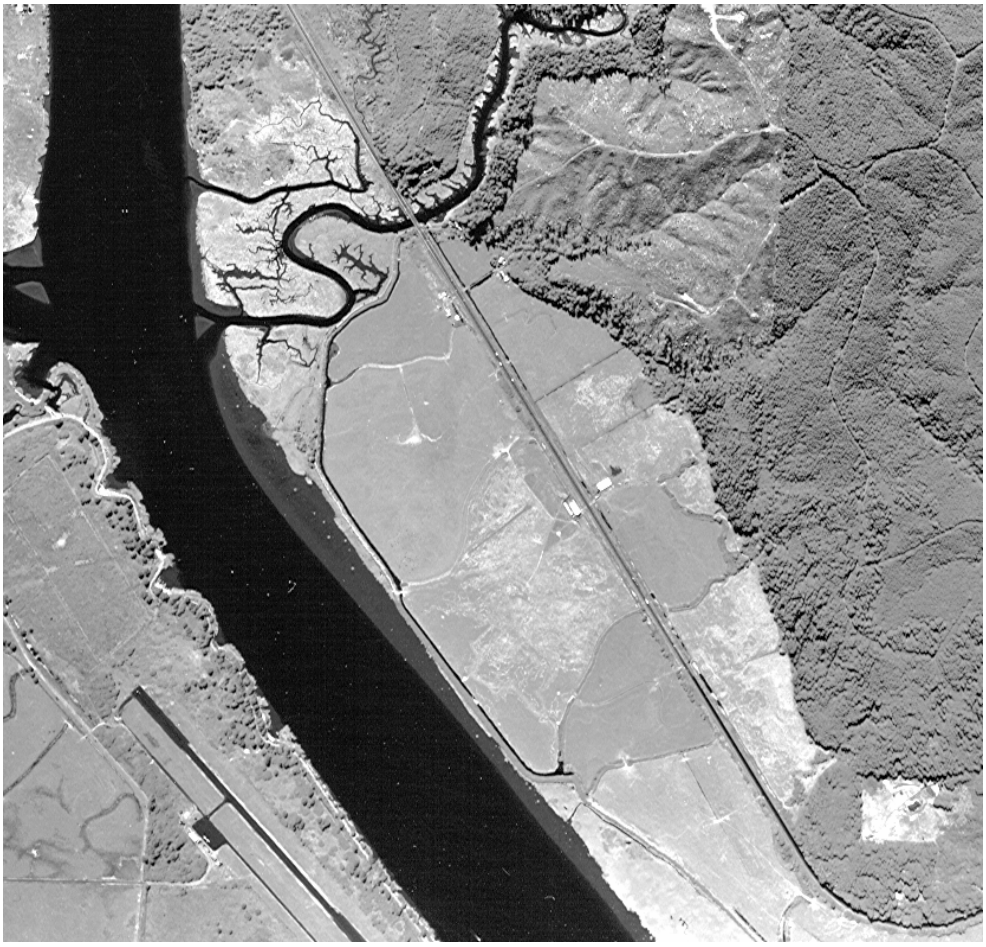
Final Environmental Assessment

Willapa River Estuarine Habitat Restoration Project
Pacific County, Washington

February 2005



US Army Corps of Engineers®
Seattle District

Washington Department of FISH AND WILDLIFE

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

DUCKS UNLIMITED

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Washington State Department of Transportation

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Responsible Agencies: The agencies responsible for this work are the US Army Corps of Engineers (Corps), US Department of Agriculture Natural Resources Conservation Service (NRCS), US Department of Transportation Federal Highway Administration (FHWA), US Department of Interior Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), Washington State Department of Transportation (WSDOT), and Ducks Unlimited, Inc. (DU).

Executive Summary: These agencies are proposing to restore 300 acres of estuarine habitat in an area along the lower Willapa River that is currently diked; raise the portion of US 101 running through the project site to prevent flooding once the dike is removed; and enhance 100 acres of freshwater wetlands on the inland side of the highway. In accordance with National Environmental Policy Act (NEPA), this document evaluates the potential environmental impacts of the proposed action.

The original draft environmental assessment (EA) for this project was released in October 2002. The revised draft EA released in August 2004 was different from the original EA in several respects. First, there is a new preferred alternative identified. This new alternative was developed in response to comments received during the fall 2002 public comment period. Second, concerns identified during the previous public comment period are addressed more thoroughly. Finally, the format and content of this EA has been modified to make it more reader-friendly. The 2002 document was a joint EA and feasibility study, which is a document the Corps prepares to obtain formal approval of a project. The feasibility study sections (e.g., incremental cost analysis) have been removed from this document so the format is that of a normal NEPA document.

The official comment period on this document occurred between August 16 and September 24, 2004

Please send questions and requests for additional information to:

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CONTENTS

TABLES

APPENDICES

1 Introduction

Over the past century, forest practices, dredging and filling associated with navigation improvements, and diking for agricultural and residential development have degraded fish and wildlife habitat in the Willapa River Basin. The US Army Corps of Engineers (Corps), US Department of Agriculture Natural Resources Conservation Service (NRCS), US Department of Transportation Federal Highway Administration (FHWA), US Department of Interior Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), Washington State Department of Transportation (WSDOT), and Ducks Unlimited, Inc. (DU) are proposing to restore estuarine habitat in an area along the lower Willapa River that is currently diked; raise the portion of US 101 running through the project site to prevent flooding once the dike is removed; and enhance freshwater wetlands on the inland side of the highway. Work on each project may proceed independently of one another, subject to each agencies respective funding and approval authorities.

In accordance with National Environmental Policy Act (NEPA), this document examines existing environmental conditions in the Willapa Basin, proposes and evaluates alternatives for restoring important habitat functions on lands owned by the Washington Department of Fish and Wildlife (WDFW), evaluates the potential environmental impacts of each of these alternatives, and recommends a preferred restoration alternative.

1.1 Location

The project area is located on the left bank of the Willapa River, the largest tributary to Willapa Bay, approximately one mile downstream of the City of South Bend in Pacific County, Washington (T14N R09W Sections 17, 18, 19, and 20). Please see Sheet 1 in Appendix A for a location and vicinity map.

The area is property for which the Natural Resources Conservation Service (NRCS) obtained Warranty Easement Deeds from five landowners through the Wetland Reserve Program. Following the establishment of the wetland easements, all landowners sold their fee title to WDFW. Approximately 400 acres of diked lands and approximately 35 acres of adjoining undiked tidelands have been acquired by WDFW and NRCS (see Sheet 2).

1.2 Authorities

1.2.1 U.S. Army Corps of Engineers

Section 1135 of the Water Resources Development Act of 1986 (Public Law 99-662, as amended) allows the Corps to modify the structure or operation of a Corps project to restore fish and wildlife habitat, or to construct restoration projects in locations where an existing Corps project has contributed to the degradation of the quality of the environment.

The Section 1135 proposed project is intended to replace some of the estuarine habitat lost when dredged material was placed in intertidal wetlands as part of the Corps' Willapa River and Harbor Project. Between the 1930s and early 1970s, material dredged from the inner Willapa River Channel below Raymond was disposed on adjacent diked wetlands. During this time, approximately 675 acres of productive intertidal and shallow subtidal habitats were affected by Corps pipeline dredge disposal activities (Corps 1972).

1.2.2 U.S. Department of Agriculture, Natural Resources Conservation Service

The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The WRP was reauthorized through 2007 in the Farm Security and Rural Investment Act of 2002. NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. The intent of the WRP is to restore native plant communities and to achieve hydrologic regimes that provide for the original or improved conditions of the site for the benefit of wetland-dependent wildlife. Special emphasis is placed on habitat for wetland dependent migratory birds, threatened and endangered species, and other wetland dependent wildlife.

1.3 Project Purpose and Need

The purpose of these proposed project elements is to restore estuarine function to diked tidelands. Diking and filling along the lower Willapa River resulted in the loss of substantial acreage of native tidal marsh plant communities and extensive dendritic tidal slough systems. Estimates of tidal marsh loss vary from 19% for the Willapa River Basin to 36% for the Willapa Bay Basin (Hedgpeth and Obrebski 1981, Boule et al. 1983). However, estimated losses are much greater for the lower portion of the Willapa River, where the proposed project is located. Shotwell (1977) estimated that 89% of the river's upper intertidal wetlands downstream of South Bend had been diked. This is a larger wetland loss figure than any other single segment within the basin.

The loss of intertidal wetlands along the lower Willapa River is of particular concern due to the critical ecological role played by this portion of the river. The Willapa River estuary is a transition point between the freshwater, confined, and protected areas of the river system to the more saline, unconfined, and exposed marine areas of Willapa Bay. Estuarine habitats like these are critical to the growth and survival of many economically important species, including oysters, salmon and trout, Dungeness crabs, and waterfowl. So the reduction in the area and diversity of estuarine habitats has impacted the lower Willapa River's capacity to support the variety of fish, bird, and invertebrate species that were historically abundant.

Dredging of the navigation channel, construction of levees, and deposition of dredged material into adjacent marshlands interrupted the flow of the river; diminished nutrient export from the marshes to adjoining habitats such as mudflats; and resulted in the loss of intertidal sloughs that were once refuge and feeding areas for fish, shorebirds, and waterfowl. The

purpose of the proposed project is to reduce these impacts by restoring tidal inundation to a large parcel in this critical portion of the estuary.

2 Alternative Analysis

Application of the Corps' section 1135 authority to restore habitat impacted by the Willapa River and Harbor Project could occur on any tidelands within the lower Willapa River upstream to the City of Raymond (the termination of the navigation project). Although the scope of potential restoration opportunities is broad, several factors reduce this geographic range, including willingness of landowners, suitability of a site for restoration, and construction feasibility. The project partners have been working in this area for many years, and have found that potential restoration opportunities are limited by a lack of willing landowners. When landowners of the 400 acres now owned by WDFW and NRCS became interested in selling their property, it presented a rare opportunity to meet the mutual goals of federal and state resource agencies. While potential restoration opportunities may exist at other locations within the lower Willapa River, the proposed site represents a real opportunity for environmental restoration consistent with national environmental restoration goals. Accordingly, the agencies determined that a reasonable range of alternatives for the purposes of this NEPA evaluation would include restoration design alternatives and the no-action alternative at the proposed project site.

2.1 Project Objectives and Evaluation Criteria

The landowners and other project partners developed several general objectives for management of the WDFW-NRCS property:

- Restore tidal inundation and processes to an estuarine area that has been diked for the past 90 years.
- Restore native tidal marsh and associated plant communities.
- Restore off-channel rearing and refuge habitat for Chinook, chum, and coho salmon, as well as cutthroat trout and other native fish species.
- Provide habitat for migratory birds and other wetland-dependant wildlife.

Based upon these objectives, several technical criteria were developed for use in evaluating various restoration alternatives. These criteria are primarily hydrologic, since the restoration of natural tidal hydrology is the means by which most of the project objectives will be achieved.

- Create wetting of all, or nearly all, of the property under the mean higher high water (MHHW) tide elevation.
- Provide adequate circulation of tidal waters to all parts of the marsh on both ebb and flood tides.

- Promote drainage of tidal waters off of the restored marsh plain to minimize the potential for fish stranding and adverse water quality impacts.
- Improve the quality of salmon habitat in the project vicinity through re-establishment of subtidal and intertidal channels, and increasing the total length of such channels.
- Limit flow velocities through hydraulic openings in the US 101 embankment.
- Minimize the risk of flooding of the US 101 roadway through the project area.
- Allow for restoration of long-term sediment deposition and transport processes.
- Maintain current level of flood protection.
- Minimize *Spartina alterniflora* colonization of the project site through active control measures.

The project partners also established two social criteria for the management of the site:

- Provide public access for educational opportunities and wildlife-oriented recreation.
- Provide a safe highway pull-off with interpretive materials.

2.2 Initial Alternative Screening

Several management alternatives and/or project features were considered by the partner agencies. After an initial screening against the project goals and technical criteria, some of these alternatives were excluded from further analysis because they did not meet one or more of the planning criteria identified in Section 2.1. Those alternatives rejected after the initial screening are described briefly below. The three remaining for further analysis are described in Section 2.3.

- The project partners considered breaching the dike in one or more places. However, breaching the dike did not meet the technical criteria related to wetting and circulation. In most natural tidal marshes, channel systems are not the exclusive conduit for tidal exchange. In a study of water movement and sedimentation processes within a natural marsh in the United Kingdom, French and Stoddart (1992) found that marsh edge sheet flow accounted for up to 39% of water movement into the marsh on a typical high spring tide, and up to 47% on the ebb. Leaving the dike in place would have implications for tidal circulation and sedimentation processes, as sheet flow along the 11,000-foot long dike-river face would be blocked.
- The project partners considered removing the dike without filling all of the existing borrow and drainage ditches. Upon review, it was determined that this grading work was necessary to meet the technical criterion related to adequate circulation of tidal waters to all parts of the marsh plain on both ebb and flood tides. If the ditches were not filled, they would capture the tidal energy needed to scour a complex network of

channels. In addition, a project that did not include grading and filling of existing drainage ditches would not satisfy the technical criterion related to drainage of tidal waters off the restored marsh plain. If the site were not graded to provide positive drainage on ebb tides, standing water could result in local topographic depressions. This may lead to fish strandings, water quality degradation due to elevated temperatures and low dissolved oxygen levels, and high water salinities that could form salt pans and make it difficult for vegetation to establish.

- The project partners considered re-aligning US 101 to the toe of the hillside at the most landward boundary of the WDFW property. However, hydrologic modeling conducted as part of the project design process indicated that the landward side of the highway could be fully inundated through installation of a bridge (Herrera 2002). In addition, the cost of road removal and reconstruction would be far higher than that of road raising and bridge installation.
- The project partners considered site revegetation to meet the general criterion relating to restoration of native tidal marsh and associated plant communities. However, because the project area has subsided since it was diked it will likely take several years for the property to accrete to elevations that would support target salt marsh plant species. Plant survival would be too low to justify the cost of plantings immediately following removal of the dike.

2.3 Description of Alternatives

2.3.1 Alternative 1 - No Action

Under the no action alternative, the dike surrounding the waterward perimeter of the property would remain in place but would not be maintained. At some point in the future, a dike breach would likely occur. Failure of the dike would likely force some construction activities on the site to maintain the safety of US 101 and to protect neighboring properties from flooding. NRCS may fund construction of a cross dike at the downstream end of the property, but would allow the inundated area to return to marsh over time. Recreation would be allowed on the site, but no parking areas or other amenities would be developed. WDFW would control any Class A noxious weeds on the site, and maintain fences to exclude livestock from the site.

2.3.2 Alternative 2 – 400 acre tidal inundation

Under Alternative 2, tidal waters, maximizing the area of estuarine habitat restored, would inundate the entire 400-acre WDFW-NRCS property.

Specific features of Alternative 2 include:

- Raising of highway US 101
- Excavation of remnant tidal channels

- Filling of farm drainage ditches and highway borrow ditches
- Construction of two new cross dikes to protect adjacent landowners from tidal inundation/flooding
- Construction of a 70-foot long bridge to convey tidal waters to the inland side of US 101
- Construction of a parking pull-out
- Construction of freshwater habitat improvements at one 22 acre site
- Removal of the existing dike and filling of its borrow ditch
- *Spartina* control

Based on the initial screening, the minimum restoration project consisted of removal of the dike and filling of ditches. The excavation of tidal channels was included because it would generate material for ditch fill, thereby avoiding the expense of importing material, and meet the technical criterion relating to re-establishment of channels. It was necessary to add the raising of US 101 and construction of cross dikes to prevent the flooding of transportation infrastructure and neighboring properties once the dike is breached.

The remaining features were incorporated into the alternative to satisfy other project goals and technical criteria. The bridge would maximize area inundated; the pullout would provide recreation opportunities; the freshwater enhancements would provide habitat for migratory waterfowl; and *Spartina* control would enable restoration of native marsh plant communities.

2.3.3 Alternative 3 – 300 acre tidal inundation and freshwater wetland enhancement

Under Alternative 3, tidal waters would inundate the 300 acres of the WDFW-NRCS property on the riverside of US 101. The 100 acres landward of US 101 would remain freshwater wetlands.

Specific features of Alternative 3 include:

- Raising of highway US 101
- Excavation of remnant tidal channels
- Filling of farm drainage ditches and highway borrow ditches
- Construction of a new cross dike to protect adjacent landowners from tidal inundation/flooding
- Placement and replacement of culverts and tidegates for water conveyance under the highway
- Construction of a parking pull-out

- Construction of freshwater cells and other freshwater habitat improvements at two sites
- Removal of the existing dike and filling of its borrow ditch
- *Spartina* control

Alternative 3 was developed in response to public comments on Alternative 2, which was identified as the preferred alternative in the December 2002 *Draft Ecosystem Restoration Report and Environmental Assessment* for work at this site. Alternative 3 shares several features with Alternative 2. However, this alternative lacks the bridge and instead incorporates freshwater wetland enhancements inland of US 101. These enhancements would occur over a much larger area than proposed in Alternative 2, and would address the general project objective of providing habitat for migratory birds in lieu of restoring tidal inundation to this portion of the property. Also, one of the cross dikes becomes unnecessary once tidal waters will not inundate the area inland of US 101, so it was removed from this alternative.

2.4 Alternative Evaluation

Under the no action alternative, a partial dike failure would result in a return of tidal inundation to the property. This could be problematic for several reasons. First, highway flooding could result from an unplanned breach, particularly if it occurred during a large storm event. WSDOT currently has funding from the Federal Highways Administration to elevate the roadway as mitigation for a State Route 105 highway project along the northern shoreline of Willapa Bay. These funds would not be available under the no action alternative, so there is uncertainty regarding how quickly action could be taken to prevent the highway from periodic flooding in the event of a breach. Neighboring properties could also be affected by flooding during storms and/or higher than normal tides, although under the no action alternative NRCS would likely construct a cross dike at the downstream end of the property to prevent regular flooding of neighbors downstream.

The no action alternative does not meet the restoration goal of the property landowners. In its current state, the freshwater wetlands of the project site do provide habitat for wetland-associated birds, habitat for amphibians, limited organic matter production/export, and flood flow alteration (Null 2002). But these habitat values are declining over time. Open water, ponded areas that have been present over much of the 400-acre project site since it was diked are gradually disappearing due to a lack of grazing. Dense, tall herbaceous and woody vegetation is gradually replacing these pool areas. As a result, the value of the property for species dependant on open water, such as waterfowl, is being reduced. While freshwater wetlands are important along river floodplains, the habitat functions they provide are better suited to freshwater reaches of the Willapa River upstream of the project area. This type of freshwater wetland is fully functional only when there is a free and open connection to the river. At this location in the landscape, fish and other estuarine organisms require low-salinity wetlands for their survival.

Although tidal inundation would be restored to the property if a breach occurred, the value of the resulting habitat would not be equivalent to that which would occur as a result of implementation of one of the action alternatives. Site hydrology (e.g., tidal circulation and sedimentation processes) would not be comparable to natural conditions, unlike a carefully designed restoration effort. Swales and existing drainage ditches on the property could trap fish as the tide ebbed, and provide areas suitable for mosquito breeding. Such pools of stagnant water could hamper the formation of a complex network of channels and recolonization of the area by salt marsh vegetation.

