Draft Environmental Assessment

South Jetty Breach Fill Maintenance

Westport, Grays Harbor County, Washington
December 2003

US Army Corps
of Engineers®
Seattle District

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Responsible Agency: The responsible agency for this work is the U.S. Army Corps of Engineers, Seattle District.

Abstract: This document evaluates the impacts of Corps placement of approximately 25,000 cubic yards of sand on the south jetty breach fill placed in 1994 and re-nourished in 2002, and along a rapidly eroding sandy shoreline in the southwest corner of Half Moon Bay. This placement of sand would occur prior to February 15, 2004 or after July 15, 2004. Additional placements will likely be required over the next three to five years. The proposed placements are an interim measure intended to extend the life of the breach fill, thereby reducing risk to the south jetty until a long-term management solution can be formulated and implemented.

Seattle District has determined that the proposed action 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.

Comment Period: Comments on the proposed action and this assessment will be accepted between December 24, 2003 and January 23, 2004.

Please send comments and requests for additional information to:

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1. INTRODUCTION

Pursuant to the National Environmental Policy Act (NEPA), this draft environmental assessment (EA) evaluates the impacts of the proposed placement of sand within the footprint of the Grays Harbor south jetty breach fill placed in 1994 and re-nourished in 2002. The purpose of this project is to reduce the risk of another breach until a long-term management strategy for the south jetty and Grays Harbor entrance can be formulated and implemented. The first placement of sand is expected to occur prior to February 15, 2004.

The finding of no significant impact (FONSI) and *Half Moon Bay Transition Gravel and Cobble Placement Final Environmental Assessment* issued on November 21, 2003 was rescinded on December 15, 2003.

1.1 Background

The shoreline to the west and south of Point Chehalis has undergone major changes since the north and south jetties were constructed between 1898 and 1917 by the Corps of Engineers, Seattle District (Corps) to provide a navigation channel through the Grays Harbor entrance. The jetty is a barrier to northerly long shore drift, and by 1904 South Beach had advanced 3,000-feet to the west. During much of the 20th century, the shoreline advanced or retreated depending on the condition of the jetty structure. However, since the 1960's a long-term trend of erosion along the South Beach shoreline has been apparent. Since 1967, South Beach has seen recession rates ranging from 2 to 62 feet per year.

Erosion of the shoreline and overtopping by storm waves at the landward end of the south jetty resulted in the formation of a breach between the jetty and the adjacent South Beach shoreline during a winter storm in December 1993. The breach widened rapidly, exposing the landward end of the jetty and eroding portions of Westhaven State Park. Within six weeks, the breach was approximately 500 feet wide. Local officials, alarmed by the formation of the breach, expressed concern about further erosion at the breach site and impacts to City of Westport public facilities, including a wastewater treatment plant, municipal well, and sewer outfall. The breach was also determined to be a potential threat to the stability of the south jetty, and there was concern that the breach could cause adverse impacts to the maintenance of the navigation channel by capturing much of the Harbor's ebb flow (Corps 1995).[1]

In March 1994, the Department of the Army directed Seattle District to fill the breach between the South Jetty and the adjacent South Beach shoreline. In late fall 1994, at a cost of $4 million, the breach was filled with approximately 600,000 cubic yards of material dredged from the Grays Harbor and Chehalis River navigation channel. The breach fill was an interim measure to help protect the south jetty, the navigation channel and local beaches until an acceptable long-term solution could be implemented. At the time of placement, the breach fill was expected to have a life of five to ten years.

[1] The effects of a breach on the operation of the navigation project are currently being modeled. Seattle District intends to maintain the existing breach fill to the extent practicable until long-term consequences of a breach can be adequately assessed and alternatives for the long-term maintenance of the south jetty and entrance channel can be re-evaluated.

