFS) and USFWS publish lists of endangered and threatened species. Section 7 of the Act requires that federal agencies consult with these agencies to ensure their actions are not likely to jeopardize listed species or result in destruction or adverse modification of designated critical habitat. The project implementer has conducted the necessary consultations under the ESA.

Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 USC § 1801, *et seq.*, 50 CFR Part 600. In 1996, the Act was reauthorized and changed by amendments to require that fisheries be managed at maximum sustainable levels and that new approaches are taken in habitat conservation. Essential Fish Habitat is defined broadly to include "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (62 Fed. Reg. 66551, § 600.10 Definitions). The Act requires consultation for all federal agency actions that may adversely affect Essential Fish Habitat. Under Section 305(b)(4) of the Act, NMFS is required to provide advisory conservation and enhancement recommendations to federal and state agencies for actions that adversely affect Essential Fish Habitat. Where federal agency actions are subject to ESA Section 7 consultations, such consultations may be combined to accommodate the substantive requirements of both ESA and MSA. The project implementer has conducted the necessary consultations under the MSA.

Fish and Wildlife Coordination Act (FWCA), 16 USC § 661, *et seq.*, and the Migratory Bird Treaty Act (MBTA) of 1918, 16 USC § 703, *et seq.* The FWCA requires that federal agencies consult with the USFWS, NMFS, and state wildlife agencies for activities that affect, control, or modify waters of any stream or bodies of water, to minimize the adverse impacts of such actions on fish and wildlife resources and habitat. Similarly, the MBTA requires the protection of ecosystems of special importance to migratory birds against detrimental alteration, pollution, and other environmental degradation. These consultations are generally incorporated into Section 404 of the Clean Water Act, NEPA, or other federal permit, license, or review requirements.

Executive Order 11988: Floodplain Management. On May 24, 1977, President Carter issued Executive Order 11988, Floodplain Management. This Executive Order requires each federal agency to provide opportunity for early public review of any plans or proposals for actions in floodplains, in accordance with Section 2(b) of Executive Order 11514, as amended, including the development of procedures to accomplish this objective.

Executive Order 11990: Protection of Wetlands. On May 24, 1977, President Carter issued Executive Order 11990, Protection of Wetlands. This Executive Order requires each agency to provide opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2(b) of Executive Order 11514, as amended, including the development of procedures to accomplish this objective.

Executive Order 12898 - Environmental Justice, as amended. On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This Executive Order requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. EPA and CEQ have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing mitigation measures that avoid disproportionate environmental effects on minority and low-income populations.

Executive Order 11514 – Protection and Enhancement of Environmental Quality. This Executive Order directs federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the nation’s environment; to inform and seek the views of the public about these activities; to share data gathered on existing or potential environmental problems or control methods; and to cooperate with other governmental agencies.

Executive Order 13007 – Indian Sacred Sites, and Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments. Executive Order 13007 describes federal policy for accommodating sacred Indian sites. This Executive Order requires federal agencies with statutory or administrative responsibility for managing federal lands to: 1) accommodate access to and ceremonial use of Indian sacred sites by Indian religions practitioners; 2) avoid adversely affecting the physical integrity of such sacred sites; and 3) maintain the confidentiality of these sacred sites.

Executive Order 13175 exists to: 1) promote regular and meaningful consultation and collaboration with Tribal officials in the development of federal policies that have Tribal implications; 2) strengthen the United States government-to-government relationships with Indian Tribes; and 3) reduce the imposition of unfounded mandates upon Indian Tribes.

Executive Order 12962 – Recreational Fisheries. This Executive Order directs federal agencies to, among other things, foster and promote restoration that benefits and supports viable, healthy, and sustainable recreational fisheries.

Executive Order 13112 – Invasive Species. The purpose of Executive Order 13112 is to prevent the introduction of invasive species and provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

Information Quality Guidelines issued Pursuant to Public Law 106-554. Information disseminated by federal agencies to the public after October 1, 2002, is subject to information quality guidelines developed by each agency pursuant to Section 515 of Public Law 106-554 that are intended to ensure and maximize the quality of such information (i.e., the objectivity, utility, and integrity of such information).