The two action alternatives were measured against the objectives and planning criteria developed by the project partners and presented in Section 2.1. Alternative 2 meets all of the planning criteria and represents the highest quality project that the landowners and other project partners envisioned for the property. However, comments received on the December 2002 *Draft Ecosystem Restoration Report and Environmental Assessment* indicated that neighboring property owners and community leaders had concerns regarding Alternative 2 (which was identified as the preferred alternative at that time). By inundating the landward side of US 101, Alternative 2 would encumber use of the hillside property, which forms the project site's southwest boundary by subjecting it to Washington State Shoreline Management Act (SMA) and Pacific County Shoreline Master Program (SMP) jurisdiction. Regulations associated with the SMA and SMP could restrict future timber harvests and/or future development of this property. Since Alternative 2 would change land use regulations for neighboring property, resulting in impacts unacceptable to those landowners and the surrounding community, it was eliminated from further consideration.

Alternative 3 alleviates concerns regarding SMA jurisdiction, and satisfies most of the objectives and planning criteria presented in Section 2.1. Although Alternative 3 would not result in the wetting of the entire NRCS-WDFW property under the mean higher high water tide elevation, it does include additional measures to enhance the remaining freshwater wetlands on the property to provide habitat for migratory birds and other wetland-dependant wildlife. Inclusion of this feature addresses the concerns of several who made comments regarding impacts of the project on wildlife currently utilizing the property. For these reasons, Alternative 3 was selected as the preferred alternative.

2.5 Project Description

Specific features of Alternative 3, which has been identified as the preferred alternative, are shown on Sheets 1 – 53 in Appendix A and described below in the general order in which they would be constructed. Tables summarizing cut and fill quantities, as well as wetland acreages affected by each element of the proposed work, can be found in Section 2.5.11 at the end of the individual project element descriptions. It is expected that three summer construction seasons would be required to complete construction of the preferred alternative. The highway and freshwater wetland enhancements would occur in summer 2005; the grading work on the river side of the highway and construction of the cross dike would occur in 2006; and the dike would be removed in 2007. Work may proceed on portions of these projects independently of one another.

2.5.1 Highway US 101

Approximately 1.25 miles of US 101 between MP 51.29 and 52.51 would be raised by WSDOT and FHWA to an elevation of +15.5 feet NAVD88 to prevent the highway from flooding once the site is opened to inundation of tidal waters. This elevation is one foot higher than the 100-year flood elevation. An additional 0.12-mile may also be raised to +13.86 feet NAVD88 as part of the same construction contract. This segment of the highway would not be flooded by the proposed dike removal work. However, raising it would fix an isolated low area that has had water over the roadway in the past.

The highway raising would require about 97,000 cubic yards (cy) of imported fill, of which 29,540 cy will be placed in wetlands (see Tables 1-3 in Section 2.5.11 and Section 4.2.1 for calculations of wetland acreages which would be affected by implementation of the preferred alternative). Borrow ditches adjacent to the highway would also be filled as part of the road raising work (see Section 2.5.4).

Two new 36-inch diameter culverts with tide gates would be installed through the highway embankment to convey water between the landward and waterward portions of the property. In addition, an existing 40-inch diameter culvert with tidegate in poor condition will be replaced with a new 30-inch diameter culvert with tidegate, and a failing 30-inch diameter culvert will be plugged. All the new culverts will have quarry spall pads installed to help prevent scour.

If the preferred alternative is selected and implemented, the highway work would occur during the spring and summer of 2005. It is estimated that it would take 65 working days to complete this portion of the project. All work would likely take place under single lane closures, with traffic being directed through the work area with flaggers or a pilot car for large work areas. No full road closures are planned. Lane restrictions would generally occur Monday through Thursday during daylight hours, and from dawn to noon on Fridays. There would be a need for some maintenance of the US 101 driving surface once the highway is covered with fill material and before the first proposed lift of asphalt is placed (e.g., dust control, grading, and compaction of the roadway). This maintenance would require traffic control and may be necessary at night or on weekends, but would occur over a short portion of the total construction period. No lane closures would occur during a holiday, or after noon on the day prior to a holiday. Lane restrictions would also be planned around any local events that could be impacted.

The proposed highway improvements have been designed to meet federal and state requirements for safety. The highway shoulders would be enlarged from 3 feet to 6 feet in width through most of the project area. The design does take into account that one side of the road embankment will be inundated by daily high tides. Highway design standards require a distance of 31 feet off the lane edge, called the clear zone, for an errant vehicle to recover. Standards require that, under normal conditions, a vehicle shall not encounter water to a depth greater then 2 feet within the clear zone. This proposal exceeds that requirement with 6-foot wide shoulders and 6:1 to 4:1 side slopes. Only during flood events and extremely high tides (1 or 2 times a year) would this depth be exceeded; this is allowable

under the design standard which covers normal every-day conditions, not extreme or rare events.

The proposed roadway design also incorporates upgrades, which would exceed current water quality standards. The broad embankment side slopes would be vegetated to form a filter strip, which would accept sheet flow runoff from impervious areas on the highway. The vegetated filter strip would remove sediments and other pollutants from the highway runoff before it is discharged into the proposed marsh and the Willapa River.

Approximately 23,000 cubic yards of the 104,300 cubic yards of material needed for the highway raising and highway borrow ditch fill would be imported from a WSDOT borrow area adjacent to US 101 near the Bone River (mile posts 45.05 through 45.14). This borrow site is located in the highway right-of-way. This material will need to be removed in order to construct a future WSDOT bridge replacement project. Obtaining the borrow material will require cutting and laying back the steep embankments to the immediate south of the existing bridge well in advance of the replacement bridge's eventual construction. These cuts are necessary to provide adequate room for the temporary detour bridge and work platforms, and to accommodate the widened approach footprint of the permanent pre-stressed concrete structure planned for construction at this site. Please see sheets 52 and 53 in Appendix A for the location of and the grading plan for the borrow site.

The work at Bone River borrow site would involve clearing and grubbing vegetation, excavation, and the use of temporary erosion control measures. It would take about 12 days to remove the needed quantity of fill. Track dozers and/or track excavators would be utilized to perform the work. Highway-legal dump trucks would transport the material to the project site. One lane of the highway will act as a work platform so the contractor can load the dump trucks. Traffic would be controlled through the work site with the use of one lane closure with flaggers at each end. Work would happen during daylight hours, with no traffic effects during non-working hours.

The remaining 81,300 cubic yards of fill material would be purchased from permitted commercial mining operation(s). Since a contract for this work had not been awarded, it is unknown exactly which business would be used to supply this material. However, several are located in Pacific County, including one in South Bend. It is likely that a contractor would purchase material from the site(s) nearest to the project area in order to keep transportation costs down.

2.5.2 Parking Pull-Out

A 0.30-acre highway pullout would be constructed by WSDOT and FHWA to provide public access to the WDFW-NRCS property for education opportunities and wildlife-oriented recreation. The turnout would provide safe access to parking on the northeasterly side of the US 101 near Potter Slough. The parking area would be approximately 15,000 square feet in size and situated at the roadway elevation. This feature would require placement of about 2050 CY of fill and about 100 CY of asphalt. The pullout would be located on an existing

elevated pad, where a recently demolished residence was located, so it would require no wetland fill.

2.5.3 Remnant Tidal Channels

Five primary channels (8,000+ feet in length) and three secondary channels (1,200+ feet in length) would be restored, through excavation, by the Corps and WDFW to allow for natural tidal hydrology and fish access to the interior of the site. Channel grading would follow the alignments of remnant tidal channels evident in aerial photographs of the site. Excavators would be used to remove blockages within the channel alignments and provide grade control. It is likely that only a portion of the total length of the remnant channels would be excavated. The excavated material would be hauled by dump trucks to be used for on-site fill (see Section 2.5.4 below), minimizing the need for imported fill material. The channels would be excavated before the old dike is removed, so water quality impacts to the Willapa River would be minimal, if any. It is not anticipated that any on-site road improvements would be required to accommodate dump trucks. However, if road improvements were required, they would be removed at the end of the first construction season. WDFW has recently demolished and removed structures on the property, so it is unlikely that extensive site clearing or trash pickup would be required prior to the initiation of earthwork.

2.5.4 Drainage and Borrow Ditches

Several existing drainage ditches and US 101 borrow areas on the river side of the highway embankment would be filled by the Corps and WDFW in order to restore natural tidal hydrology, eliminate mosquito breeding areas, and prevent fish stranding once the dike is removed. Borrow ditch fill is necessary to ensure that tidal waters scour complex tidal channels, rather than pond and potentially trap fish. Approximately 8,100 CY of material will be required to fill the highway borrow ditches and 7,400 CY of fill would be placed in farm drainage ditches. Fill material will be obtained from the excavation of remnant channels (see Section 2.5.3), and from off-site sources (see Section 2.5.1). The fill would be moved on-site via dump trucks, and would be spread with a bulldozer. General site grading to eliminate existing swales that could prevent restoration of natural tidal hydrology would also occur. A vibratory roller may be used to compact the material. This fill and grading work would occur prior to removal of the dike.

2.5.5 Cross Dike

A new ~1,400 foot long cross dike would be constructed by NRCS in order to prevent flooding of adjacent properties downstream of the project site. Approximately 5,200 CY of imported fill material would be required. Material would be hauled to the site on US 101 by single unit dump trucks or trucks and pups. The material would be spread by bulldozer and compacted by a vibratory roller. Due to expected settlement of the dike, the dike would be topped off in the second construction season using similar construction methods. Topsoil and seed will be placed on the finished dike.

2.5.6 Dike Removal

Approximately 10,000 linear feet of existing dike along the Willapa River would be excavated by the Corps and WDFW down to the elevation of the mudflat/marsh fronting the dike. Inlets for each of the 5 primary channels in the mudflat on the riverside of the existing dike would also be excavated. Removal of the dike would result in the inundation of approximately 300 acres of WDFW property on the northeast (river) side of US 101. Approximately 46,000 cubic yards of material would be excavated from the old dike and placed in the borrow ditch directly adjacent to the dike. The first stage of the excavation effort would open the remnant channels to the river, which would also provide drainage for the borrow ditch and an escape route for any fish which have accessed the site during construction activities. An excavator situated on top of the dike would move the material. Due to the depth of the old borrow ditch, it is not possible to avoid placing material in the ditch while water is in the ditch. It is anticipated that work will occur at more than one site on the dike in order to expedite the work. Each work area would be enclosed with a silt curtain, and fish would be netted out before fill placement.

Due to concerns of resource agencies and oyster growers downstream of the project site, water quality would be monitored during removal of the dike. The Washington Department of Health will monitor fecal coliform levels and the Corps will monitor turbidity levels in the Willapa River. If the monitoring indicates that water quality standards have been exceeded, work would stop until the parameters return to normal levels.

2.5.7 Freshwater Habitat Enhancements

Approximately 120 acres of freshwater wetlands on and directly adjacent to the WDFW-NRCS property would be enhanced by NRCS to help offset the loss of freshwater habitats that would occur if the estuarine habitat restoration features were implemented. These enhancements are necessary because the open water, ponded areas that were historically present over much of these 120 acres (as well as the remainder of the 400+ acre site) are gradually being replaced by different freshwater habitats. The lack of grazing on the site has and will continue to result in the presence of dense herbaceous and woody vegetation rather than more open pooled areas. This change negatively impacts the value of these lands for waterfowl and other species utilizing the property. Local residents use this area for waterfowl hunting, so the freshwater wetland enhancements provide a locally valued function within the overall project.

WRP Site 1

Wetlands Reserve Program (WRP) Site 1 is located on the west (landward) side of US 101. Work at this site would involve grading to create three freshwater wetland cells and six amphibian ponds. The portion of the highway borrow ditch on the landward side of the US 101 embankment remaining after completion of the highway raising would also be filled as part of this project element.

The three freshwater cells or ponds would be surrounded by new levees constructed from borrow material excavated from ponds within those cells. The cells would total 60 acres in

size (22 acres, 21 acres, and 17 acres for ponds 1, 2, and, 3, respectively), and the levees would cover 9 acres of the site. The levee borrow area would occupy a total of 11 acres within the three ponds; any extra borrow material will be spread throughout the site to provide additional micro-topographic features. The ponds would be covered with water during the fall and winter months. Existing swales would be enhanced and new swales constructed to establish deeper waters within the larger ponds that may persist during the summer months. A total of 10 swales would occupy 3 acres. Please see Table 1 for a summary of cut and fill quantities associated with this project element.

The new tidegates would serve as water control structures, which would be used to retain freshwater in the cells, providing seasonal or semi-permanent hydrology. These structures will provide an opportunity for moist soil management to maintain optimum plant communities for waterfowl and shorebirds.

The six amphibian ponds totaling an area of approximately 1 acre will be distributed adjacent to the hillside bordering the property. Ponds will range in size from 0.08 acres to 0.29 acre and will have variable depths between 6 and 18 inches. The amphibian ponds were designed to hold water long enough for frog or salamander eggs to hatch and the tadpoles develop into their terrestrial form; the ponds would completely dry out most summers and fill up again the following fall/winter.

WRP Site 2

Wetlands Reserve Program (WRP) Site 2 is a 22 acre parcel located immediately downstream of the WDFW property, just west of the proposed cross dike (see Section 2.5.5). The property is owned in fee title by a private party, but is protected by an underlying NRCS permanent wetland easement. The private landowner previously owned a parcel, which was used primarily for duck hunting, near the center the WDFW property. As part of the WDFW purchase agreement, this landowner traded lands at the margin of the project site rather than selling his property outright. Part of that agreement included a provision for WRP restoration actions to enhance waterfowl habitat on the property.

On the west and northern boundaries of the site, a small levee (2 to 3 feet in height) would be constructed to retain seasonal freshwater. High spots existing in that area and borrow material would be used to construct this levee to the 8 foot elevation (NAVD88 datum). Approximately 4,700 CY of fill would be needed to construct the two-sided levee, affecting 0.58 acre of wetlands. A water control structure would be installed through the west levee and used to retain freshwater in the old remnant slough and four adjoining swales, providing seasonal or semi-permanent hydrology. The structure would provide the opportunity for moist soil management in the swales to maintain the optimum plant community for waterfowl and shorebird habitat. Historic micro-topographic features would be re-established adjacent to the remnant slough to create a more diverse hydrologic and vegetative community.

Existing swales and shallow depressions would be enhanced to allow for more open freshwater habitat. Approximately 11,600 cubic yards of material would be removed from almost 6.4 acres. Habitat mounds or islands, adjacent to the open water areas, would mimic

the natural landscape and will serve to provide higher ground and to direct water flow during flood conditions.

2.5.8 *Spartina* Control

After construction of all the preceding project elements is complete, a program to control the invasive exotic species *Spartina alterniflora* (smooth cordgrass) would be implemented on the property. *Spartina* infestation is the most serious risk to the success of the project. WDFW *Spartina* experts expect that the time that the site is most vulnerable to a *Spartina* infestation be in the first three years after the dike breach.

WDFW has an established program to control the invasive exotic salt marsh grass *Spartina* in Willapa Bay. This program is part of an ongoing multi-agency *Spartina* control effort in Willapa Bay. Protocols of the control program, which this project will follow, are expected to evolve as new research points to more effective control measures. *Spartina* control efforts on the project property will employ Integrated Pest Management principles; multiple control techniques will be employed, with herbicide application used only as a last resort.

As part of their on-going program, WDFW crews sprayed a 5-acre *Spartina* meadow fronting the project site, as well as a larger meadow across the Willapa River, with herbicides during the summers of 2002, 2003, and 2004 to eliminate an immediate seed source. The treatment method for *Spartina* outside of the dike is the herbicide glyphosate as a ground application. Airboats were used, and each application took approximately two days.

After the dike is removed, WDFW Spartina control crews would monitor the project site. Monitoring for *Spartina* within the dike would begin in the growing season immediately following the dike removal. Monitoring would consist of ground surveys for seedlings, and would occur throughout the growing season (May-October). Any *Spartina* seedlings found within the project footprint would be removed manually. If all seedlings are pulled each year, manual removal is expected be effective in future years. If seedlings became clones and meadows formed, the herbicide glyphosate (Rodeo®) would need to be used to prevent further infestation. The herbicide imazapyr (Arsenal©) may also be used. Compared to glyphosate, imazapyr requires less chemical and shorter drying times to kill *Spartina*. Herbicide application will be used only as a last resort within the project footprint.

The proposed control measures would be conducted under a five-year Aquatic Noxious Weed Control National Pollutant Discharge Elimination System Waste Discharge General Permit issued to the Washington Department of Agriculture (WSDA) in 2002. This permit requires that herbicide treatments occur only between July 1 and October 31. All WDFW staff responsible for herbicide application will hold valid pesticide licenses, and have passed the WSDA aquatic pest control exam. Herbicides would be applied to *Spartina* consistent with the pesticide label, and restrictions imposed by the US Environmental Protection Agency, Ecology, and USFWS.

2.5.9 Post-Construction Monitoring

Post-construction monitoring of site hydrologic/hydraulic development, vegetation, fish/bird usage, and mosquito densities would occur for a period of 5 to 10 years. Standardized monitoring protocols (e.g., Simenstad 1991) would be used for monitoring the ecological function of the site. WDFW, in conjunction with the project partners, is developing an adaptive management plan for the project site that will be completed prior to construction. The plan will include sampling protocol and management triggers as to when action will be necessary to correct project function. Additional sampling will also be done to fully characterize mosquito-breeding characteristics throughout the early portion of the year (March and April). This will be combined with the 2004 study to develop an effectively management plan the freshwater ponds for minimize mosquito breeding opportunities. WDFW expects the additional sampling for mosquitoes to provide information as to when to draw water down at the ponds. WDFW, as the land manager, will be the lead agency implementing all portions of the monitoring plan, with assistance from the other project partners.

2.5.10 Site Maintenance

WDFW would control any Class A noxious weeds on the site, likely involving periodic disking of the freshwater areas to control reed canary grass (*Phalaris arundinacea* L.), and maintain any fences to exclude livestock from the site. As needed, NRCS would maintain project elements on WRP Sites 1 and 2, including managing the boards in the water control structures. Tidegates under US 101 would be owned and maintained by WDFW. WSDOT would help with maintenance by cleaning debris from the tide gates to keep them functional.

In the unlikely event US 101 is damaged during storm condition, debris from the roadway and shoulders would be removed; the rock shoulders would be re-graded; the shoulder slopes would be re-graded, and asphalt would be repaired. Localized, spot maintenance may be needed to shore up any damaged roadway embankment areas along the toe of the fill. Maintenance would be needed on the culverts under US 101 to keep them free of debris and provide protection from scour.

2.5.11 Excavation-Fill Quantity and Acreage Estimates

The current quantity estimates listed in Tables 1 and 2 below show an excavation surplus of approximately 41,400 CY. The project partners intend to excavate only that amount of material required for the on-site fill work, thereby avoiding the cost of off-site disposal. One way to do this may be to reduce the amount of fill removed from the dike. The current estimate was generated with the assumption that the dike would be taken down to the elevation of the pasture behind it. Since the marsh in front of the dike is approximately two feet higher in elevation than this pasture, leaving the dike slightly higher than assumed here could eliminate the fill surplus.