In 1997, the Corps released a study which evaluated various alternatives and selected a long-term plan to protect against another breach. The *Long Term Maintenance of the South Jetty at Grays Harbor, Washington* report confirmed that continued erosion of the shoreline adjacent to the South Jetty, if left unchecked, would result in the formation of a permanent breach between the South Jetty and the adjacent South Beach. The selected alternative consisted of an extension of the South Jetty to meet the existing Point Chehalis revetment, combined with periodic beach nourishment with sand in Half Moon Bay. This plan was to be constructed in two phases: (1) a buried 1,900-foot southward extension of the existing Point Chehalis revetment; and (2) a 2,500-foot eastward extension of the South Jetty across Half Moon Bay. The Point Chehalis revetment extension was constructed between November 1998 and March 1999. In accordance with the inter-agency mitigation agreement for the extension project, the entire revetment was buried under 2 to 3 feet of sand and a beach nourishment stockpile was created so that sand eroded by winter storms is replaced and the toe of the structure remains buried. Material dredged during navigation channel maintenance is periodically used to replenish the stockpile of sacrificial material.

By 1999, State of Washington resource agencies, City of Westport, and other public interests had serious concerns related to environmental and recreational impacts associated with the proposed South Jetty extension. In addition, surveys indicated that the breach fill material was eroding more slowly than originally anticipated. Therefore, the jetty extension project was deferred and a modified plan to extend the life of the breach fill was developed. The new plan consisted of three elements: (1) construction of a wave diffraction mound to maximize wave refraction-diffraction, thereby reducing wave-induced erosion of the shore in the western portion of Half Moon Bay adjacent to the jetty; (2) a gravel/cobble transition beach designed to slow erosion of the beach directly adjacent to the south side of the jetty, and to eliminate the dangerous 8-foot high scarp that had formed in that location; and (3) major repair work on the inner (landward) end of the jetty structure so that it is better able to withstand the undermining effects of any future breaches and to help reduce wave-caused erosion of the unprotected portion of Half Moon Bay. As mitigation for this work, the Corps removed armor stone from a 250-foot long remnant of the south jetty east of the diffraction mound. The crest elevation was lowered from +8 feet MLLW to +2 feet MLLW.

Between December 1999 and February 2000, the remnant jetty crest was lowered, the wave diffraction mound was constructed and 11,600 cubic yards of 12-inch minus rounded cobbles and gravels were placed on the adjacent beach. The South Jetty rehabilitation work occurred in late 2001 and early 2002. Severe storms during November and December of 2001 caused overtopping of the South Beach shoreline directly south of the jetty. The temporary construction haul road used to transport armor rock as part of the South Jetty repair project was breached by severe end cutting erosion and storm wave overtopping and three large rainwater runoff gullies, each about 5 feet deep, cut through the narrow strip of land remaining. In January 2002, it was necessary to make urgent repairs to relocate the haul road. At this time, an additional 16,100 cubic yards of 12-inch minus cobbles and gravels were placed along the western shore of Half Moon Bay to maintain access to the jetty via this haul road.

Between 1996 and 2001, an estimated 70,000 cubic yards of fill material eroded from the upper elevations of the breach fill site. In 2002, the Corps placed an additional 135,000 cubic yards of

dredged material at the breach site and planted about 60,000 sprigs of native dune grass (*Elymus mollis*) at the site to reduce wind erosion of the fill.

1.2 Project Purpose and Need

End-cutting at the termination of the transition beach, erosion on the ocean side of the breach fill, loss of sand through aeolian (wind) transport, and the formation of rainwater runoff gullies have been identified as the major threats which could result in a failure of the breach fill. The Corps has undertaken a number of measures to extend the life of the existing breach fill, including placement of 135,000 cy of sand in spring 2002, placement of additional transition beach material in winter 2002, and planting of dune grass to reduce wind loss. These efforts, which do show promise for extending the fill life well into the future, may be compromised if erosion is allowed to initiate a "weak point" as occurred in late 2001. At that time a combination of factors—including a low fill elevation on the South Beach side, reduced fill width due to storm runoff drainage channels, and severe end-cutting at the transition beach termination—would have caused another breach if additional fill had not been placed.