Section 508 of the Rehabilitation Act, 29 USC § 749D, et seq. Under Section 508 of the Rehabilitation Act, all federal agencies must take steps to afford persons with disabilities, including members of the public, access to information that is comparable to the access available to others. Section 508 was enacted in part to eliminate access barriers associated with information technology. For web accessibility under Section 508, documents posted must make text equivalents available for any non-text elements (including images, navigation arrows, multimedia objects (with audio or video), logos, photographs, or artwork) to enable users with disabilities access to all important (as opposed to purely decorative) content. Compliance also extends to making accessible other multimedia and outreach materials and platforms, acquisition of equipment and other assistive technologies, and computer software compliance.

Other potentially applicable federal, state, Tribal, and local laws that are integrated into the regulatory process include:

- Archaeological Resources Protection Act, 16 USC § 469, *et seq.*
- Bald and Golden Eagle Act, 16 USC §§ 668-668d
- Clean Air Act, as amended, 42 USC § 7401, *et seq.*
- Coastal Zone Management Act of 1982, as amended, 16 USC § 1451, *et seq.*
- Marine Mammal Protection Act, 16 USC § 1361, *et seq.*
- National Historic Preservation Act, 16 USC § 470, *et seq.*
- Shoreline Management Act, Ch. 90.58 RCW and Ch. 173-14 WAC
- Historic Preservation Act, Ch. 27.34 RCW, Ch. 27.44 RCW, and Ch. 27.53 RCW
- State of Washington Executive Order 21-02
- State of Washington Hydraulic Code, Ch. 77.55 RCW and Ch. 220-110 WAC

Appendix B

Sediment Chemistry Sampling Events with Data Used by Trustees for Natural Resource Injury Assessment

| Year | Author(s) | Study/ Report Name |
|------|------------------------|---|
| 2000 | Parametrix | Port Gamble Mill sediment chemistry reconnaissance investigation |
| 2001 | Parametrix | Historical Landfills 2 and 3 sediment data report |
| 2003 | Parametrix | Sediment Characterization Report, Former Pope & Talbot, Inc. Site, Port Gamble Bay, Washington |
| 2003 | Parametrix | Sediment characterization report, Former Pope and Talbot, Inc., Department of Natural Resources Aquatic Land Lease No. 20-012795 |
| 2004 | Parametrix | Historical Landfill No. 4 upland soil cleanup action report |
| 2004 | Parametrix | Sediment Cleanup Action Plan, Former Pope & Talbot, Inc. Mill Site |
| 2006 | Anchor | Existing Data Compilation Report, Former Mill Site Sediments, Port Gamble, Washington |
| 2009 | Anchor | Remedial Investigation Report, Former Pope & Talbot Inc. Sawmill Site, Port Gamble, WA |
| 2009 | Hart Crowser | Remedial Investigation, Port Gamble Bay, Port Gamble, WA |
| 2010 | PGST | E-mail transmission of tissue data for Port Gamble Bay from Bill Beckley, Ridolfi, Inc. to Kevin MacLachlan, Ecology on 14 September 2010. Submitted on behalf of the Port Gamble S'Klallam Tribe, Port Gamble, WA. |
| 2011 | NewFields | Port Gamble Bay Supplemental Remedial Investigation, Port Gamble, WA |
| 2011 | Ridolfi | E-mail transmission of sediment data for Port Gamble Bay from Bill Beckley, Ridolfi, Inc. to Russ McMillan, Ecology on 29 November 2011. Submitted on behalf of the Port Gamble S'Klallam Tribe, Port Gamble, WA. |
| 2014 | WDFW/ PGST/ Ecology | Herring Embryo Mortality Study Sediments (in preparation) |

PGST = Port Gamble S'Klallam Tribe

WDFW = Washington Department of Fish and Wildlife

Ecology = Washington State Department of Ecology