Table 1. First Construction Season Cut and Fill Quantities and Affected Areas

Project Element	Excavation (cy)	Fill (cy)	Wetland Footprint (Acres)
Tidal channels	23,200	--	4.33
Farm drainage ditches	--	7,408	4.54
Highway borrow ditches	--	8,100	2.56
Cross dike	1,391	5,178*	1.14
Highway pull-out	--	2,050*	No wetland footprint
Highway raising	--	29,540*,**	4.38
Stone for non-erodible plugs	--	24*	Included in ditch fill
Stone for culvert scour protection	--	70*	Included in ditch fill
WRP Site 1 swales	11,140	--	3.09
WRP Site 1 ponds	45,850	--	11.2
WRP Site 1 levees	7,330	34,400	9.09
WRP Site 2 swales	11,567	--	6.38
WRP Site 2 islands	--	5,300	2.53
WRP Site 2 levees	--	4,700	0.58

* Imported structural fill; all other fill generated from on-site excavation.
** An additional 67,460 CY of imported material will be required to raise the highway. Given the elevations where this material will be placed, it will not involve wetland fill

Table 2. Second Construction Season Cut and Fill Quantities and Affected Areas

Project Element	Excavation (cy)	Fill (cy)	Wetland Footprint (Acres)
Dike removal	45,776	--	10.38
Borrow ditch fill	--	51,417	10.38

Table 3. Project Cut and Fill Totals

Total Excavation	146,508 cy
Total Fill	216,147 cy
from on-site sources	111,825 cy
from imported sources	104,322 cy
Total Cut Footprint	35.38 acres
Total Wetland Fill Footprint	35.20 acres

3 Existing Conditions

3.1 Physical Characteristics

3.1.1 Geology

The Willapa Basin is characterized by low hills with steep topography and large lowland floodplains. Floodplains of the lower Willapa River have low, even topography. These characteristics have resulted in extensive diking and agricultural development of floodplain areas along the lower river reaches. In the low elevation portions of the floodplains, winding sloughs form the only noticeable topographic relief. These sloughs, ranging in width from less that 1 foot to 100 feet, often have no freshwater source and are filled and emptied only by the tide. The sloughs generally have one steep, eroding bank and a shallow accreting bank, and are continually changing in form as the channel is realigned.

Lowland areas that immediately flank the northern, eastern, and southern parts of Willapa Bay are formed on Pleistocene marine terraces composed of sand, silt, and clay. Soils of the Ocosta Association are common in the lower floodplains of the major rivers flowing into Willapa Bay. According to the Pacific County Soil Survey, soils of the WDFW property are comprised primarily of Ocosta silty clay loam, which form in clayey alluvium near coastal bays. This poorly drained soil has a silty clay loam surface layer with the percentage of clay increasing with soil depth. This Ocosta soil is very deep, and has a high water table for most of the winter and spring months.

The Bone River Borrow site consists of rolling hill terrain forested by mostly conifer trees. The soil consists of Willapa Silt loam, with slopes varying from 8-70%. The surface layer is a dark brown silt loam to a depth of 20 inches, followed by a subsoil layer of mottled dark yellowish brown silty clay loam approximately 23 inches thick. The substratum to a depth of 60 inches or more is mottled pale brown silty clay loam.

3.1.2 Hydrology, Hydraulics, Geomorphology

The hydrology, hydraulics, geomorphology, and flooding of the project area are dominated by tidal conditions. The project site consists of diked pasturelands historically used for cattle grazing, remnant tidal sloughs, and drainage/borrow ditches. Currently the project area is protected from daily tidal inundation by a levee that runs along the left bank of the Willapa River. However, during times in the rainy season, standing water is present on the much of the site. A tide gate located on the southeast property boundary discharges into Potter Slough.

US 101 bisect the site into two areas. There is no significant hydraulic connection through the road fill. The area between US 101 and the levee is drained to the river by a large remaining slough and tide gate. The area between US 101 and the hillside to the west is drained to the southeast by a large ditch and tidegate to Potter Slough.

The mean semi-diurnal tide is 9.4 feet (PWA 2001). When the tide and/or waves exceed 12 feet in elevation, most of the length of US 101 through the project site will be flooded if the existing levee is breached or removed as planned. The 100-year flood elevation for the site is +14.52 feet (NAVD88 datum), and WSDOT is planning to raise US 101 to +15.5 feet through the project site.

Potter Slough flows through a relatively undisturbed marsh to the southeast of the project site. This site, which is also owned by WDFW, is used as the reference condition for predictions about the form and pattern of the tidal channel network and marsh that will form once tidal action is restored to the project area. Philip Williams & Associates, Ltd. (PWA), in association with Herrera Environmental Consultants and WSDOT, performed the hydrologic, hydraulic, and geomorphic investigations for this project.

Channels in the Potter Slough reference marsh typically have straight-sided clay banks. In contrast, lower-banked, wider, and shallower channel forms characterize remnant channels in the pastureland.

3.1.3 Water Quality

Portions of the lower Willapa River have been placed on the Washington 303(d) list of impaired water bodies for high summer temperatures (at Raymond), low dissolved oxygen (at Raymond and South Bend), and high fecal coliform levels (at Raymond, and adjacent to the downstream portion of the project site). The Washington State Department of Ecology is currently developing recommendations for Total Maximum Daily Load (TMDL) limitations for the Willapa River basin

The Washington State Department of Health, Office of Food Safety and Shellfish Programs (DOH) certifies and monitors commercial shellfish harvest areas. DOH classifies areas as "approved," "conditionally approved," "restricted," or "prohibited" based upon a combination of water quality and pollution source information. The water quality standard DOH uses is based upon the presence of fecal coliform bacteria. DOH uses a two-part standard based on a minimum of 30 samples from each monitoring station in a shellfish area (NRCS 2002). Part one of the standard states that the geometric mean of the sample set cannot exceed 14 fecal coliforms (fc) per 100 mL. Part two of the standard states that the estimated 90^{th} percentile of the sample set cannot exceed 43-fc/100 mL. A minimum of six samples per year is collected from each station in Willapa Bay.

The portion of Willapa Bay near the mouth of the Willapa River carries both "approved" and "prohibited" classifications. The DOH sanitary line separating the "approved" and "prohibited" areas is approximately 2.9 miles downstream from the mouth of Potter Slough (NRCS 2002). The "prohibited" classification is based on a combination of poor water quality and the existence of active point and non-point pollution sources. Point sources impacting the area are the sewage treatment plant outfalls in the Willapa River near Raymond and South Bend. Non-point sources are watershed-wide and include farm animal wastes, storm water, septic systems, and wildlife (NRCS 2002).

The WDOH sampled 6 stations on the project site and 2 stations in the Willapa River adjacent to the project site for total coliform bacteria in January and May 2002 (NRCS 2002). Coliform levels in the January samples ranged from 2 – 170 fecal coliforms (fc)/100 mL, with both river samples containing 49 fc/100 mL. Coliform levels in the May samples ranged from 11 – 240 fecal coliforms (fc)/100 mL, with both river samples containing 1.7 fc/100 mL. Two re-suspended sediment samples collected during the May sampling trip contained 49 and 920 fc/100 mL.

The Bone River borrow site is located at the confluence of the Bone River with Willapa Bay. Willapa Bay is on the 303(d) list for fecal coliform near the mouth of the Palix River, (approximately 2.5 miles south of the borrow site) and near Bruceport (approximately 3.5 miles northeast of the borrow site).

3.1.4 Air Quality

There are no major industrial sources of air pollution around Willapa Bay. The predominant onshore winds and winter storms assure an almost constant replenishment of clean, fresh air from the Pacific Ocean. Temperature inversions that might trap smoke or other pollutants are rare.

3.1.5 Hazardous and Toxic Wastes

Past chemical applications on the WDFW property were typical of livestock and residential uses. Herbicides were applied on the pasture soils, and may have also been applied for right-of-way maintenance along the highway, on the dike, and on the 1998 clear-cut above the project site. Insecticides may have been applied along road ditches prior to the 1970s.

As part of a site investigation funded by NRCS and Ducks Unlimited, Batelle sampled and tested 22 sediment and water stations, 12 soil herbicide stations, and 15 soils and lead shot stations for a variety of contaminants (NRCS 2002). The sampling stations represent all parts of the project site, including observed potential hotspots. Chemical analyses for the following parameters of concern were conducted: total petroleum hydrocarbons, organ chlorine pesticides, chlorinated herbicides, total sulfides, total organic carbon, nutrients (nitrate, nitrite, ammonia, orthophosphate, total phosphate, total Kjeldahl nitrogen), fecal coliform bacteria, and lead shot.

Diesel-range and residual-range hydrocarbons were not detected or were detected below the method-reporting limit in all sediment and samples. Pesticides were not detected or were detected below the method reporting limit in all samples but one soil sample, where 4,4'-DDT and methoxychlor were detected. This station is located inland of one of the proposed cross dikes. Herbicides were detected in only one soil sample, taken at a station located on the dike above the tide gate in the southeastern portion of the property, as well as one sediment sample. No shotgun pellets were present in any of the 15 samples collected in areas of waterfowl hunting.

As part of previous WDFW demolition work on the property, contractors pulled creosote-coated wood pilings out of the ground at a former cattle feed lot site. A subsequent visual investigation of this area found no creosote at the surface, but was unable to rule out the presence of creosote below ground.

Corps staff has prepared a preliminary assessment screening for the project site. A site visit was performed as part of the preliminary assessment screening on September 20, 2002. The only contamination found is creosote remaining from pile removal at the former feed lot. Also, WDFW indicated that there are two small spot spills of oil and hydraulic fluid from equipment used to remove the Graves barn in January 2001, but no such contamination was found during the site visit.

There are no known or suspected hazardous materials at the Bone River borrow site.

3.2 Natural Resources

3.2.1 Vegetation

The existing vegetation on the WDFW property is planted and native pasture grasses (*Agrostis* spp.) with intermixed rushes (*Juncus effusus, J. balticus, Scirpus microcarpus*), and sedges (*Carex obnupta*). Stands of cattail (*Typha* spp.) and horsetail (*Equisetum* spp.) are present in the borrow ditch along US 101, and cattail is present in low-lying areas landward of the highway. Blackberry (*Rubus* spp.) covers much of the dike and also lines some portions of the borrow ditches and many of the channels crossing the site. Willow (*Salix* spp.) is present in scattered clumps as well.

The Bone River borrow site consists of approximately 0.80 acres of conifer dominated and mixed conifer-deciduous dominated forest. Most of the trees are second growth, replanted conifers or volunteers ranging in size from 4 inches diameter-at-breast-height (dbh) to greater than 30 inches dbh. The smaller trees are located on the slope immediately adjacent to the highway; everything beyond this edge is an even-aged stand 40+ years in age. A query of the WDFW Priority Habitats and Species database indicated that no sensitive or endangered plants occur on the borrow site.

Wetlands. WSDOT identified six wetland areas along the US 101 corridor on and adjacent to the project site in a March 2002 wetland delineation (Null 2002). Each wetland was classified according to the USFWS system (Cowardin et al., 1979), rated by category according to the Washington State Department of Ecology rating system (Ecology 19983), and rated by classes according to the Pacific County Critical Areas Ordinance, which is very similar to Ecology's system. A summary of estimated wetland acreages and their corresponding classifications can be found in Table 4, and the wetland areas are mapped on Sheets 24 and 25 in Appendix A. Several principal functions of these wetlands were identified by WSDOT, including: habitat for wetland-associated birds, habitat for amphibians, organic matter production and export, and flood flow alteration.

Table 4. Delineated Wetlands on and adjacent to the Project Site

	Estimated Acreage	Cowardin Class	Ecology Rating	Pacific Co. Rating
Wetland A	100+ acres	Palustrine Aquatic Bed/ Emergent/Scrub-Shrub	Category II	Class II
Wetland B	1 acre	Palustrine Emergent	Category III	Class III
Wetland C	0.5 – 1 acre	Palustrine Emergent	Category III	Class III
Wetland D	20+ acres	Palustrine Emergent/Scrub-Shrub	Category III	Class III
Wetland E	100+ acres	Palustrine Emergent/Scrub-Shrub/Forested	Category II	Class II
Wetland F	200+ acres	Palustrine Emergent/Scrub-Shrub	Category II	Class II

Source: March 2002 WSDOT wetland delineation (Null 2002)

In addition, approximately 40 acres of high salt marsh (Estuarine Emergent, Category I wetlands) are present on the river side of the dike along the downstream portion of the site. This area is labeled "Wetland G" on Sheet 24 in Appendix A.

Wetlands A, F, and G comprise the restoration project site. Wetlands B, C, D, and E are located downstream of the restoration site adjacent to the 0.12 mile portion of highway WSDOT may raise to alleviate past flooding problems (see footnote in Section 2.5.1).

The National Wetlands Inventory database shows estuarine salt marsh, tidal wetlands/mud flats, and palustrine forested wetland within 500 feet of the borrow site. Tidal wetlands also occur less than 200 feet to the north and northwest of the borrow site, on the south bank of the river.

Exotic Species. *Spartina alterniflora* is a perennial, deep-rooted salt marsh species native to the Atlantic and Gulf coasts of North America. It was introduced to the West Coast during the 1890s as a result of its use as packing material for oyster shipments from the East Coast (Frenkel and Kunze 1984). *Spartina* is spreading rapidly over the tidelands of Willapa Bay, and it is degrading habitats that support a diverse community of estuarine organisms, including aquatic migratory birds, anadromous fish, and the invertebrate and plant communities that support them.

Widespread colonization by *Spartina* induces major modifications of physical, hydrological, chemical, and biological estuarine functions. *Spartina* displaces eelgrass (*Zostera* spp.) on mudflats and native vegetation in salt marshes. Benthic invertebrate species composition in the intertidal zone changes substantially as *Spartina* occupies the tidelands (Zipperer 1996, Norman and Patton 1995 as cited by USFWS 1997). As *Spartina* becomes dominant, mudflats are raised and channels are deepened. This in turn eliminates the gently sloping bare intertidal zone that lies between the salt marsh and the tidal channels (Aberle 1993).

The *Spartina* invasion in Willapa Bay and the lower Willapa River is the largest in Washington. There is a 5-acre *Spartina* meadow directly outside of the dike at the downstream end of the WDFW property, and a larger meadow on the opposite side of the river. A WDFW crew, as part of an on-going Washington State *Spartina* control program,

sprayed the meadow adjacent to the project site with herbicides during the summers of 2002 and 2003. Some patches in the meadow on the other bank of the Willapa River were also sprayed in summers 2002 and 2003. Follow-up treatments occurred during the summer of 2004.

Potter Slough Reference Site. A natural tide marsh and slough complex is located southeast of the restoration site (see Sheet 2). This marsh has not been diked, and is in excellent biological condition, so it has been used as a reference area during this study.

A WSDOT survey crew and an estuarine ecologist from the Battelle Marine Sciences Laboratory surveyed the Potter Slough reference area at multiple discrete locations to delineate the upper and lower elevation limits of dominant salt marsh plant species (Herrera Environmental Consultants 2002). Native salt marsh vegetation in the reference marsh was distributed along an elevation gradient from approximately +4 feet to +10 feet (NAVD 88 datum). Some general zonation patterns were evident, with *Carex lyngbyei* dominating at the lower end of this range (+4 to +8 feet) and *Distichlis spicata* at the upper end (+7 to +10 feet). *Distichlis* was mixed with *Deschampsia caespitosa*, at the upper elevations. *Carex* was most often encountered at the edge of marsh channels adjacent to Potter Slough, an area that likely receives relatively large salinity variations from local runoff to the slough. Unvegetated mudflat occurred between +4 feet and +6 feet. *Spartina alterniflora* was located along the river edge at the lower elevation ranges (approximately +6 feet).

3.2.2 Wildlife

A query of the WDFW Priority Habitats and Species database indicates that the project site is designated as wood duck habitat, and a waterfowl concentration area. Marsh hawks (*Circus cyaneus*), osprey (*Pandion haliaetus*), and great blue herons (*Ardea herodias*) are commonly seen hunting on the WDFW property. The pasture grass is thick with vole burrows, and deer trails are often observed. Coyote (*Canis latrans*) scat and elk (*Cervus elaphus*) droppings have also been found on the property.

The Willapa River estuary provides habitat for wintering and migrating shorebirds, which feed on mudflats and roost in marshes and pastures along the river. Dominant species are the Western sandpiper (*Calidris mauri*) and short-billed dowitcher (*Limnodromus griseus*) in the spring, and dunlin (*Calidris alpina*) during the winter (Cullinan 2001).

Waterfowl utilize Washington's coastal bays primarily during migration. American wigeon (*Anas Americana)* account for 80% of the waterfowl species migrating through Grays Harbor and Willapa Bay with fall counts peaking at approximately 30,000 birds. Northern pintails (*Anas acuta)* are the second most abundant with about 15,000 birds, and mallards (*Anas platyrhynchos)* are common during all times of the year.

Large numbers of green-winged teal (*Anas crecca*), common goldeneye (*Bucephala clangula*), bufflehead (*Bucephala albeola*), red-breasted merganser (*Mergus serrator*), and to a lesser extent, canvasback (*Aythya valisineria)*, northern shoveler (*Anas clypeata*), ruddy duck (*Oxyura jamaicensis*), ring-necked duck (*Aythya collaris*) and gadwall (*Anas strepera*)

will use the area during migration and wintering periods. Wood ducks (*Aix sponsa*) use the area as breeding habitat and during migration periods.

About 90,000 scoters (*Melanitta sp.)* are counted annually during midwinter surveys by the USFWS with over half occurring in western Washington. Canada geese (*Branta Canadensis)* are most numerous along Willapa Bay with a resident population of 900–1,000 birds. Another significant movement of geese through the region is by black brant (*Branta bernicla)*. Willapa Bay is one of the most important wintering and spring staging areas for brant on the West Coast. Approximately 12,000 birds use the area as spring staging habitat while 2,500 birds are present during the winter months.

Of the waterfowl that uses Willapa Bay, green-winged teal prefer to forage on mudflats where they find seeds and small invertebrates. Wigeon feed more on vegetative parts of aquatic plants, compared to other dabbling ducks, and commonly feed on submerged aquatic vegetation such as eelgrass. Gadwall, pintail, and canvasbacks also use estuaries and feed on submerged aquatic vegetation. Northern shovelers can be found in shallow water along the shores of estuaries, especially where freshwater enters the estuary. Their diet is heavily dominated by animal material. Scaup (*Aythya sp.)* forage primarily on animal material including small fish, mollusks, and snails. Buffleheads commonly feed on fish, amphipods, isopods, shrimp, and mollusks in estuarine environments during the winter.

Currently the project area is a wet pasture habitat and consists of palustrine, emergent/scrub shrub wetlands along with drainage ditches and borrow areas that retain freshwater. The site had been grazed by cattle through the 1990s; today only elk intermittently graze the property. During the rainy season, standing water is most likely present on the majority of the site. A variety of waterfowl will use this type of habitat.

The Bone River borrow site and surrounding areas to a distance of 0.5 miles are used by a variety of wildlife species, including: shorebirds and waterfowl, wintering Roosevelt elk, bald eagle perching and foraging; and suitable, potentially occupied marbled murrelet nesting habitat (WDFW Priority Habitats and Species Database, Washington Department of Natural Resources Natural Heritage Program Database, personal communication with WDFW biologists, orthophoto analysis and field observations).

3.2.3 Fisheries

Fish Usage of Willapa Basin. Several salmon stocks are found in the Willapa Bay Basin: two fall Chinook stocks, six chum stocks, one coho stock, and six winter steelhead stocks. Fall Chinook are found in all Willapa Bay major tributaries; hatchery fish dominate the production of Chinook with adults from hatchery programs providing the majority of natural spawning. The chum and steelhead stocks are entirely wild. Historic abundance of chum salmon was much higher than current abundance. The chum salmon stock in the Willapa River has the lowest escapement of the six stocks within the Basin. Habitat loss and degradation is one likely cause for the reduction in chum salmon current abundance from historic numbers (WDFW 1994). Without restoration of the lost habitat the historic productive capability is likely lost.

Phinney and Bucknell (1975) provided a general description of the rearing and emigration periods for Willapa Basin juvenile salmon. Fall Chinook rear and emigrate in river and estuary habitats of Willapa Basin from January through October with juvenile emigration occurring between mid-February and October. Juvenile coho rear in freshwater areas year-round and emigrate through the lower river and estuary from mid-February to the end of June. Chum rearing and emigration occurs from February through mid-May. These migration times tend to parallel those observed during an extensive study conducted in Grays Harbor, Washington during March – October 1980 (Prinslow et al. 1981).