The purpose of the proposed work is to extend the life of the breach fill by nourishing the area adjacent to the south jetty. This will protect the south jetty and navigation channel from damage which could be caused in the event of another breach. Preventative maintenance of the breach fill is a much more cost-effective strategy than after-the-fact emergency repairs, and requires a relatively small quantity of material to restore the height of the fill area. Action now could prevent more costly repairs in the future. The proposed project will also partially nourish the area adjacent to the previous gravel placement which has severely eroded.

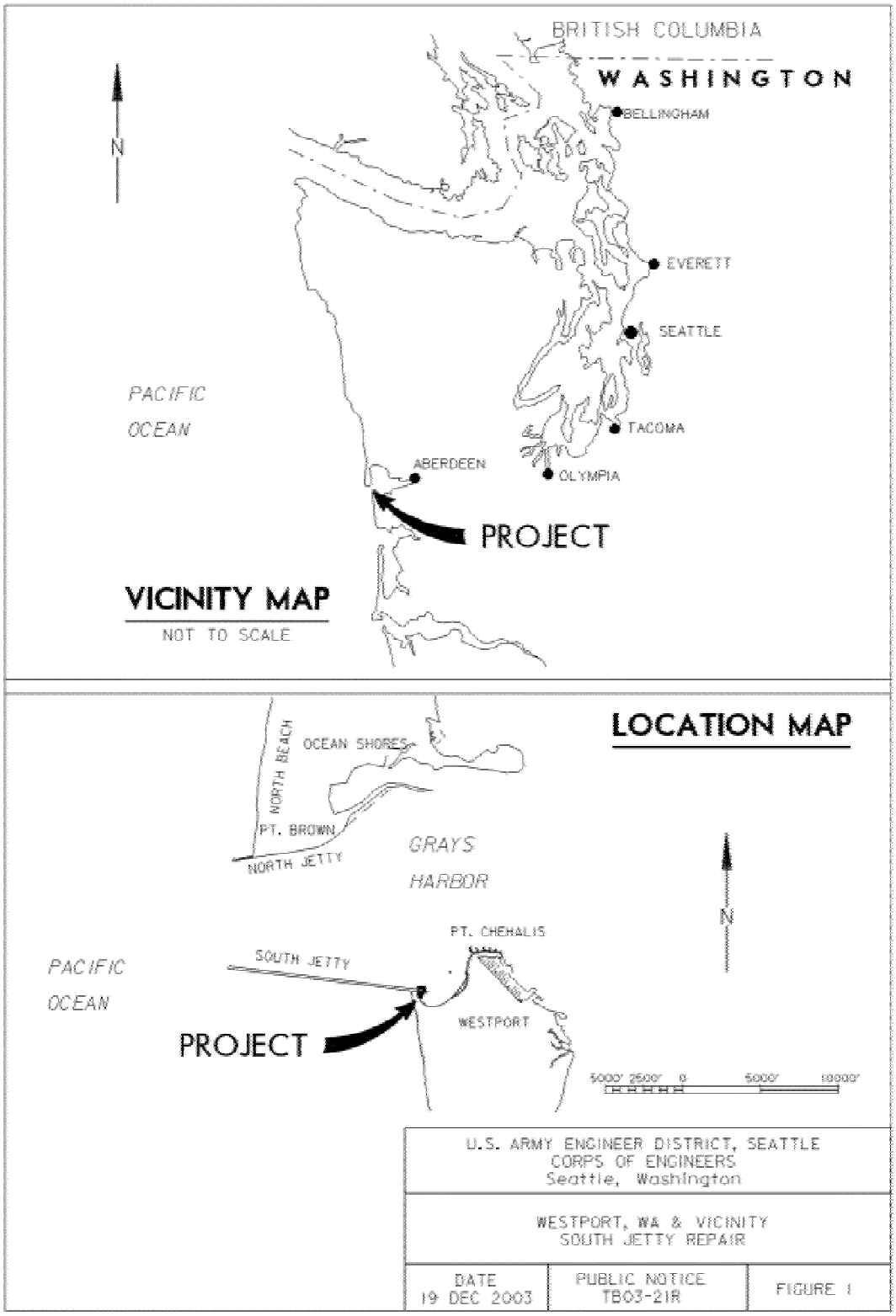
1.3 Location

The project area is located in Westhaven State Park, Westport, Grays Harbor County, Washington (T16N, R12W, Section 1). The location of the proposed work is shown on the vicinity and location map in Figure 1.