The lower Willapa River, like all estuaries in rivers supporting salmon stocks, serves as the transitional area for juvenile salmon leaving the freshwater portion of their life cycle and entering the marine environment (Phinney and Bucknell 1975). Chum (*Oncorhynchus keta*) and Chinook salmon (*O. tshawytscha*) are considered the most estuarine-dependent salmon species, feeding and rearing in estuarine habitats for extended periods before migrating to pelagic marine habitats. Both species prefer relatively fine-grained substrate and low stream gradients, and are oriented to shallow water habitats located close to shore.

Fish Usage of Project Site. Fish surveys were conducted on the portion of the property inland of US 101 in the spring of 2000 (Dave Kloempken, WDFW, pers. comm.). The presence/absence of fish was determined by electroshocking. Seven drainage locations were surveyed and electroshocked, where there was sufficient water. No fish were found on any of the surveys.

Historically, salmon and other fish species would have had access to the rearing habitat then present on the project site. But the dike along the river has prevented fish from accessing the area for almost 100 years. The Willapa Bay Fisheries Enhancement Group (WBFEG) identified constructed barriers as the primary factor preventing juvenile salmon from accessing rearing habitat in the Willapa Bay basin (WBFEG 2001). Impassable culverts in streams and dikes/levees in estuarine areas have blocked off habitats that were historically accessible to fish. The effects of dikes and filling on the river floodplain include: 1) elimination of off-channel habitats such as sloughs and side channels, 2) increased flow velocity during flood events and tidal exchange due to the constriction of the channel, 3) reduced groundwater flows, and 4) simplified channels since LWD is lost and channels are straightened when dikes and levees are constructed. Furthermore, Hood (1994) showed that the effects of diking extend beyond the boundary of the actual dike, with actual tidal channel loss being greater in areas seaward of the dike due to the reduced tidal flushing in the tidal channels. The impacts of dikes along the lower Willapa River, along with other forms of degradation elsewhere in the Basin, have reduced the capacity of the system to support the large fish populations that were historically present.

Fish Usage Adjacent to Bone River Borrow Site. Several fish species utilize the Bone River, including: steelhead; chum and coho salmon; resident and searun cutthroat trout; Pacific and western brook lamprey; northern squawfish; bridgelip sucker; and sculpin (WDFW Salmon and Steelhead Habitat Inventory and Assessment Program, StreamNet database).

3.3 Threatened and Endangered Species

The types of habitat degradation described in previous sections have led to population declines of many fish and wildlife species. Some of these species have been listed as threatened pursuant to the Federal Endangered Species Act. Based upon correspondence with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), five listed species potentially occur in the project vicinity: bald eagle (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus*), Northern spotted owl (*Strix occidentalis*), Coastal/Puget Sound bull trout (*Salvelinus confluentus*), and Steller sea lion (*Eumetopias jubatus*). In addition, the brown pelican (*Pelecanus occidentalis*) and Oregon silverspot butterfly (*Speyeria zerene hippolyta*) potentially occur in the vicinity of the Bone River borrow site.[1]

When this study was initiated, coastal cutthroat trout (*Oncorhynchus clarki clarki*) had been proposed for listing by USFWS. USFWS has since determined that coastal cutthroat trout are not warranted for listing under the Act.

Below are brief descriptions of the life histories and occurrence of these protected species in the project area. Projected impacts of the proposed projects on threatened and endangered species are addressed briefly in Section 4.3.

3.3.1 Bald Eagle

The Washington State bald eagle (*Haliaeetus leucocephalus*) population was listed as threatened under the Endangered Species Act in February 1978. Since DDT was banned in 1972, bald eagle populations have rebounded. The bald eagle was proposed for de-listing in July 1999.

USFWS has indicated that wintering bald eagles may occur in the vicinity of the project. The bald eagle wintering season extends from October 31 through March 31. Food is recognized as the essential habitat requirement affecting winter numbers and distribution of bald eagles (Steenhof 1978). Other wintering habitat considerations are communal night roosts and perches. Generally large, tall, and decadent stands of trees on slopes with northerly exposures are used for roosting; eagles tend to roost in older trees with broken crowns and open branching. Bald eagles select perches on the basis of exposure, and proximity to food sources. Trees are preferred over other types of perches, which may

[1] The Bone River Bridge Replacement Project underwent a separate Section 7 ESA consultation in 1999 (FWS Ref. 1-3-99-I-1245, NMFS Ref. WSB 99-370). WSDOT has determined that completing the proposed excavation work in advance of the replacement bridge's construction will have no additional, unforeseen impacts to any listed species (or designated or proposed critical habitat) under USFWS jurisdiction.

include pilings, fence posts, power line poles, the ground, rock outcrops, and logs (Steenhof 1978).

A query of the WDFW Priority Habitats and Species database indicates that there is a bald eagle nest about 1.5 miles from the project area. Two bald eagle nests are also present more than 0.75 mile from the Bone River borrow site. No known active or historical bald eagle nests, territories, communal roosts or wintering concentrations are documented within 0.5 miles of the borrow site.

3.3.2 Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) was listed as a threatened species under the Endangered Species Act in October 1992. Primary causes of population decline include the loss of nesting habitat, and direct mortality from gillnet fisheries and oil spills.

Marbled murrelets forage in the near-shore marine environment and nest in inland old-growth coniferous forests. USFWS has indicated that foraging marbled murrelets may occur in waters adjacent to the proposed project. Murrelets often aggregate near localized food sources, resulting in a clumped distribution. Prey species include herring, sand lance, anchovy, osmerids, seaperch, sardines, rockfish, capelin, smelt, as well as euphasiids, mysids, and gammarid amphipods. Marbled murrelets also aggregate, loaf, preen, and exhibit wing-stretching behaviors on the water.

Although marine habitat is critical to marbled murrelet survival, USFWS's primary concern with respect to declining marbled murrelet populations is loss of terrestrial nesting habitat. Critical habitat was designated for the marbled murrelet in May 1996. The critical habitat designation included only terrestrial nesting habitat. A query of the WDFW Priority Habitats and Species database indicates that there have been marbled murrelet sightings in potential nesting habitat approximately 3 miles and approximately 6 miles south-southeast of the project site.

Suitable, potentially occupied marbled murrelet nesting habitat is present at a distance of approximately 0.25 mile from the Bone River borrow site. The nearest documented occurrences of marbled murrelet (i.e., numerous below-canopy observations) are located approximately 2.0 miles from the project area. The borrow site is located directly adjacent to designated marbled murrelet critical habitat. The closest portions of this designated critical habitat are located more than 350 feet off the WSDOT right-of-way.

3.3.3 Northern Spotted Owl

The Northern spotted owl (*Strix occidentalis caurina*) was federally listed as a threatened species throughout its range in June 1990. The primary reason for this listing was the reduction and fragmentation of habitat that was projected to continue under the forest practices utilized at the time of listing.

The northern spotted owl nests in tree cavities, on debris platforms, and in the old nests of other large birds. In Washington, nesting occurs between March 1 and July 31, and fledging occurs between August 1 and September 30. Dispersal of juvenile owls begins in the early fall. Usually juveniles move from their natal area to a breeding site, and occasionally adults move from one breeding site to another.

Spotted owls prey on a broad array of species, such as insects, birds, and small mammals; however, primary prey items are wood rats (*Neotoma fuscipes* and *N. cinerea*) and flying squirrels. Although spotted owls are nocturnal, during the day they forage opportunistically and may move short distances to change roosting position in response to changes in ambient temperature or exposure to direct sunlight.

In Washington, the northern spotted owl occurs on the Olympic Peninsula, in the western lowlands, and in the Cascades, generally below elevations of 4200 feet. A query of the WDFW Priority Habitats and Species database indicates that there are nesting areas approximately 3.7 miles south-southeast of the project site and 8 miles southeast of the project site. Suitable northern spotted owl nesting and foraging habitats are not present within 0.5 mile of the Bone River borrow site. The nearest documented occurrence of northern spotted owl (a single adult in 1997) is located approximately 2.75 miles from the borrow area.

3.3.4 Bull Trout

The Coastal/Puget Sound bull trout (*Salvelinus confluentus*) population segment was listed as a threatened species under the Endangered Species Act of 1973, as amended in October 1999. Bull trout populations have declined through much of the species' range; some local populations are extinct, and many other stocks are isolated and may be at risk (Rieman and McIntyre 1993). A combination of factors including habitat degradation, expansion of exotic species, and exploitation has contributed to the decline and fragmentation of indigenous bull trout populations.

Bull trout are known to exhibit four types of life history strategies. The three freshwater forms include adfluvial forms, which migrate between lakes and streams; fluvial forms, which migrate within river systems; and resident forms, which are non-migratory. The fourth and least common strategy, anadromy, occurs when the fish spawn in fresh water after rearing for some portion of their life in the ocean. The major rivers that drain into Willapa Bay are characterized by a relatively low gradient, low elevations, and dominant winter peak flows with a lack of spring snowmelt—all conditions less than optimal for bull trout. It is likely that no spawning populations occur in the Willapa Basin, so any fish in the project area would be the anadromous type using the system for foraging (USFWS 2003). Any bull trout in Willapa Bay or its tributaries are most likely from streams known to support bull trout spawning, like the Quinault River or Queets River (Jeff Chan, pers. comm.).

Until recently, bull trout were not known or presumed to use the Willapa River system. However, a bull trout was caught by a Washington State Department of Fish and Wildlife fish technician at approximately river mile 29 on the Willapa River in February 2002

(USFWS 2003). The fish was caught approximately one mile downstream of the Willapa/Forks Creek State Salmon Hatchery. Therefore, USFWS has requested that Corps projects in the Willapa River system, including Willapa Bay, need to be assessed for potential impacts to bull trout (USFWS 2003).

The status of bull trout in Willapa Bay and the Willapa River, particularly the species' migration patterns within the estuary, is largely unknown. Since the Willapa River is located at the southern extent of the species, abundance may be naturally low. There are no other confirmed observations USFWS is aware of in the Willapa system (Jeff Chan, pers. comm.).

3.3.5 Steller Sea Lion

The Steller sea lion (*Eumetopias jubatus*) was listed as a threatened species under the Endangered Species Act in November 1990. Two types of terrestrial habitats are utilized by Steller sea lions: rookeries are areas where adults congregate for breeding and pupping, and haul-outs are areas used for rest and socializing. Sites used as rookeries during the breeding season may be used as haul-outs during the remainder of the year. Steller sea lions haul-out on offshore islands, reefs, and rocks, while rookeries generally occur on beaches. Preferred rookeries and haul-out areas are located in relatively remote areas where access by humans and mammalian predators is difficult. Locations are specific and change little from year to year. When not on land, Steller sea lions are generally seen inshore, less than 5 miles from the coast.

Steller sea lions may be observed along the Washington coast year round, but they are most abundant during March-April and August-November, and least abundant during breeding season in May-July (Gearin and Jeffries 1996). No breeding rookeries have been identified in Washington waters. The majority of Washington's Steller sea lion haul-out sites are located along the northern outer coast. Willapa Bay has several documented haul-out areas used regularly by harbor seals, but there is no documentation that these sites are used by Steller sea lions (Jeffries et al. 2000).

3.3.6 Brown Pelican

During the spring and summer, the California brown pelican (*Pelecanus occidentalis*) migrates northward from their breeding range in central California to feed. Important prey items are small surface-schooling marine fishes, particularly northern anchovies and Pacific sardines. Pelicans are present in Willapa Bay during the summer, fall, and winter. Concentrations of migrating and/or roosting brown pelicans have been documented on Long Beach Peninsula and on islands within Willapa Bay. Day roosting has been documented on the Snag Islands; approximately 1.5 miles west of the Bone River borrow area.

3.3.7 Oregon Silverspot Butterfly

The Oregon silverspot butterfly (*Speyeria zerene hippolyta*) occupies grassland habitats, which provide caterpillar host plants and adult nectar sources. The violet that caterpillars

require for their development is a member of disturbance-oriented meadow communities. These meadow habitats historically have been maintained in an early successional state due to periodic fires, which prevent trees and shrubs from overshadowing low ground cover plants. As development has made such periodic fires undesirable, they have been prevented, and meadow communities have gradually becomes forest.

The salt marsh and salt meadow habitats found within the floodplain downstream of the Bone River Bridge may provide suitable habitat for the Oregon silverspot butterfly. However, neither individuals of this species, nor the species' plant host have been identified within the project area.

3.4 Cultural Resources

A professional cultural resources reconnaissance survey was conducted for the proposed project. The survey consisted of an examination of the archaeological and historic site records at the Washington State Office of Archaeology and Historic Preservation (OAHP) and a pedestrian survey of the project area. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) and no sites or structures listed on the state inventory are located within the proposed project area. Background research indicated that a historic-period Native American village was located near the mouth of the Willapa River, but outside of the proposed project area. The pedestrian survey sampled a small portion of the project area and did not find any evidence of prehistoric or historic-period cultural material. The project area at the time of the survey was densely overgrown with waist-high grass, resulting in limited ground surface exposures.

The Bone River borrow area was surveyed for cultural resources in 1992 as part of the Bone River Bridge replacement project (Morgan 1992). A portion of the early twentieth century Moore Oyster Cannery is located within the proposed borrow area. At the time of the 1992 survey, the remains of the site included an extensive Japanese oyster shell midden, miscellaneous oyster rakes, machinery hardware, and a loading platform. Only the oyster midden is present within the borrow site footprint.

3.5 Socio-Economic Resources

3.5.1 Land and Shoreline Use

Within the 600,000-acre Willapa Basin, approximately 78% of land is in timber production (Willapa Alliance 1998, as cited by WSCC 1999). Less than 3% of this timberland is in permanent conservation, and only a small fraction is old growth timber. The remainder of the basin consists of estuary/wetland (12%), agriculture (6%), and residential uses (4%) These percentages have remained essentially unchanged since 1950 (Willapa Alliance 1998, as cited by WSCC 1999). Many of the rural lands along the Willapa River are used for raising cattle and other livestock.

Historic uses of the project property have included cattle grazing, human residence, and waterfowl hunting. Livestock, primarily beef cattle, had year-round access to pasturelands. All remaining livestock was removed from the WDFW property in 2001. Structures on the site included homes and carports, barn and shop buildings, open-sided cattle sheds, pump houses, and fences. Human waste was disposed of via four septic systems. Three of these septic systems have been pumped out and removed; the site of the fourth is expected to be filled and capped with asphalt for a highway pullout. The remaining structures were demolished by WDFW in 2002.

The Bone River borrow site is located in a rural part of Pacific County dominated by commercial timberland. The portion of US 101 running through the borrow site is the main north-south highway in southwestern Washington and is used heavily by trucks (primarily logging trucks) throughout the year. Tourist traffic comprises a significant portion of the highway during the summer months.

Approximately 200 feet to the north of the borrow site lies the Bone River Natural Area Preserve, owned by the Washington Department of Natural Resources and the Nature Conservancy. This preserve, currently totaling 2,565 acres, contains the finest salt marshes remaining in Willapa Bay, and includes tideflats, sloughs, freshwater streams, freshwater wetlands and conifer forests. Approved uses of the site include research and education. The property to the south of the borrow site is owned by Weyerhaeuser.

3.5.2 Economy

Major industries in Pacific County include tourism, logging, lumber manufacturing, oyster harvesting, seafood canning, crabbing, commercial and sport fishing, dairy farming, and cranberry production. In 1990, the County's economy was more dependent on employment in forestry, fisheries, manufacturing, and personal services than Washington state as a whole (Cook and Jordan 1994). Employment in distributive, social, and producer services was under-represented in Pacific County by comparison.

Many farms along the Willapa Basin's river valleys raise beef and dairy cattle, with related production of hay, silage, and calves. During the 1990's, beef cattle production in Pacific County declined while numbers of dairy cattle slowly increased (Willapa Alliance, n.d.). Changing markets, the cyclical nature of worldwide beef prices, an oversupply of milk, waste management restrictions, and rising property prices have lead to a consolidation of the number of cattle farms. In Pacific County, this trend has resulted in fewer farms with more head of cattle per farm, and operations that import more feed and silage than in the past (Willapa Alliance, n.d.).

Many of Willapa Bay's tidal flats are in private ownership and managed for oyster mariculture sites. Pacific and neighboring Grays Harbor counties are home for two-thirds of the oyster industry in Washington (Conway 1991, as cited by USFWS 1997). Washington Department of Fish and Wildlife reported a five-year average of 462,000 gallons of Pacific oysters harvested in Pacific County (Hoines 1996, as cited by USFWS 1997). In Pacific County, the oyster growing and processing industry employed 480 workers with a total labor

income of $6.3 million, accounting for one out of every twelve jobs in 1990 (Conway 1991, as cited by USFWS 1997).

3.5.3 Recreation

There are two museums, 10 historic sites, and 20 parks or other recreational facilities in Pacific County, including Willapa National Wildlife Refuge; Fort Canby, Fort Columbia and Leadbetter State Parks; and Bush Pioneer and Bruceport County parks.

Recreational uses of Willapa Bay include motor boating, kayaking, canoeing, sailing, hunting, fishing, clamming, wildlife viewing, and camping. Due to shallow water depths, large tidal ranges, swift currents, frequent high winds, and unpredictable weather patterns in the bay, all forms of boating are limited both spatially and temporally. Most boating occurs at higher tidal stages. Within the bay, recreational clamming is limited to public lands with firm sandy substrates, primarily along the west shore of Long Island.

WDFW and the City of South Bend are considering a plan to develop a nature and interpretive trail to showcase the Willapa estuary on a 120-acre property WDFW owns next to the city boat ramp and parking lot. The trail would be located directly north of the Potter Slough marshlands and would connect the proposed restoration effort to existing recreational facilities. The trail would be located in the area where the first Pacific County sawmill once stood. WDFW has contracted with an environmental engineering firm to develop a preliminary design on the site known locally as the "Chermack property." The preliminary design was completed and a public meeting was held to ask the residents of South Bend and the rest of Pacific County to comment on the proposal. The need for public comment and involvement at the local level is deemed critical to the success of the trail project.

3.5.4 Mosquitoes

Over 25,000 linear feet of ditches with very limited circulation are present on the project site. As a result, the project site supports large numbers of freshwater mosquitoes. Tide gates prevent fish, which prey on mosquito larvae, from entering the ditches. During summer 2004, Battelle Marine Sciences Laboratory the sampled the project site and adjacent un-diked areas to determine mosquito species composition and densities. The preliminary results confirm that the South Bend area has a very high density of nuisance mosquitoes. The highest areas of existing mosquito production come from the sewage treatment plant (across the river from South Bend) and from stagnant freshwater ditches and ponds in and around South Bend. The city has a vector control program for nuisance mosquitoes that responds on an as-need basis. The study also confirms that there are a wide variety of mosquito species in the South Bend area, all of which are typical to the Pacific Northwest.

3.5.5 Transportation, Public Services, and Utilities

State highways provide primary access to many parts of Pacific County. One of the most vital connections is US 101, which runs through the project area and the Bone River borrow

site. The portion of US 101 that runs through the project site has 11-foot wide lanes and variable-width shoulders (between 3 feet and 8 feet, with a 4 foot average). Current average daily traffic is 3,600 vehicles; 13% of this total is composed of truck traffic. The portion of US 101 that runs through the borrow area has 11-foot wide lanes and 3 to 4 feet wide shoulders. The Willapa Harbor Airport is located on the right bank of the Willapa River across from the project site.

The only utilities on the project site are those along US 101. Pacific County Public Utilities District #2 has an aerial 12.5 kv 4-wire line at approximately 40 feet left of the highway centerline. Century Telephone Company has a buried 25 &106x cable at approximately 39-40 feet left of centerline.

3.5.6 Aesthetics and Noise

The WDFW property and Bone River borrow site are visible from US 101. Since purchasing the property, WDFW has demolished several houses and auxiliary structures. A broad, flat expanse of pasture grasses with very few trees characterizes the landscape on the river side of the highway. The landward boundary of the WDFW property is a steep hillside in timber production. Timber in portions of this area was harvested during the summers of 1998 and 2001. A variable-width forested buffer remains adjacent to the bottomland.

Vehicle traffic on US 101 is the main source of noise at the project site. Boat traffic along the river and airplane traffic associated with an airport across the river from the WDFW property also contribute to ambient noise levels.

4 Environmental Consequences of the Alternatives

4.1 Physical Characteristics

4.1.1 Geology

Proposed Action

Based on topographic surveys conducted during investigations of the project site and adjacent un-diked marshlands, the ground surface within the project area appears to be approximately 2 feet lower in elevation than the Potter Slough reference area (Herrera Environmental Consultants 2002). Under the preferred alternative, the marsh plain elevation will rise through natural accretion of sediments once tidal waters inundate the project site. Accretion rates in restored wetlands in Grays Harbor have been measured at approximately 1/8 inch (3.5 mm) per year (Thom 1992).

The finished roadway grade at the Bone River borrow site will remain the same. The grading work will widen highway ditches and flatten slopes adjacent to the road for approximately

450 feet along both sides of the roadway. Finished slopes will be 3:1 on the left side of centerline and 2:1 on the right side, and will be vegetated to prevent erosion. WSDOT will provide permanent stabilization of the cut slopes through application of tilled and compost-amended topsoils, seeding, fertilization and mulch according to WSDOT Roadside Development standards.

This work would remove material from the south end of the Bone River bridge that would need to be removed when the bridge is replaced (currently scheduled for 2009).

No Action

Under the no action alternative, the elevation of the property will likely remain the same as the current condition until the dike failed. At that time accretion would begin to occur, but likely at a rate slower than under the preferred alternative. This is because marsh edge sheet flow accounts for a substantial portion of water and sediment movement into and out of a marsh (French and Stoddart 1992). One or more localized breaches would preclude this type of sheet flow, thereby reducing the total amount of sediment entering the marsh.

4.1.2 Hydrology

Proposed Action

Riverward Side of US 101: Implementation of the preferred alternative would result in a re-introduction of tidal waters to the former pasture lands. The site would be graded so that waters drain from the marsh surface rather than collecting in isolated pools, and to encourage the formation of a tidal channel network. Philip Williams & Associates, Ltd. (PWA) conducted an investigation of the Potter Slough reference site in order to make predictions about the form and pattern of the tidal channel network and marsh that will form once tidal action is restored to the project area (Herrera Environmental Consultants 2002). This evaluation guided the design of the "pilot" channels to be excavated prior to dike removal (as described in Section 2.5.3); a geomorphic analysis determined the dimensions the channels should be to reach short-term equilibrium.

The PWA evaluation indicated that after the dike is removed, the pilot channels would begin adjusting from their constructed forms and patterns in response to the constant flooding and ebbing of the tides. Sediments would accrete, and vegetation would start to establish on the margins of the mudflat, gradually encroaching on the banks of the tidal sloughs and marsh interior. Over several years the tidal channels should begin to approach the long-term equilibrium dimensions predicted by PWA using the un-disturbed analogues at Potter Slough (PWA 2001). As sedimentation continues, vegetation would fully colonize the tidal slough banks and marsh interior, reducing the tidal prism significantly. Marsh channel tidal flows and velocities would decrease in response to the reduced tidal prism.

The re-introduction of tidal influence associated with the preferred alternative is not expected to affect groundwater or private wells in the project vicinity. Tidal influence is limited to groundwater near the ground surface, and typically does not extend below 20 feet in depth. Most wells in the project vicinity tap into a groundwater discharge zone 60 to 100 feet or

more below the surface. This regional aquifer is discharging from depth towards sea level, that is, it has a hydraulic head generally in the range of 20 to 30 feet. This water is, in essence, "under pressure" that would prevent the intrusion of brackish water from the surface. For wells outside of the zone of tidal influence (i.e., outside of the immediate project area), brackish water intrusion into the groundwater becomes even less of an issue. Only shallow wells located within the project footprint would be likely to be affected by the intrusion of brackish water. Therefore, any project-related impacts would not be significant.

Landward Side of US 101: As described in Section 2.5.7, construction of the freshwater wetland enhancements at WRP Sites 1 and 2 would result in the formation of seasonal ponds. Tidegates under the highway would serve as water control structures, retaining rainwater in the cells. The wetlands would be flooded in the fall, with water held there into the spring. The water control structures would be managed for vegetation and habitat diversity, as well as water depth. Management decisions (i.e., how many and when boards are placed/removed) would be based on the plant community response to water management and desired water depths.

WDFW would place boards in the tidegates in September. The number of boards in the structure at each wetland would determine the water levels in that wetland. As the rains begin, the wetlands would fill. Fall flooding should coincide with the arrival times and population size of fall waterfowl migrants. The cells would be managed to flood gradually and maximize the area with water depths of 6-12 inches. Flooding strategies would be varied among years to enhance productivity and diversity. The structures would require minimal operation; once the boards are in place, they can be left with little maintenance.

During the spring and summer months, water in the cells will evaporate. The dewatering of the wetland cells is called drawdown. Board removal can increase the rate of drawdown. Monitoring during the spring and early summer months will determine if and when pulling boards out of the structure is necessary to achieve a drawdown. Due to the limited water source at this site, a managed drawdown may not be necessary.

Drawdowns are managed because their rate and timing has an important influence on the composition and production of vegetation within the cells. In slow drawdowns, accomplished by removing only the top board from the structure, wetlands are gradually drained during a period of 2 weeks or more. This produces more diverse vegetative cover. Fast drawdowns occur within a few days and produce similar conditions over the entire wetland simultaneously.

At this site, an early drawdown may be used as a tool to prevent mosquito breeding in the freshwater cells (see Section 4.5.4).

Bone River Borrow Site: All work related to cutting and laying back the existing embankments along US 101 will be confined to upland portions of the Bone River site and will have no impact on site hydrology, wetlands, or riparian cover.

No Action

Under the no action alternative, hydrologic conditions on the property would remain the same as existing conditions until a dike failure occurred and allowed tidal waters to inundate the property. However, without pre-breach grading the resulting channel network would be very different from that which would result from deliberate inundation. Tidal waters would collect in isolated low spots on the property, resulting in pools that do not drain. Existing borrow and drainage ditches would likely hold water, and dampen the tidal energy required to cut channels. This would cause the formation of small, dendritic channels draining only a small portion of the property directly adjacent to the breach site(s), rather than a more complex network of small, medium, and large channels draining the entire parcel as would occur under the preferred alternative (Coats et al. 1995).

4.1.3 Water Quality

Proposed Action

Over the long-term, water quality within the restored project site would improve as compared to existing conditions. The reintroduction of tidal flushing would decrease temperatures and increase dissolved oxygen levels on the property. The freshwater portions of the project site would be dry during the warm summer months, so ponded areas should not experience degraded conditions. However, short-term impacts to water quality would result from construction activities. Parameters of concern and methods that will be employed to reduce impacts are described individually below. The project partners will obtain a Section 401 Water Quality Certification from the Washington Department of Ecology (Ecology). All protective measures and monitoring required by Ecology will be implemented during construction.

Turbidity. Interior grading work, construction of the new levees and vehicle pull out, and raising of the highway would occur while the old dike is still in place. The only connection to the Willapa River prior to the removal of the old dike is through one tidegate that empties into Potter Slough. Since the interior construction will occur during the summer dry season, flow out through the tidegate is expected to be minimal, if any. Therefore, these actions will not affect turbidity levels in Potter Slough or the Willapa River.

During the removal of the old dike the construction site would flood twice daily during high tides. Disturbed areas would be inundated, and sediments would be carried to the Willapa River and/or Potter Slough on ebb tide. The increase in turbidity associated with implementation of the preferred alternative is not expected to be significant for the following reasons: most excavation and grading work would occur one year before the dike is removed, allowing for some degree of stabilization before the site is inundated; all practicable construction techniques would be implemented to reduce the introduction of suspended sediments into Willapa Bay during dike removal; turbidity monitoring would occur during construction; all state requirements for the protection of water quality would be met; and construction activities most likely to result in sediment releases will be short-term (~3 months).

At the Bone River borrow site, WSDOT will meet all requirements of the Implementing Agreement between the Washington State Department of Ecology and the Washington State Department of Transportation Regarding Compliance with the State of Washington Surface Water Quality Standards when working in the Bone River borrow site.

Fecal Coliform. Results of sampling efforts at the site (NRCS 2002) indicate that, given the current designation of the receiving waters adjacent to the site, fecal coliform contamination on the WDFW property would not affect oyster harvest downstream of the project site. The number of fecal coliform bacteria in samples from the project site was less than or equal to the number in the river samples in six of the seven samples collected in January (NRCS 2002). In samples collected during the month of May, four had bacteria levels lower than those in the river, and four had levels above. The samples with the higher concentration were located in stagnant areas conducive to bacteria growth; such conditions would not exist after the dike breach occurred. NRCS (2002) concluded that if coliform contamination is transported with fine sediments into the river adjacent to the project site, it would be diluted before reaching the approved harvest areas downstream of the site in the same manner as treated sewage from the City of South Bend is diluted. Therefore, impacts are not expected to be significant. As a precaution, the Washington Department of Health would monitor fecal coliform levels in the Willapa River adjacent to and downstream of the project site during dike removal.

Biological Oxygen Demand. The Washington State Department of Ecology (Ecology) has proposed a dissolved oxygen total maximum daily load (TMDL) standard for portions of the lower Willapa River. When the project site is first opened to tidal inundation, there will likely be a period of reduced dissolved oxygen in the Willapa River due to increased sedimentation. This condition would be temporary in nature until tidal action removes disturbed sediments and the site reaches equilibrium. Sediment resuspension may also occur during storm events or times of tidal scour; any increases associated with these instances would also be temporary in nature.

After construction at the site is complete, the proposed project is not expected to further reduce dissolved oxygen levels in the Willapa River or affect Ecology's TMDL proposal. A May 15, 2001 letter from Ecology stated that any biological oxygen demand (BOD) generated on the project site would be considered part of the background condition. In fact, over the long-term the preferred alternative may improve water quality conditions as compared to the no action alternative. The Ecology letter stated that the removal of cattle from the project site is considered a reduction in anthropogenic sources of BOD and bacterial contaminants and, therefore, an improvement in water quality conditions. Ecology's position is that reducing human impacts and returning the site to more natural conditions would be inherently consistent with State Water Quality Standards.

Herbicide Applications. The degree of water-quality degradation associated with herbicide application for *Spartina* control would be dependent upon the amount of Rodeo® tank mix that reaches the water and its subsequent biodegradation. Because *Spartina* intercepts most

of the ground-applied herbicide tank mix (Major and Grue 1997), and over spray or drift is minimal, the primary source for glyphosate and adjuvant[2] introduction into seawater results from the initial washing of target vegetation by the first tidal inundation or rainfall that occurs before chemical incorporation into *Spartina* tissue (USFWS 1997). The NPDES permit for this work requires that treatments shall not occur when a tidal regime leaves plants dry for less than four hours (Ecology 2002).

Dilution, dissipation, and biodegradation quickly diminish waterborne concentrations of glyphosate and adjuvant. Paveglio et al. (1996) found that concentrations of glyphosate and nonylphenol polyethoxylates in seawater were below detection limits (0.5 and 2.0 ppb, respectively) 1 day post-treatment (2 tidal cycles) after aerial application of Rodeo® (4.7 liters/ha) and X-77® Spreader (1.0 liter/ha) to control *Spartina* in Willapa Bay.

Herbicide application would be used as a last resort on the project site. The primary method of *Spartina* control would be manual removal of seedlings. This method should be effective if all seedlings are pulled each year. Herbicides would be used on the project site only if seedlings become clones and meadows formed. Any impacts associated with herbicide application are expected to be minor, of short duration, and localized.

No Action

Under the no action alternative, water quality on the project site would be degraded due to the amount of stagnant water on the property. Temperatures would be high and dissolved oxygen levels low during the warm summer months. Even when the dike failed and tidal waters flooded the site, water quality would be degraded compared to conditions under the preferred alternative. This is because grading would not occur under the no action alternative; drainage would be prevented by swales and ditches on the property and stagnant conditions would persist, although to a lesser extent that existing conditions.

4.1.4 Air Quality

Proposed Action

There will be some minor short-term impacts to air quality due to the use of construction equipment (such as excavators, dump trucks, and bulldozers). Slight elevation of carbon dioxide and particulates levels are expected in the immediate construction area. Since these impacts would be temporary, minor in scope, and highly localized, they are not expected to be significant.

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[2] Adjuvants are any chemical added to an herbicide tank mix. They are used for a variety of reasons: to improve the wetting or spreading of spray drops; to increase penetration of the herbicide into plant cells (surfactants); to reduce herbicide losses from evaporation; to retard foaming in spray tanks; to increase the viscosity of a tank mix to reduce drift; to prevent/reduce over-spray or multiple treatment of sprayed areas (dyes); and to buffer the pH of diluting water (USFWS 1997).

No Action

No changes to existing conditions would occur.

4.1.5 Hazardous and Toxic Wastes

Proposed Action

Results of the Battelle sampling effort (NRCS 2002) indicate that there is little or no reason to believe that persistent contaminants of concern are present on the project site at levels that could produce unacceptable ecological or human health risks. In most cases, contaminants of concern were either not detected, or detected in quantities that do not represent concern based upon a review of various regulatory guidance and scientific literature. In a few cases, detected values exceeding regulatory criteria were noted, particularly for pesticides/herbicides. These are in small, isolated areas. The work in the exceeded areas does not trigger any response requirements by the Washington Department of Ecology (Ecology). The WSDOT Hazardous Materials Program has developed policies and procedures for situations where wastes are encountered or generated. Whether the original source of hazardous waste is from WSDOT activities, from a tenant, or inherited when property is acquired, stringent environmental laws and regulations expose WSDOT to full responsibility for cleanup and proper disposal. The Hazardous Materials Program conducts and manages hazardous materials for WSDOT site and corridor projects. The Hazardous Materials Program staff range from 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trained to 80 hour Self Contained Breathing Apparatus (SCBA) trained. Staff is qualified to conduct Initial Site Assessments, Preliminary Site Investigations, and Detailed Site Investigations. WSDOT also has several highly qualified and responsive on-call environmental consultants who provide a wide range of services from investigations to cleanups. WSDOT has mandatory contracts for the Disposal of Contaminated Solid and Liquid Waste, Environmental Drilling Services, and Environmental Analytical Laboratory Services.

Spartina control actions are not expected to result in significant impacts to sediments in and adjacent to the project area. Glyphosate is not environmentally persistent and would not accumulate within sediment from ground applications of Rodeo® tank mixes. Drift of Rodeo® tank mixes to non-target areas associated with ground applications to *Spartina* would be minimal under favorable environmental conditions (USFWS 1997). The NPDES permit for this work requires that broadcast applications of herbicides shall not be made when the wind speed at the application site exceeds ten miles per hour (Ecology 2002).

No Action

No changes to existing conditions would occur.

4.2 Natural Resources

4.2.1 Vegetation

Proposed Action

Re-establishing functional connections between the river and its floodplain provides a mechanism to increase both primary and secondary productivity at and downstream of the property. Since restoring tidal hydrology to the property would re-create habitat types that support the base of the food chain (e.g., dissolved organic and particulate carbon, vegetation detritus, and benthic/epibenthic invertebrates), project benefits would be realized throughout the entire food web. Re-establishing hydrologic connectivity would also facilitate nutrient exchange between productive intertidal marshes and the waters of Willapa Bay. By restoring the natural energy flow processes, the project area would be better able support critical life stages of a variety of species.

The restoration of tidal hydrology will displace existing vegetation on the project site, as this vegetation will not be able tolerate daily inundation and increased salinity. Most of the project site will be left to recolonize naturally; predicted vegetation communities are described below. The US 101 road embankment and cross dikes will be seeded with tufted hairgrass (*Deschampsia cespitosa*) below +10' and a filter strip of bentgrass (*Agrostis* spp.) between +10' and +14' in elevation. Some of the existing topsoil may be stripped from the pasture and placed on the areas to be seeded.

Wetland Losses and Gains. The proposed action would result in the conversion of approximately 300 acres of freshwater (palustrine) wetlands to estuarine intertidal wetlands, similar to those present at the site historically. In terms of the Washington wetland rating system (Ecology 1993), this conversion would result in the loss of approximately 300 acres of Category II wetlands, but a gain of approximately 300 acres of Category I[3] wetlands. As defined by the Ecology rating system, Category I wetlands are the highest quality wetlands in the state. Large estuarine wetlands are classified as Category I because estuaries are extremely productive ecosystems where tremendous quantities of sediments, nutrients, and organic matter are exchanged between terrestrial, freshwater, and marine communities; this productivity benefits an enormous variety of plants and animals (Ecology 1993).

As part of the proposed project, approximately 17.5 acres of drainage and borrow ditches will be filled to the surrounding grade. However, they will be within the restored tidal prism and will remain wetlands. Approximately 18 acres of wetlands will be filled through enlargement of the US 101 embankment and construction of dikes/levees. Approximately 10.5 acres of existing uplands will be restored to wetlands through removal of approximately 10,000 linear feet of dike along the Willapa River. Approximately 0.75 acre of undiked salt

[3] A wetland can be rated as Category I if it meets any one of five Category I criteria (Ecology 1993). After implementation of the preferred alternative, the project would meet Criterion 4c, which classifies estuarine wetlands over 5 acres in size as wetlands with irreplaceable ecological functions.

marsh would be disturbed during excavation of three channel inlets on the riverside of the dike. In total, the proposed work would result in a net loss, through filling, of approximately 7 acres of wetlands (road and dike fills minus upland to wetland excavations).

The WSDOT wetland delineation identified several principal functions of the freshwater wetlands on the project property, including habitat for wetland-associated birds and amphibians. With the exception of habitat for amphibians, the re-introduction of tidal inundation will maintain or improve these functions. In addition, the proposed action would provide rearing habitat for commercially and recreationally important fish species.

In order to mitigate for the wetland habitat functions lost due to tidal inundation of the site, the project partners have incorporated the creation of freshwater cells and ponds on the 100 acres landward of highway US 101. Open water, ponded areas that were historically present over much of the 400 acre project site will not be lost entirely because of the restoration of tidal inundation; the lack of grazing on the site would, over time, lead to presence of dense herbaceous and woody vegetation rather than pooled areas. However, local residents valued this area for waterfowl hunting, so the freshwater wetland enhancements provide a locally valued function within the overall larger project.

The project will result in a net loss of approximately 7 acres of wetlands over the 400-acre parcel. However, the improvement in wetland function and quality associated with restoring natural hydrology through re-connecting most of the site to the Willapa River would compensate for this loss. When considered in its entirety, the project is considered to be self-mitigating.

Expected Marsh Development. Inside the diked area, ground surface elevations are generally lower and less heterogeneous than in the Potter Slough reference marsh area, suggesting compaction and subsidence from extended periods of grazing and lack of tidal influence. Topographic mapping of the restoration site shows that most of the property between + 5 and + 9 feet elevation, with some areas below +5 feet elevation (NAVD 88 datum).