1.4 Authority

The Grays Harbor and Chehalis River Project, including maintenance of the Federal navigation channel and the South Jetty, is authorized by the River and Harbor Act of August 30, 1935 (House Document 53, 73rd Congress, 2nd Session) and the Water Resources Development Act of November 17, 1986 (Public Law 99-662). The proposed work is within the Grays Harbor and Chehalis River Project operations and maintenance (O&M) authority because its intent is to protect navigation features, including the south jetty and navigation channel. This is a proper use of O&M funds because of the reasonable relationship between the project and its purpose for protecting a Congressionally authorized navigation project, including features (i.e., South Jetty and Federal Channel), from a possible breach landward of the South Jetty.

Figure 1. Location and Vicinity Map



1.5 Previous documents

Additional information on the history of Grays Harbor and Chehalis River Navigation Project engineering structures, erosion in the project area, and the natural resources of Grays Harbor can be found in previous Corps documents. The following documents are incorporated here by reference, and are available for inspection at the Seattle District office. Complete bibliographic information for these documents can be found in the reference section of this assessment.

- South Jetty Sediment Processes Study, Grays Harbor Washington: Evaluation of Engineering Structures and Maintenance Measures (April 2003)
- Half Moon Bay Transition Gravel and Cobble Placement Final Environmental Assessment (November 2003), rescinded December 15, 2003
- Design Analysis (Revised), Grays Harbor, Washington FY 1999 South Jetty Repair (September 1999)
- Long Term Maintenance of the South Jetty at Grays Harbor, Washington, Evaluation Report (June 1997)
- Point Chehalis Revetment Extension Project, Westport, Washington, Interagency Mitigation Agreement (October 1998)
- Review of Long-Term Maintenance Plans for the South Jetty, Grays Harbor, Washington; Report by a Special Subcommittee of the Committee on Tidal Hydraulics and Coastal Engineering Research Board (1995)
- South Jetty Breach Fill Final Environmental Assessment (April 2002)
- South Jetty Repair Final Environmental Assessment (July 1999)
- Final Environmental Assessment: Fiscal Years 2001-2006 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Navigation Project, Grays Harbor County, Washington (April 2001)
- Programmatic Biological Evaluation: Fiscal Years 2001-2006 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Navigation Project, Grays Harbor County, Washington (December 2000)
- North Jetty Performance and Entrance Navigation Channel Maintenance, Grays Harbor, Washington September 2003 ERDC/CHL TR-03-12

2. ALTERNATIVES CONSIDERED

In March 2003, the Corps met with several government agency and public interest group representatives to discuss erosion issues affecting Half Moon Bay and South Beach. Many potential solutions were raised, but most would require engineering feasibility analyses and extensive coordination with a variety of affected parties so they are not immediately able to be implemented. Since there is a need for short-term action to minimize damage to the breach fill prior to implementation of any long-term strategy for the south jetty and Grays Harbor entrance,

the alternatives presented below address possible interim actions only. Further study and coordination is necessary to determine the most appropriate long-term strategy. Potential long-term strategies will be evaluated in future feasibility study and NEPA documents. It is expected that a long-term strategy could not be implemented before 2006, at the earliest.

Under all of these alternatives presented below, the Corps would continue to place sandy material dredged from the Grays Harbor navigation channel at nearshore and direct beach disposal sites in Half Moon Bay and off of South Beach to replace some of the material lost through erosion. Plans for management of dredged material will also be evaluated and coordinated as part of the long-term planning effort.