Combined with this elevation data, information from the Batelle/WSDOT vegetation survey described in section 3.2.1 can be used to predict the vegetation communities that will likely colonize the river side of the highway when tidal inundation is restored (Herrera Environmental Consultants 2002). Generally, above +9 feet (NAVD 88 datum) *Distichlis spicata* is expected to dominate. Between +7 feet and +9 feet, *Deschampsia caespitosa* will likely dominate, with *Distichlis spicata* and *Salicornia virginica* also present. Between +5 feet and +7 feet there will likely be competition between *Carex lyngbyei* and *Spartina alterniflora*; some areas of bare mud are also expected in this range. *C. lyngbyei* and bare mud would be present below +5 feet. Although *S. alterniflora* was not documented below +5 feet at Potter Slough, it is likely to be a dominant competitor in this elevation range.

Based on studies in a formerly diked wetland in nearby Grays Harbor, vegetation composition on the project site is expected to change dramatically in the first five to six years following dike breaching (Thom et al. 2002). Bare areas will likely dominate the site during the first few years, until elevation builds through accretion of sediments. Accretion rates in

restored wetlands in Grays Harbor have been measured at approximately 1/8 inch (3.5 mm) per year (Thom 1992). During the first 1 to 6 years, it is likely that ephemeral species such as *Atriplex patula* and *Cotula spp*. will colonize the bare areas. *Salicornia* and *Carex* will likely follow these early colonizers, with *Distichlis* and *Deschampsia* gradually becoming more abundant over the first decade. Because of its wide salinity tolerance, *Carex* may dominate in areas of freshwater seepage at the landward edge of the site. It may take over a decade for a mature marsh community to develop on the site.

Bone River Borrow Site. Approximately 1.2 acres of conifer and mixed conifer-deciduous forest would be impacted by excavation operations. To the west of US 101, this work would primarily impact dense herbaceous and shrub layers dominated by salal (*Gaultheria shallon*), sword fern (*Polystichum munitum*), palmate coltsfoot (*Petasites palmatus*), Indian plum (*Oemleria cerasiformis*), and scrubby alder (*Alnus rubra*) and birch (*Betula spp.*). Approximately 15 small second-growth conifers [western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*)] and a single large-diameter (> 60 inches dbh) Sitka spruce (*Picea sitchensis*) would also be impacted. To the east of US 101, this work would impact herbaceous and shrub layers of similar composition, but would remove a greater number of mixed age/size-class conifers. Table 5 provides an estimate of impacts to woody vegetation associated with the embankment work on each side of US 101.

Table 5. Bone River Excavation Impacts to Woody Vegetation by Size-Class (DBH in Inches)

	60(+)	40 - 60	32 - 40	24 - 32	Other
West Station 460+50 to 457+40	1	0	0	<5	15
East Station 460+40 to 456+45	3	<5	<10	<25	100

The borrow site would be seeded with a native or naturalized grass species to provide erosion control and water quality improvement/protection. Cut slopes would be restored following construction using native woody shrub and tree species to restore roadside environmental functions.

Spartina Control. Since *Spartina* would be expected to rapidly colonize bare areas very soon after dike removal, aggressive control measures would be implemented. These measures are described in Section 2.5.8. Taking no action to control *Spartina* in and adjacent to the restoration site would have more adverse impacts than reasonably applied control measures. Delays in initiating control measures would result in geometric increases in impacts and control costs.

No Action

Under the no action alternative, existing conditions would remain until the dike failed. At that time, salt marsh species may begin to colonize portions of the site on the river side of US 101. However, as described in Section 4.1.1, accretion would likely occur at a rate slower than under the preferred alternative. This would slow the development of a marsh, leaving much of the site as mudflat for a longer period of time. Also, *Spartina* colonization would likely occur without the control efforts associated with the preferred alternative.

4.2.2 Wildlife

Proposed Action

Implementation of the preferred alternative would re-establish natural estuarine habitat processes, and therefore favor the native fauna of the area. The existing grazed wet pasture habitat would be returned to the natural condition of a mosaic of mudflat, marshes, and channels. As the restoration takes place and tidal inundation occurs, plant and animal communities will shift towards those species using terrestrial / freshwater habitats to those species using marine/estuarine habitats.

Waterfowl (e.g. ducks, geese, swans) and other water-dependant birds (e.g. herons, egrets, osprey, eagles), not only play a major ecological role in estuarine systems, but also provide recreational opportunities for hunters, photographers, and bird watchers. Many species are highly dependent upon wetlands and submerged aquatic vegetation for their survival.

The shift from terrestrial/freshwater habitat to that of a marine/estuarine habitat is not likely to have a significant impact on the variety of wildlife species currently present at the project site. Evans et al. (1998, 2001) concluded that waterbirds quickly establish themselves on newly created intertidal habitats. He also concluded that the speed of development in bird assemblages (variety of species and habitat use) followed closely to the changes in benthic fauna as the invertebrates colonized the newly formed mudflats. In most cases, macrofauna (including birds) colonize quickly and the assemblages reach maturity in a short period of time, often less than three years (Simenstad & Thom 1996). Most, if not all, of the waterfowl and other species present are generalists in nature and can move easily between both freshwater and saltwater habitats. Raptors will continue to use the area hunting for waterfowl in the newly formed salt marsh. Waterfowl and shorebird use will likely go up (not counting annual migration fluctuations) given the new variability of shallow, open-water margins along the intertidal zone. However, owls and other species dependent upon small rodents and drier habitats would likely be diverted elsewhere given the habitat conversion from semi-dry to mostly wet.

The control of the non-native cordgrass, *Spartina alterniflora,* will be critical the success of establishing waterfowl, shorebirds, and other species in utilizing the project area. Stralberg et al. (2004) states that *Spartina* can render large mudflat areas effectively unavailable to shorebirds for foraging if left unchecked. In Willapa Bay, *Spartina* increased from 800 ha. in 1994 to over 2500 ha. in 2002 (Buchanan 2003), aerial surveys conducted in 2000-2001 suggest a reduction in shorebird numbers by as much as 67% and foraging time by as much

as 50% in the southern portions of the bay as compared to data from the 1991-1995 surveys (Jaques, 2002). Unfortunately, bird data are missing prior to 1991, making it difficult to estimate how much of this reduction is attributable to the invasion of *Spartina* (Buchanan, 2003). Regardless, controlling *Spartina* is extremely important.

Bone River Borrow Site. Excavation and grading at the Bone River borrow site will be confined to upland areas only. The work will not impact adjacent tidally influenced wetlands and meadows. Site hydrology will not be altered and no short term (construction-related) or long term impacts to water quality are anticipated. Noise and visual disturbance impacts to wildlife that may frequent the area should not be significant considering the prevailing levels of traffic on this portion of US 101 and the short duration (approximately 12 days) activity at the site.

No Action

In its current state, the freshwater wetlands of the project site do provide habitat for wetland-associated birds, habitat for amphibians, limited organic matter production/export, and flood flow alteration (Null 2002). But these habitat values are declining over time. Open water, ponded areas that have been present over much of the 400-acre project site since it was diked are gradually disappearing due to a lack of grazing. Dense, tall herbaceous and woody vegetation is gradually replacing these pool areas. As a result, the value of the property for species dependant on open water, such as waterfowl, is being reduced.

4.2.3 Fisheries

Proposed Action

Ecological Importance of Target Habitats. The two primary ecological roles of Northwest estuaries are feeding and refuge (Thom 1987). The feeding role involves the production, trapping, export and cycling of energy within an estuary (Thom 1987). Vegetation biomass produced in estuaries provides the primary fuel source for the detritus-based food webs upon which many species, including juvenile salmonids, depend. As plant material decays, it supplies food for micro-organisms. Detritus, a mixture of dead plant material and living microbes, is a major food source for small invertebrates. These invertebrates are food for small fish, including juvenile salmonids and forage fish such as herring, surf smelt, anchovies, and sand lance. The target habitats for the proposed restoration effort—salt marshes and tidal sloughs—are crucial to the feeding function because of their role in detritus production and export (Seliskar and Gallagher 1983, Simenstad 1983). The refuge function is a result of the structural complexity of estuarine habitats. Features like emergent and submerged aquatic vegetation, sinuous channels, and large woody debris provide protection from predation and high stream flows, as well as areas for resting, spawning, rearing, and larval retention. For anadromous species, estuarine habitats also provide both spawning adults and out migrating juveniles transition or staging sites for the physiological shift from fresh to salt water, and migratory pathways to ocean feeding habitats or freshwater spawning habitats (Simenstad and Cordell 2000).

Juvenile Chinook salmon generally reside longer in coastal Washington and Oregon estuaries than they do in Puget Sound and Georgia Strait, where the coastal habitat is more sheltered (Healey 1982). When they enter the estuary they first occupy tidal creeks high in the marshes. Fresh (2003) found that non-vegetated river delta habitats such as mud and sand flats are relatively unimportant habitat types for rearing estuarine juveniles. Recent studies in the Salmon River estuary in Oregon have demonstrated that a substantial proportion of sub-yearling migrants use estuarine marshes, and this portion of the population may account for up to 20% of returning adults (Cornwell et al. 2003). Beamer et al. (2003, 2004) observed a relationship between the number of fry migrants entering the Skagit River estuary and the density of fry in tidal channels. This relationship suggests that there is a carrying capacity (either instantaneous or annual) for the number of fish that use estuaries. Given the extensive habitat losses that have occurred in the lower Willapa River, the remaining intertidal and shallow water habitats may now be at or exceeding their carrying capacities for Chinook fry.

Estuaries and Fisheries Recovery. The restoration of estuarine habitats is essential for the conservation and recovery of depressed Pacific salmon populations (Simenstad and Cordell 2000). Estuarine habitats provide juvenile salmonids with abundant prey during critical growth periods. The highest juvenile growth rates for Chinook and chum salmon have been recorded in estuaries (Simenstad et al. 1982). For years, it has been suspected that one reason for the declines in some salmon runs over the past century is limited estuarine food resources during the out migration period (Simenstad et al. 1982). Productive foraging habitat allows juveniles to gain a significant amount of weight during their migration to the ocean, which was thought to improve their chances for survival once at sea (Simenstad et al. 1982, Aitkin 1998). Recent research has validated this hypothesis by correlating survival of juvenile Chinook salmon (through adult return data) directly to the amount of available estuarine habitat. Magnusson and Hilborn (2003) showed that nearly pristine estuaries result in juvenile-to-adult survival rates nearly four times greater than heavily degraded estuaries. They concluded that estuaries with more habitat area have the highest survival rates for coho salmon as well.

The need for this and other similar projects has been recognized in fishery recovery planning efforts for the Willapa River basin. The Willapa Bay Fisheries Enhancement Group identified loss of estuary habitat due to dikes, tidegates, and roads as a habitat concern in the Willapa River basin (WBFEG 2001). They listed dike removal as a recommended restoration action to increase the amount of accessible rearing habitat. The proposed project also received funding from the Washington Salmon Recovery Funding Board, successfully competing with other restoration projects proposed in the area.

The proposed project is expected to result in an increase in the capacity of the Willapa River to support fish populations.

Predicted Fish Usage of the Post-Construction Project Site. Implementation of the preferred alternative would allow fish to utilize habitat within the project site. It is likely that restored channel and marsh habitats will be utilized primarily by juvenile chum and summer Chinook salmon out migrants as areas for physiological transition, refuge, feeding, and growth during late spring through early summer. However, these shallow vegetated areas and dendritic

channel systems may also provide functions to a number of other salmonid species, including coho salmon, steelhead, cutthroat trout, and char. Early out migrating coho fry (age-0 fry or pre-smolts) may feed and rear in productive estuarine habitats for extensive periods, a life-history strategy that may be especially prevalent in areas like the Willapa Basin where coastal populations reside in streams with seasonal low flows and elevated temperatures. Age 1+ coho smolts also utilize shallow intertidal marsh habitats for feeding and cover during out migration. Coastal cutthroat trout juveniles and adults feed and migrate over a variety of substrates within estuarine habitats during the spring to fall. While coastal cutthroat trout rarely over winter in saltwater, they can be found in tidal freshwater areas of estuaries as they await favorable conditions to move upstream.

Fish access marshes primarily through tidal channels during cycles of tidal pulsing. Access is constrained by channel depth, which is dependant on the tide stage. In Pacific Northwest estuaries, only the larger tidal channels tend to be deeper than the mean lower low water elevation, so most channels dewater completely during spring low tides. Young salmonids occupy a matrix of estuarine habitats rather than a particular habitat, and benefit if there is a place where they can reside during low tides in close proximity to where they are feeding in the marshes. If flow-restricted areas move fish far from productive feeding areas, this would theoretically be a detriment to the fish. Marshes with deeper channels tend to have areas where fish can find refuge during low tides. Once the tide rises, fish can again move up into smaller channels to feed. By incorporating larger/deeper channels into the preferred alternative, the site would potentially provide expanded periods of utilization of the system by these fish.

Based on post-construction monitoring of other Northwest dike breach and slough construction projects (Cordell et al. 1998, Simenstad et al. 2001, Tanner et al. 2002), it is expected that juvenile salmonids will access the project site in numbers roughly comparable to those in natural sloughs shortly (1 to 5 years) after dike removal is complete. However, preferred benthic prey resources may not be available within the project site during this time frame. As the transition from a freshwater pasture to a saltwater marsh progresses, there will be large fluctuations in densities and assemblage structure of juvenile salmonid invertebrate prey organisms (Cordell et al. 1998). During this transition period, it is expected that the diets of salmonids in the newly restored habitat would consist of a higher proportion of fallout insects.

Short-Term Construction Effects. As discussed in Section 4.1.3, short-term impacts to water quality—particularly turbidity—would result from construction activities associated with implementation of the preferred alternative. Management measures will be implemented to reduce the impact of increased suspended sediment concentrations on fish in the Willapa River. In addition, the removal of the dike, which is the part of the proposed action expected to have the largest impact on turbidity levels in the river, will occur outside of the juvenile salmonid out migration season (March 1 – June 15) so that smolts, the life history stage most sensitive to elevated turbidity levels, would not be affected by this activity.

Potential physiological effects of increased suspended sediment concentrations on salmonids include: biochemical stress responses (elevated plasma glucose and cortisol levels), impaired

osmoregulatory capacity, gill flaring (a response to gill irritation roughly equivalent to a cough), impaired oxygen exchange due to clogged or lacerated gills, and reduced tolerance to infection. Laboratory studies have shown that short-term exposures (<4 days) to elevated suspended levels on the order of 14,400 mg/l do not impair osmoregulatory capacity (Servizi 1990). However, Sockeye have been shown to exhibit gill damage at exposures of 3,100 mg/l over 96 hours (Servizi 1990). Biochemical responses and gill flaring appear to be reversible, as recovery occurs when the stressor is removed or the fish escapes the plume. However, if the stress is chronic, a metabolic cost may be incurred (Servizi 1990).

Effects of increased suspended sediment concentrations on salmonids may also include deterrence from migratory paths, and reduced foraging success. The impact of turbidity on fish foraging behavior is not clear (Gregory 1990). Some experimental work has demonstrated declines in foraging rates and reaction distances toward planktonic prey with increasing turbidity, while one study indicates that the feeding of Pacific herring larvae may be enhanced by suspended sediment concentrations as high as 1000 mg/l (Gregory 1990). Laboratory tests have also shown that some juvenile salmonids tend to swim near the surface when exposed to suspended sediments, which may make them more vulnerable to bird predation (Servizi 1990).

Laboratory experiments like those cited above have yielded some information on the response of fish to elevated suspended sediment concentrations, but applicability of this information is highly subjective given the often conflicting results attributable to variations in experimental design. In addition, bioassay-type tests generally measure an endpoint, often mortality, under conditions dissimilar to those organisms encounter in the field. Dose-response relationships measured under laboratory conditions tend to simulate a worst-case scenario for motile organisms, which can often avoid unsuitable conditions (Clarke and Wilber 1999). Under most scenarios, fish and other motile organisms encounter localized suspended sediment plumes for exposure durations on a temporal scale of minutes to hours (Clarke and Wilber 1999). A few generalizations can be taken from this research, however. Smolts are the life history stage most sensitive to elevated turbidity. For this reason, dike removal will occur outside of the salmonid out migration period. It is also clear that turbidity levels are unlikely to cause acute physiological injury to adult fish at any time during removal of the dike.

Construction activities associated with implementation of the preferred alternative would degrade water quality on a relatively localized and temporary basis, neither over the long term nor Bay-wide. Given the width of the Willapa River and volume of water discharged, suspended sediment concentrations high enough to cause adverse effects would be diluted quickly and relatively limited in extent. Adult salmonids are expected to avoid these areas readily, while juveniles would be less able to avoid such areas. Therefore, dike removal would not occur during the juvenile out migration period. This timing restriction will reduce the potential for exposure of juveniles to adverse conditions. Therefore, impacts are not expected to be significant.

Bone River Borrow Site. Excavation and grading at the Bone River borrow site will be confined to upland areas only. The work will not impact adjacent tidally influenced wetlands

and meadows. Site hydrology will not be altered and no short term (construction-related) or long term impacts to water quality are anticipated.

Effects of *Spartina* Control Efforts. Paveglio et al. (1996) examined the fate of the herbicide formulation commonly used to treat *Spartina* infestations in Willapa Bay. Study plots were located in three locations in southern Willapa Bay. The plots consisted of 25% *Spartina* (clones and seedlings) and 75% mudflat with eelgrass. Rodeo® and X-77® Spreader were applied aerially at low tide. These conditions approximate a worst-case scenario for over-spray associated with the treatment of *Spartina* in Willapa Bay (Paveglio et al. 1996). Concentrations of the Rodeo® and X-77® Spreader in spray deposit, sediment, off-site seawater, seawater, and *Spartina* were measured at 1, 14, 28, and 119 days post-treatment.

Results of the fate analysis were then compared to concentrations of the same herbicide formulation found to elicit toxicological responses in laboratory studies. The concentration of glyphosate found during the first tidal inundation of the study was 23,000 to 56,000-fold less than the 96 hour LC50 concentrations (the dose that results in the death of 50% of the organisms in the bioassay test lasting 96 hours) for Chinook and coho, and 108-fold less than the concentration that did not disrupt seawater adaptation or growth of coho salmon smolts (Paveglio et al. 1996). The maximum concentration of glyphosate in seawater during this study was 25 to 39,000-fold less than the 96 hour LC50 concentration for fertilized eggs of Atlantic oysters (*Crassostrea vulgaris*), fiddler crabs (*Uca pugilator*), grass shrimp (*Palaemonetes vulgaris*), a marine diatom (*Skeletonema costatum*), mysid shrimp (*Mysidopsis bahia*), and sea urchins (*Tripneustes esculentus*).

Paveglio et al. (1996) concluded that because glyphosate tightly adsorbs to the soil, does not bioaccumulate, and a large margin exists between maximum concentrations of glyphosate found in seawater in his study and concentrations that result in acute and subacute impacts to aquatic organisms, it is unlikely that toxicological effects to marine organisms from glyphosate in seawater would result from Rodeo® treatment of *Spartina*.

In a companion study, Simenstad et al. (1996) did not detect short (28 days post-treatment) or long-term (119 days post-treatment) effects to epibenthic invertebrate communities within the test plots.

Based on the results of these and other studies (e.g., Kubena et al. 1996), the use of herbicides to control *Spartina* is not likely to result in significant effects to fish or their prey organisms.

No Action

Under the no action alternative, fish would not have access to habitat on the project site unit the dike failed at some point in the future. Although tidal inundation would be restored to the property when a breach occurred, the value of the resulting habitat would not be equivalent to that which would occur as a result of implementation of the preferred alternative. Site hydrology (e.g., tidal circulation and sedimentation processes) would not be comparable to natural conditions, unlike a carefully designed restoration effort. Swales and existing drainage ditches on the property could trap fish as the tide ebbed, and provide areas suitable

for mosquito breeding. Such pools of stagnant water could hamper the formation of a complex network of channels and recolonization of the area by salt marsh vegetation.

4.3 Threatened and Endangered Species

4.3.1 Bald Eagle

Proposed Action

The project and borrow areas provides important bald eagle feeding habitat, particularly during the wintering season. Anadromous fish returning to spawn, waterfowl, and shorebirds are the primary prey items in and around Willapa Bay and its associated drainages. Foraging bald eagles may be displaced by the noise of heavy equipment, but are not expected to be significantly disrupted by project construction. Eagles tend to tolerate more disturbances at feeding sites than in roosting areas (Steenhof 1978).

Implementation of the preferred alternative is not expected to have a significant effect on the availability of prey within the project area. Re-introduction of tidal inundation to the project site will result in the displacement of some prey items, namely rodents and other small mammals, currently on the property. However, the project would provide habitat for waterfowl and shorebirds, which are prey items.

Construction activities associated with implementation of the preferred alternative will occur outside of the bald eagle wintering period (October 31 – March 31). No communal night roosts or perch trees would be physically disturbed by construction activities. Likewise, the preferred alternative would have no effect on the nest sites located near the project site and Bone River Borrow area.

The agencies have determined that the proposed project is not likely to adversely affect the bald eagle.[4]

No Action

The no action alternative would have no effect on the bald eagle.

4.3.2 Marbled Murrelet

Proposed Action

Construction activities associated with implementation of the preferred alternative would occur adjacent to murrelet foraging habitat. Noise levels are a concern since heavy equipment operation will produce noise above ambient levels. The effects of human

[4] The USFWS (and NMFS where applicable) must concur with the determinations made throughout this section in order for Endangered Species Act Section 7 compliance requirements to be satisfied.

disturbance on murrelets at sea are not well documented, but they apparently habituate to heavy levels of boat traffic (Strachan et al. 1995). Marbled murrelets are relatively opportunistic foragers; they have flexibility in prey choice that likely enables them to respond to changes in prey abundance and location (USFWS 1996). This indicates that if murrelets are present in the immediate vicinity of heavy equipment and they are disturbed while foraging, they would likely move without significant injury.

Construction and *Spartina* control activities are not expected to result in a reduction in the abundance or distribution of murrelet prey items. Increases in turbidity associated with dike removal could reduce visibility in the immediate vicinity of the project site, thereby reducing foraging success for any murrelets that remain in the area. As discussed in Sections 4.1.3 and 4.2.3, the use of herbicides is not likely to result in significant impacts to fish and benthic prey organisms because the approved herbicides remain tightly bound to sediments, do not bioaccumulate, and a large margin exists between post-treatment concentrations and the concentrations known to result in acute and subacute impacts to aquatic organisms. Overall, any reduction in availability of food would be highly localized and would be expected to subside rapidly.

Construction activities would have no effect on murrelet nests or nesting habitat. Although the Bone River borrow site is located directly adjacent to designated marbled murrelet critical habitat, the closest portions of this designated critical habitat are located more than 350 feet off the WSDOT right-of-way and would not be impacted by the project.[5] As described in Section 4.2.1, the stand of trees to be removed from the borrow area east of US 101 is dominated by mature second-growth hemlock less than forty (40) inches in diameter. The work would remove a few large diameter Sitka spruce and hemlock positioned along the brow of the existing embankment. Surrounding stands are dominated by hemlock ranging in size from six (6) to forty (40) inches dbh. Few, if any, of the trees to be removed provide limbs of sufficient size to serve as suitable marbled murrelet nest platforms. At a site visit in October 2004, WSDOT biologists identified one or two suitable platforms, in the largest of the remnant trees along the edge of the existing embankment. These limbs are positioned low in the canopy (at less than 20 feet above ground level) and are exposed at the edge of the surrounding stand. These platforms and trees are surrounded by younger aged stands (primarily hemlock less than 40 inches dbh) that do not exhibit the structural components of suitable murrelet habitat.

A noise impact analysis conducted for the Bone River Bridge Replacement project concluded that construction at this site would not result in a significant increase to ambient noise disturbance within the potentially occupied marbled murrelet nesting habitat located closest to the project area. The Bone River site lies in close proximity to potentially suitable marine foraging habitats for the marbled murrelet. The excavation work may temporarily increase

[5] The Bone River Bridge Replacement Project underwent a separate Section 7 ESA consultation in 1999 (FWS Ref. 1-3-99-I-1245, NMFS Ref. WSB 99-370). WSDOT has determined that completing the proposed excavation work in advance of the replacement bridge's construction will have no additional, unforeseen impacts to any listed species (or designated or proposed critical habitat) under USFWS jurisdiction.

noise levels and visual disturbance to a distance of 0.5 mile from where activities are conducted. Suitable marine foraging habitats and inland flight corridors may be subject to temporarily elevated levels of disturbance. To minimize the potential for disturbance, WSDOT will avoid periods of peak murrelet activity by restricting work to daylight hours only. All work will be conducted from one-half hour after sunrise to one-half hour before sunset.

Based upon the preceding evaluation, the agencies have determined that the proposed project is not likely to adversely affect the marbled murrelet and will have no effect on designated critical habitat for this species.

No Action

The no action alternative would have no effect on the marble murrelet.

4.3.3 Northern Spotted Owl

Proposed Action

The operation of heavy equipment associated with the implementation of the preferred alternative will produce elevated noise levels. There are no established guidelines for disturbance since spotted owls, like many raptors, have a variable tolerance for disturbance and human activity. However, USFWS guidance suggests that loud or disruptive activities located within a 0.25-mile radius of activity centers or nest sites be conducted outside of the nesting period (USFWS 1999). No USFWS critical habitat units are located within one mile of the project site (2/4/02 Species List Query by Curtis Tanner, USFWS Western Washington Office).

The preferred alternative would have no impact on owl nesting, roosting, or foraging habitat. The conifer dominated and mixed conifer-deciduous dominated stands present at the Bone River borrow site do not provide suitable habitat for the northern spotted owl. These stands lack the structural diversity and decadence characteristic of suitable spotted owl nesting and foraging habitats; layered canopies are absent, standing or fallen large diameter snags are uncommon and tree densities are sufficiently high to limit below-canopy flights. Surrounding stands may provide marginally suitable spotted owl dispersal habitat, but are located more than three miles from the closest known occurrence of the species.

Based upon the preceding evaluation, the agencies have determined that the proposed project will have no effect on the Northern spotted owl.

No Action

The no action alternative would also have no effect on the Northern spotted owl.

4.3.4 Bull Trout

Proposed Action

Short-term impacts to water quality, particularly turbidity, would result from construction activities associated with implementation of the preferred alternative. Management measures would be implemented to reduce the impact of increased suspended sediment concentrations on bull trout and other fish in the Willapa River. In addition, the removal of the dike, which is the part of the proposed action expected to have the largest impact on turbidity levels in the river, will occur during timing windows identified by USFWS (between July 15 and February 15).

The bull trout life history stages requiring the lowest fine sediment levels—spawning, incubation, and fry rearing—occur in headwater streams and small tributaries far upstream of the project area. Potential effects of elevated turbidity levels associated with the dike removal include exclusion of bull trout from their habitat through a reduction in water quality, and a temporary, localized reduction in prey resources through physical habitat disturbance.

These effects should be insignificant, given the low numbers of bull trout thought to be present in the Willapa system; the small proportion of any migratory pathway which could be affected by sediment plumes and herbicide applications; and the temporary nature of elevated turbidity. The agencies have determined that the proposed project is not likely to adversely affect bull trout.

No Action

The no action alternative would have no effect on bull trout.

4.3.5 Steller Sea Lion

Proposed Action

Given the lack of rookery and major haul-out areas in and near Willapa Bay, implementation of the preferred alternative would have no effect on breeding habitat or behavior. No haul-out sites will be physically disturbed. Noise associated with upland construction activities is not likely to disturb any sea lions in the Willapa River. There would be no reduction in the abundance and distribution of Stellar sea lion prey items associated with the proposed project. Increases in turbidity associated with dike removal are not expected to reduce visibility to the extent that foraging success could be impacted. As discussed in Sections 4.1.3 and 4.2.3, the use of herbicides is not likely to result in significant impacts to fish and benthic prey organisms because the approved herbicides remain tightly bound to sediments, do not bioaccumulate, and a large margin exists between post-treatment concentrations and the concentrations known to result in acute and subacute impacts to aquatic organisms. The agencies have determined that the proposed project would have no effect on the Steller sea lion.

No Action

The no action alternative would also have no effect on the Steller sea lion.

4.3.6 Brown Pelican

Proposed Action

Any noise or visual disturbance impacts to brown pelicans potentially foraging near the project area or Bone River excavation site would not be significant in light of the work's short duration and the prevailing levels of traffic on this portion of US 101. Excavation and grading at the Bone River site would be confined to upland areas, would not alter site hydrology, and would result in no short term (construction-related) or long term impacts to water quality. The project would not impact suitable habitat or the brown pelican prey-base. The agencies have determined that the proposed project is not likely to adversely affect the brown pelican.

No Action

The no action alternative would have no effect on the brown pelican.

4.3.7 Oregon Silverspot Butterfly

Proposed Action

The salt marsh and salt meadow habitats found within the floodplain surrounding Bone River Bridge may provide suitable habitat for the Oregon silverspot butterfly. However, neither individuals of this species, nor the species' plant host have been identified within the project area. The agencies have determined that the proposed project would have no effect on the Oregon silverspot butterfly.

No Action

The no action alternative would also have no effect on the Oregon silverspot butterfly.

4.4 Cultural Resources

Proposed Action

The Willapa Bay estuary has experienced earthquake-induced subsidence at numerous times in the past, resulting in lowering of the ground surface. Past subsidence in the northeast corner of the estuary is evidenced by the documentation of a number of archaeological deposits below the present high tide line. The documentation of submerged sites in the vicinity of the project area, combined with the presence within the project area of geomorphological features likely to contain cultural resources, such as two large sloughs and the shore of the Willapa River, provide sufficient justification for archaeological monitoring in selected areas during ground disturbing activities.

Prior to the beginning of construction, the Washington State Office of Archaeology and Historic Preservation (OAHP), the Shoalwater Bay Tribe, and the Chehalis Confederated Tribes will be consulted concerning details of the proposed archaeological construction monitoring and the procedures to be followed if cultural resources are inadvertently uncovered.

The 1992 archaeological survey report for the Bone River borrow site concluded that the few remains of the Moore Cannery present at the site would not contribute any significant information to either cannery activities at this location or to early cannery activities in Willapa Bay. The portion of the site that would be affected by borrow activities contains only a deep deposit of Japanese oyster shell. In January 2003, the Washington State Office of Archaeology and Historic Preservation (OAHP) reviewed materials relating to the Bone River Bridge replacement project and concurred that no historic properties would be affected resulting from use of the proposed borrow area. However, OAHP recommended archaeological monitoring during earth moving activities.

No Action

The no action alternative would have no effect on historic properties.

4.5 Socio-Economic Resources

4.5.1 Land and Shoreline Use

Proposed Action

The preferred alternative is consistent with the shoreline policies contained in the 2000 Pacific County Shoreline Master Program (County Resolution No. 2000-039). Specific shoreline policies (contained in Section 3. Introduction to Policies and Regulations, B. Shoreline Policies) with which the preferred alternative has been designed to satisfy include:

- 4. (b.) Reclaim and restore areas that are biologically and aesthetically degraded to the greatest extent feasible.
- 4.(c.) Preserve scenic vistas, aesthetics, and vital estuarine estuaries for fisheries and wildlife protection.
- 5. (b.) Design public access projects such that they provide for public safety and minimize potential impacts to private property and individual privacy.
- 7. (b.) Encourage educational projects and programs that foster a greater appreciation of the importance of shoreline management, maritime activities, environmental conservation, and maritime history.
- 11. (b.) Invasive, noxious weeds causing irreparable damage to the shoreline environmental should be removed with all due diligence.
- 25. (e.) Locate and design recreational developments to preserve, enhance, or create scenic views and vistas.

- 29. (a.) Allow location, design, construction, and maintenance or removal of dikes and levees so that they will not cause significant damage to adjacent properties or valuable resources.

No land use changes would occur at the Bone River borrow site.

The project partners have applied for a Shoreline conditional use permit from Pacific County.

No Action

Under the no action alternative, these County goals for shoreline management would not be met on the project property.

4.5.2 Economy

Proposed Action

The impacts of the loss of approximately 400 acres of pastureland are not expected to be significant to the agricultural sector of Pacific County's economy. The Findings of Fact and Conclusions of Law associated with Pacific County Resolution 98-089, which adopts the 1998 Pacific County Comprehensive Plan, found that: "…it is highly questionable whether a reasonable monetary rate of return can be obtained from farming activities that do not involve aquaculture or cranberry production. Commodity crops are virtually nonexistent in Pacific County." Farmland within Pacific County designated as prime by a 1986 USDA Soil Conservation Service Soil Survey has severe limitations based on high rates of erosion and excessive water in or on the soil. Only land devoted to aquaculture and cranberry production was designated "Agricultural Land of Long-term Commercial Significance" by the Pacific County Comprehensive Plan. As described in previous sections of this document, the proposed project is not expected to result in significant impacts to oyster aquaculture downstream of the project site. High soil and porewater salinities on the project site would make cranberry farming on the property problematic.

The acquisition of land by the NRCS and WDFW provided financial relief to willing sellers of former agricultural lands.

No Action

No changes to existing conditions would occur.

4.5.3 Recreation

Proposed Action

The implementation of the preferred action will make public lands more easily accessible to the general public. Construction of the highway pullout would provide parking and other amenities to assist the public in viewing and learning from the site.

If constructed, the nature trail proposed for the Chermack property would provide a critical link between this restoration effort and other nearby recreational facilities associated with the Willapa River estuary. It is an opportunity to promote "Watchable Wildlife" recreation, enhancing economic development for the coastal tourism industry.

No Action

No changes to existing conditions would occur.

4.5.4 Mosquitoes

Proposed Action

Riverward Side of US 101: Since implementation of the proposed project would change hydrology of the project site from fresh water to salt water, the composition of the mosquito community would be expected to shift to those species tolerant of increased salinity, such as the golden marsh mosquito *Aedes dorsalis*. Overall, a reduction in mosquito abundance is expected to result from the proposed project

Implementation of the preferred alternative would offer two types of mosquito control benefits: source reduction and biological controls. The source reduction benefit consists of eliminating larval habitats or rendering them unsuitable for larvae development. Filling them with dike material would eliminate the ditches currently on the site. In addition, the construction of an interconnected system of channels that regularly flood and drain would re-introduce moving water to the property, which is detrimental to mosquito larvae. The biological control benefit consists of the re-introduction of fish to the property, which is expected to reduce the reproductive success of mosquitoes within the project site. Small fish, including juvenile salmon, are known to be very effective predators of mosquito larvae and adults.

Studies of a salt marsh in San Francisco Bay after a levee breach support the idea that hydrologic restoration may be a means of mosquito control and management (Kramer et al. 1995 and Liu n.d.). These studies noted a reduction in the salt marsh mosquitoes *Aedes dorsalis* and *A. squamiger* after a levee breach allowed bay water to flood study wetlands. The authors suggest that enhanced tidal circulation might have reduced mosquito abundance by impeding the conditioning process of the eggs, by promoting predation on eggs and larvae, or by decreasing the amount of standing water available for breeding (Kramer et al. 1995).

Based on this information, the work proposed for the riverward side of US 101 is not expected to increase the risk of contracting West Nile virus in Pacific County. In parts of the country where West Nile is present, the virus has been detected in as many as 40 mosquito species. Only seven mosquito species present in Washington are among those in which the virus has been detected: *Culex pipiens, Culex tarsalis, Aedes vexans, Aedes cinereus, Anopheles punctipennis, Coquillettidia perturbans, and Ochlerotatus japonicus* (Tom Gibbs, Washington Department of Health Zoonotic Disease Program, pers. comm.). Only one of these species, *Culex tarsalis*, is commonly found in salt marshes. *Culex tarsalis* is a

widespread species also found in a wide variety of permanent and semi-permanent freshwater habitats, such as wet pastures, woodland pools, riparian areas, and woodland pools. It is likely that the project site currently provides larval habitats for *Culex tarsalis, Aedes vexans, and Aedes cinereus*.

A reduction in mosquito abundance is expected to result from the proposed project as a whole. In order to confirm this conclusion, the Corps Section 1135 project site and adjacent undiked areas was sampled during summer 2004. Preliminary results in indicate that the Corps section 1135 project will likely result in an overall decrease in mosquito production and would not result in an increase of West Nile virus exposure risks to South Bend residents. If the final results of this study indicate that mosquito production would increase over existing conditions and the resultant production increased the probability of risk of West Nile virus, then an adaptive management program will be pursued to reduce mosquito production to current conditions.

Landward Side of US 101: Since WRP Sites 1 and 2 are designed to hold freshwater and lack fish access, these portions of the project site are not expected to reduce mosquito larval habitats. The freshwater cells will be inundated during the winter and spring months, prior to the prime breeding seasons of many mosquito species (e.g., the reproductive cycle of *A. dorsalis* begins in March, and *C. pipiens* in May). If the Battelle study indicates that spring and early summer water levels in the WRP sites present a mosquito breeding concern, the cells could be drawn down earlier than they would be considering bird usage alone. Preliminary findings on the freshwater side are that the site can be managed to result in no increase in production over existing conditions. Preliminary findings also indicate no change in the potential risk to South Bend residents from West Nile virus.

No Action

The current condition of the project site—over 25,000 linear feet of ditches with very limited circulation and high mosquito production—would be maintained until a breach occurred. At that time, there would be some reduction of mosquito breeding habitat on the portion of the site riverward of US 101. This reduction would not be as great as that which would occur under the preferred alternative, since swales and existing drainage ditches on the property could prevent full drainage of the site as tides ebbed. Pools of stagnant water could provide breeding habitat for some mosquito species.

4.5.5 Transportation, Public Services, and Utilities

Proposed Action

During construction, the portions of US 101 running through the project area and at the Bone River borrow site would be periodically reduced to single lanes. Traffic would be directed through the work areas with flaggers or a pilot car for large work areas. No full road closures are planned. Lane restrictions would generally occur Monday through Thursday during daylight hours, and from dawn to noon on Fridays. There will be a need for some maintenance of the US 101 driving surface once the highway is covered with fill material and before the first proposed lift of asphalt is placed (e.g., dust control, grading, and compaction

of the roadway). This maintenance would require traffic control and may be necessary at night or on weekends, but would occur over a short portion of the total construction period. No lane closures would occur during a holiday, or after noon on the day prior to a holiday. Lane restrictions would also be planned around any local events that could be impacted. Emergency services, school buses, and public transit may be impacted by the lane restrictions, but they will be given preferential treatment and allowed to pass through the work zone quickly. The duration of lane restriction impacts would be short (65 days), and localized (less than 2 miles), so effects would be insignificant.

The transport of fill material between the project site and the borrow sites would result in an increase in heavy truck traffic along US 101. An estimated 8-12 dump trucks would be used to haul fill from the Bone River borrow site to the road raising project site. Assuming the use of 20 CY trucks with pups, approximately 1150 truck trips between Bone River and the project site (~7 miles) would occur over the 12 to 15 day duration of excavation at the Bone River site. This would result in an average increase in 95 truck trips per day.

A larger quantity of material would be transported to the site from commercial borrow source(s). Since contracts for the work had not been awarded, it is unknown exactly which business would be used to supply this material. However, several are located in Pacific County, including one in South Bend. It is likely that a contractor would purchase material from the site(s) nearest to the project area in order to keep transportation costs down. For the highway work, an estimated 4065 truck trips would be required to bring fill material and paving items from commercial site(s). An average of 135 additional truck trips per day over 35 days, or 100 truck trips per day for 45 days would be expected. For the cross dike construction work, 259 truck trips would be required to transport material to the project site. This may or may not occur at the same time as the highway work.

The increase in traffic would occur over an estimated 30 to 55 weekdays during daylight hours. Impacts of these increased traffic levels would be short-term, and would occur over stretches of highway that regularly accommodate large truck traffic (e.g., logging trucks). Therefore, the effects would be insignificant.

Highway US 101 would not be flooded by the implementation of the preferred alternative. WSDOT would raise US 101 to an elevation of 15.5 feet, which is one foot higher than the 100-year flood event. The highway will provide uninterrupted access, and will not be subject to closures due to tidal inundation. The raising should provide the level of protection to allow unimpeded travel through the area. There would be no anticipated travel restrictions during storm conditions at the project site. If storm conditions were severe enough to warrant travel restrictions, it is likely they would be necessary at several other stretches of US 101 prior to the project site.

Power and telephone lines located within the WSDOT right-of-way would be affected by the highway construction activities and need to be replaced. Approximately 30 poles would be moved to the embankment on the landward side of the highway. Poles would be located 5 to 10 feet further from the driving surface than they are now for increased safety. Installation will occur towards the end of the highway work, likely before seeding of the embankment

occurs, and will occur with an auger. However, if additional funding becomes available, the lines will be buried in the embankment. No service interruptions are anticipated.

No Action

Under the no action alternative, a partial dike failure would result in a return of tidal inundation to the property. Highway flooding could result from an unplanned breach, particularly if it occurred during a large storm event. WSDOT currently has funding from the Federal Highways Administration to elevate the roadway as mitigation for a State Route 105 highway project along the northern shoreline of Willapa Bay. These funds would not be available under the no action alternative, so there is uncertainty regarding how quickly action could be taken to prevent the highway from flooding in the event of a breach.

4.5.6 Aesthetics and Noise

Proposed Action

Implementation of the preferred alternative will result in a short-term degradation of visual resources as compared to the no action alternative. The re-introduction of tidal waters onto the project site will result in dying and decaying vegetation, which will be visible from US 101. However, after vegetation begins to colonize the restored area, the project site will transform into a natural, scenic vista that is compatible with the surrounding landscape and enhances views of the Willapa River.

At the Bone River borrow site, mature trees would be removed from the slopes adjacent to the highway. However, they will be replanted with similar species. Views from the highway would be degraded until the new trees mature, but this impact would be temporary.

The operation of heavy equipment associated with the project will temporarily increase ambient noise levels in the immediate project vicinity. These increases will be temporary, minor in scope, and highly localized. Therefore, they are not expected to result in significant impacts.

No Action

No changes to existing conditions would occur until a dike breach occurred. At that time, effects would be similar to those under the preferred alternative. The key difference would be that ponded water would be present during much of the tidal cycle under the no action alternative.

5 Cumulative Effects

NEPA requires the evaluation of cumulative impacts to assess the overall effect of a proposed action on resources, ecosystems, or human communities in light of past, present, and reasonably foreseeable future projects. The cumulative impact analysis includes actions that are federal, non-federal, and by private entities.

In the past, the trend in the lower Willapa River was one of substantial wetland loss due to diking and filling. While the creation and maintenance of freshwater wetlands in pasture lands benefited some waterfowl species, the overall degradation of ecological function associated with diking activities negatively affected fish and wildlife populations, as well as water quality, in this portion of the basin. Compared to historic conditions, the current trend is maintenance of status quo, although some interest in restoration is evident in the activities of the Willapa Bay Fisheries Enhancement Group and the Washington Salmon Recovery Funding Board. In the foreseeable future, there may be increased interest in restoration. However, no other restoration projects on the scale of the proposed action are on the horizon for the immediate future. *Spartina* control efforts will likely continue to dominate available resources.

WDFW holds 3,380 acres of land in Pacific County. This figure includes hatcheries and boat launches in addition to natural areas. WDFW's major landholdings within the Willapa Bay and its drainages, including those at Palix, Nemah, Smith Creek, and North River, are natural marshes without dikes that are managed for waterfowl and public access. There are no other properties in Willapa Bay or its drainages that WDFW has purchased specifically for restoration involving dike removal. So, while restoration of tidal inundation to former pasturelands may adversely impact some species of waterfowl (as described in Section 4.2.2), this impact will not have significant cumulative impacts because few similar projects are occurring within the Willapa Basin.

In light of the past trend of loss, and in the context of past, present, and reasonably foreseeable actions, the proposed project will not result in significant cumulative effects. In fact, the project would be a reversal of adverse cumulative effects, which occurred in the past. The purpose of this project is to counteract some of the degradation that occurred when intertidal wetlands were diked and filled along the lower Willapa River. The preferred alternative will not reverse all adverse impacts associated with past development, but it is an improvement over the no action alternative. The project has been designed to restore ecological functional connections between habitats along the lower Willapa River and throughout Willapa Bay, so that overall impacts should be beneficial to species that use these habitats.

6 Environmental Compliance

6.1 National Environmental Policy Act

This Environmental Assessment (EA) satisfies the documentation requirements of the National Environmental Policy Act (NEPA). Findings of No Significant Impact (FONSIs) signed by the Corps of Engineers and the Federal Highways Administration can be found in Appendix B.

6.2 Endangered Species Act

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

Effect determinations for each species potentially occurring in the action area are provided in Section 4.3. The project partners have requested USFWS concur with these determinations based on the information provided in Sections 2.5, 3.3, and 4.3 of this EA. The EA was also sent to NOAA Fisheries, but concurrence is not required since the project partners have determined the project would have no effect on species under their jurisdiction.

6.3 Clean Water Act

Under Section 404 of the Clean Water Act (CWA), a permit is required for discharges of dredged or fill material into water of the United States. Waters of the United States are defined to include wetlands. The project partners have applied for a Section 404 permit from the Seattle District Corps of Engineers.

Under Section 401 of the CWA, a water quality certification is required for activities, which may result in any discharge into the navigable waters. The certification, issued by the Washington State Department of Ecology (Ecology), ensures that the discharge will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the CWA. The project partners have applied for a Section 401 Water Quality Certification from the Washington Department of Ecology.

6.4 Coastal Zone Management Act

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of a state's approved Coastal Zone Management (CZM) Program. The Shoreline Management Act of 1972 (RCW 90.58) is the core of authority of Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local government. Pacific County implemented the SMA through the preparation of a Shoreline Master Program, which was approved by the Department of Ecology. The project partners have applied for a Shoreline Conditional Use Permit from Pacific County.

6.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (16 USC 470) requires that a federal agency having direct or indirect authority to issue a license authorizing an undertaking shall take into account the effect of the undertaking on historic properties.

The Section 106 process includes research and field investigation in consultation with the Washington State Office of Archaeology and Historic Preservation (OAHP), the Advisory

Council on Historic Preservation, concerned Tribes, and local governments. The process generally includes identifying historic properties that may be affected by the project; gathering information sufficient to evaluate the eligibility of properties found for the National Register; and consulting among agencies and other concerned parties to avoid or mitigate adverse impacts on significant properties.

To comply with the National Historic Preservation Act, a historic site records search was conducted at the Washington State OAHP and a pedestrian archaeological reconnaissance survey was conducted of a portion of the proposed project area. Construction monitoring by an archaeologist is recommended during native soil disturbing activities due to the possible presence of buried cultural resources. Prior to the beginning of construction, the State Historic Preservation Officer (SHPO), the Shoalwater Bay Tribe, and the Chehalis Confederated Tribes would be consulted concerning details of the proposed archaeological construction monitoring and the procedures to be followed if cultural resources are inadvertently uncovered.

6.6 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. This goal is accomplished through Corps funding of US Fish and Wildlife Service (USFWS) habitat surveys evaluating the likely impacts of proposed actions, which provide the basis for recommendations for avoiding or minimizing such impacts.

Coordination with USFWS has been ongoing throughout the study process. The USFWS is a member of the interagency committee involved in planning of the proposed restoration project. In 2002, USFWS prepared a Preliminary Draft Coordination Act Report (CAR) to document USFWS support for the project, and to present the Service's current views of the benefits and adverse impacts to fish and wildlife resources expected to occur if the project goes forward. Once the design is finalized, USFWS will prepare a Final CAR to fully satisfy the requirements of the FWCA.

6.7 Magnuson Fishery Conservation and Management Act

The Magnuson Fishery Conservation and Management Act requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) regarding actions that may affect Essential Fish Habitat (EFH) for Pacific coast ground fish, coastal pelagic species, and Pacific salmon. The Act defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH is the habitat (waters and substrate) required to support a sustainable fishery and a managed species' contribution to a healthy ecosystem. Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish. Substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities.

The project area, as part of the Washington State Estuarine EFH composite, has been designated as EFH for various life stages of 18 species of groundfish, 5 coastal pelagic species, and 3 species of Pacific salmon.

6.7.1 Potential Adverse Effects to EFH

NOAA guidance on evaluating non-fishing impacts to EFH suggests that restoring coastal and riverine habitat that supports managed fisheries and their prey will assist in sustaining and rebuilding fisheries stocks and recovering certain threatened or endangered species by increasing or improving ecological structure and functions (Hanson et al. 2003). Improvement of coastal wetland tidal exchange and reestablishment of historic hydrology is provided as a specific example of habitat restoration, which would benefit stocks managed by the Pacific Fisheries Management Council.

Most of the construction activities associated with the proposed project would occur outside of designated EFH (i.e., landward of the MHHW line). However, removal of the dike will occur in and directly adjacent to areas currently inundated by tidal waters, and will serve to move the MHHW line landward to US 101. Therefore, much of this analysis focuses on the construction impacts of dike removal.

Hanson et al. (2003) lists four potential adverse impacts of restoration activities on EFH: (1) localized nonpoint source pollution, such as influx of sediments and nutrients; (2) interference with spawning and migration periods; (3) temporary or permanent removal of feeding opportunities; and (4) indirect effects from actual construction portions of the activity.

Temporary water quality degradation and disturbance of benthic food resources would be the primary effects of construction activities associated with the proposed project. As described in Section 4.1.3, sampling efforts on the property indicate that the site will not be a significant source of nonpoint pollution once the dike is breached. Potential effects of contamination resulting from herbicide application for *Spartina* control are addressed in Section 4.1.3, 4.1.5, and 4.2.3. As described in Section 4.2.3, the project will result in a 300-acre expansion of intertidal foraging habitat; temporary impacts to benthic food resources adjacent to the dike during construction would be insignificant. Dike removal activities will occur during the salmon work window provided by WDFW to avoid interference with spawning and migration activities. Any windows recommended by NOAA for the protection of the 18 species of groundfish and 5 coastal pelagic species potentially occurring in the area would be considered for implementation to the maximum extent practicable.

6.7.2 EFH Conservation Measures

The following measures will be implemented to minimize potential adverse effects to designated EFH described above.

1. Construction best management practices will be implemented to protect water quality during removal of the dike (e.g., working in the dry during low tides, use of silt curtains, hay bales, and/or erosion mats).
2. Areas used for construction staging will be planned in advance and kept to a minimum in size.
3. Temporary access pathways and staging areas used during construction will be removed and restored.
4. *Spartina* patches adjacent to and across the river from the property have been treated with herbicides over the past several summers to remove an immediate seed source. Aggressive *Spartina* control will continue after the dike is removed in order to ensure the success of native vegetation on the restored site.
5. Integrated pest management principles will be employed for *Spartina* control, with herbicides used only as a last resort on the project site.
6. Dike removal work will not occur during critical salmon windows (October-July) in order to reduce impacts to spawning, nursery, and migration functions.
7. Monitoring will be conducted during and after project implementation to ensure compliance with project design criteria (baseline monitoring has already occurred).

6.7.3 Conclusion

The partner agencies have determined that the proposed action will not reduce the quality and/or quantity of EFH. In fact, the project will increase the quantity of EFH by restoring tidal inundation to 300 acres. Due the implementation of the conservation measures listed above, no adverse effects to EFH are expected to result from the proposed action.

6.8 Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Activities that involve the construction of dams, bridges, dikes etc. across any navigable water, or placing obstructions to navigation outside established Federal lines and excavating from or depositing material in such waters, require permits from the Corps. The Corps conducts public interest reviews to ensure that proposed projects comply with Section 10, and as part of these reviews coordinates with other Federal, State, and local agencies.

A Rivers and Harbors Action Section 10 review will occur concurrently with the Clean Water Act Section 404 review described in section 6.3 above.

6.9 Clean Air Act

The Clean Air Act required states to develop plans, called State implementation plans (SIP), for eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards (NAAQS) while achieving expeditious attainment of the NAAQS. The

Act also required Federal actions to conform to the appropriate SIP. An action that conforms with a SIP is defined as an action that will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The project area is not located in a non-attainment area, and any adverse impacts to air quality associated with the project will be temporary and highly localized, so the project will not cause or contribute to any new violation of any standard in any area.

6.10 Washington State Hydraulic Code

Work that uses, diverts, obstructs, or changes the natural flow or bed of any freshwater or saltwater of the state requires a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). The statutory authority for this requirement is contained in Chapter 75.20 RCW and Chapter 220-110 WAC. The project partners received an HPA on August 3, 2004 (Log # ST-G0986-01). All provisions of the HPA will be implemented during construction.

6.11 Executive Order 12898, Environmental Justice

Executive Order 12898 directs every Federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations.

The Shoalwater Bay Tribe constitutes a distinct, separate community of Native Americans who rely on Treaty-reserved fish for subsistence, economic, and spiritual purposes. The implementation of the preferred alternative is not expected to result in any disproportionate adverse environmental effects or impacts on the health of tribal members, or other minority/low-income populations.

The project does not involve the siting of a facility that will discharge pollutants or contaminants, so no human health effects would occur. No interference with treaty rights is anticipated, as construction would not physically interfere with fishing in usual and accustomed places, and the restoration plan is intended to beneficially impact fishery resources. Implementation of the proposed projects would not negatively affect property values in the area, or socially stigmatize local residents or businesses in any way.

7 Conclusion

Based on the preceding environmental assessment, the proposed project is not a major Federal action significantly affecting the quality of the human or natural environment, and therefore does not require preparation of an environmental impact statement.

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APPENDIX B.
Findings of No Significant Impact

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

CENWS-PM-PL-ER

WILLAPA RIVER ESTUARINE HABITAT RESTORATION
PACIFIC COUNTY, WASHINGTON

FINDING OF NO SIGNIFICANT IMPACT

1. Project Authority and Purpose. Section 1135 of the Water Resources Development Act of 1986 (Public Law 99-662, as amended) allows the Corps of Engineers to modify the structure or operation of a Corps project to restore fish and wildlife habitat, or to construct restoration projects in locations where an existing Corps project has contributed to the degradation of the quality of the environment. The proposed project is intended to replace some of the estuarine habitat lost when dredged material was placed in intertidal wetlands as part of the Corps' Willapa River and Harbor Project. Between the 1930s and early 1970s, material dredged from the inner Willapa River Channel below Raymond was disposed on adjacent diked wetlands. During this time, approximately 675 acres of productive intertidal and shallow subtidal habitats were affected by Corps pipeline dredge disposal activities. The Washington State Department of Fish and Wildlife is the local sponsor for this Section 1135 project.

2. Proposed Action. The proposed section 1135 action is one component of a larger multi-agency effort. Other federal agencies with involvement in separate estuarine projects include the Federal Highways Administration (FHWA) and the U.S.D.A. Natural Resources Conservation Service (NRCS). The Section 1135 project will restore tidal inundation to property owned by WDFW, which has been diked for the past 90 years. This will occur by removing approximately 10,000 linear feet of dikes. The dike material will be used to backfill the borrow ditches adjacent to the dikes. Farm drainage ditches and borrow ditches along US 101 will also be filled. Remnant tidal channels will be excavated to restore natural tidal hydrology. Worked supported by NRCS includes a cross dike that will be constructed to prevent tidal inundation of neighboring properties and enhancement of existing freshwater wetlands. Washington Department of Transportation (supported by FHWA) will construct a highway pull-off to provide access and parking for school buses and other vehicles. Most of the earthwork would occur in the dry, prior to dike removal. Approximately 70,000 cubic yards of material would be excavated and approximately 70,000 cubic yards of material would be placed as fill. Work on each project may proceed independently of one another.

3. Summary of Impacts. Pursuant to the National Environmental Policy Act, the Corps has prepared an Environmental Assessment (EA) in cooperation with the FHWA and NRCS. The

Corps is acting as the lead federal agency under the National Environmental Policy Act. The EA describes the environmental consequences of the proposed projects as a whole which are briefly summarized below.

The Corps section 1135 proposed project would re-establish 300 acres of salt marsh, and restore off-channel rearing and refuge habitat for juvenile salmonids and other estuarine fish species. The project is expected to result in an increase in the capacity of the lower Willapa River to support fish populations. In addition, waterfowl and shorebird use of the property is likely to increase.

The Corps has coordinated with State and Federal resource agencies to assure careful consideration of fish and wildlife resources. No adverse impacts to threatened or endangered species are anticipated. Impacts of construction activities on salmonids will be reduced and/or avoided through implementation of timing restrictions.

While the project will result in the net loss of approximately 7-acres of wetlands in the 400-acre parcel, the improvement in wetland function and quality would more than compensate for this loss. When considered in its entirety, the project is considered to be self-mitigating.

Unavoidable adverse impacts of the Corps Section 1135 project will generally be localized in nature, short in duration, and minor scope. None of these adverse impacts associated with the Corps section 1135 project would be significant either individually or cumulatively. Construction activities associated with the Corps section 1135 project may temporarily disrupt local and tourist traffic on the portion of US 101 running through the site, but no full road closures will occur. The transport of fill material to the project site from commercial borrow sites would result in an increase in heavy truck traffic along US 101. This impact will not be significant because it would be short-term and would occur over stretches of highway that regularly accommodate heavy truck traffic (e.g., logging trucks). Short-term degradation of water quality in the Willapa River would occur during removal of the dike. A temporary increase in turbidity and a temporary decrease in dissolved oxygen levels are anticipated. Monitoring will occur to ensure that all State requirements for the protection of water quality are met. Temporary displacement of wildlife may occur due to the noise associated with construction activities. Owls and other species dependent on small rodents or other drier habit prey items would likely be permanently displaced, but raptors will continue to use the area for hunting waterfowl in the new salt marsh.

A reduction in mosquito abundance is expected to result from the proposed project as a whole. In order to confirm this conclusion, the Corps section 1135 project site and adjacent undiked areas was sampled during summer 2004. Preliminary results in indicate that the Corps section 1135 project will likely result in an overall decrease in mosquito production and would not result in an increase of West Nile virus exposure risks to South Bend residents. If the final results of this study indicate that mosquito production would increase over existing conditions and the resultant production increased the probability of risk of West Nile virus, then an adaptive management program will be pursued to reduce mosquito production to current conditions.

4. Finding.

Based on the analysis described above and provided in more detail in the EA, this Corps section 1135 project is not a major Federal action significantly affecting the quality of the human environment, and therefore does not require preparation of an environmental impact statement.

24 Feb 05

Date

Debra M. Lewis
Colonel, Corps of Engineers
District Engineer