2.1 No Action

Under the no action alternative, the Corps would not take any actions to prevent further loss of breach fill material and recession of the shoreline along the southwest corner of Half Moon Bay. As a result, significant damage to the breach fill could occur prior to the implementation of a long-term strategy for the south jetty and Grays Harbor entrance. There is a large degree of uncertainty relating to predictions of the status of the breach fill during this time period. The possibility of a breach similar to the 1994 event occurring this year is highly unlikely. However, continued erosion of the shoreline adjacent to the south jetty, if left unchecked, would eventually result in the formation of a breach between the south jetty and adjacent South Beach.

The 1994 breach fill material eroded more slowly than originally anticipated, but in November of 2002, erosion of the fill on both the ocean and Half Moon Bay shorelines resulted in overtopping of the fill, and concerns were raised that the breach could reform. Emergency measures were undertaken to place additional dredged material on the fill and additional gravel on the Half Moon Bay transition beach. These measures prevented a breach from reforming during the winter of 2002-03, but the shoreline retreat along the entire southern portion of Half Moon Bay continues at an alarming rate of over 60-feet-per-year, and much of the Half Moon Bay shoreline as returned to its pre-breach location. If the recession rate does not slow dramatically, Westhaven State Park may not be accessible by the summer of 2004. By the summer of 2005, the Park restroom facilities will be destroyed unless they are removed, and within 3 years, the access road along the entire southern portion of Half Moon Bay will be lost. If the southwest shoreline of Half Moon Bay continues to retreat at the present rate, the southern portion of the breach fill will be narrowed to less than 250 feet within three years. At this point the fill could become vulnerable to overtopping in this area. In addition, although the South Beach shoreline has been retreating at a relatively slow rate of 5 feet per year (2000 – 2003), a return to historical erosion rates of 30 to 50-feet-per-year should be considered to be a very real possibility. A South Beach recession rate of 50-feet-per year, combined with the current rate of erosion in Half Moon Bay, could significantly increase the potential for a breach to reform within the next 5 years. Proactively addressing the areas of localized erosion of the fill, including the southwestern portion of Half Moon Bay, appears to be a reasonable and prudent method to extend the life of the breach fill.

A rapid rate of erosion along either the ocean side or the Half Moon Bay side of the breach fill increases the likelihood of such a breach. Should a breach occur, the consequences on the Federal project could be serious. Studies to evaluate the short and long-term effects of a breach

and to re-evaluate the long-term maintenance plan for the South Jetty probably will take 3 to 5 years to complete. If action is not taken to slow ongoing erosion in Half Moon Bay, the effects of this erosion may constrain the array of suitable design options available for long-term maintenance of the south jetty. The more damage that occurs, the risk of another breach forming increases and the more costly it becomes to re-nourish the breach fill. The Corps is not willing to accept this risk, so the no action alternative was eliminated from further consideration.

2.2 Placement of Additional Transition Cobble / Gravel Material

This alternative involves the placement of up to 40,000 tons (27,000 cubic yards) of 12-inch minus gravel and cobble material along approximately 1,000 linear feet of beach in the southwest corner of Half Moon Bay. Barring an increase in the frequency of severe winter storms, this interim measure would be expected to provide adequate erosion protection for the next 5 years without a need for placement of additional material.

The material placed would all be less than 12 inches in diameter, with between 50-85% by weight less than 3 inches. This is the same material gradation used for the two previous placement efforts. Past experience at the site has shown that this material size has significantly reduced the erosion rate of the shoreline in the area where it was placed. However, previous premature termination of the transition beach led to severe end-cutting of the down-drift sand. This is because the wave approach angle at the terminus of the existing transition beach creates strong longshore currents that readily erode and transport sand along the shoreline to the east. At the location of proposed transition beach termination, the wave approach angle is nearly perpendicular to the shoreline so the longshore transport potential is reduced and much less end-cutting would be expected.

Because of a lack of sufficient data on the two previous placements of gravel and cobble in Half Moon Bay or from similar projects elsewhere, there is uncertainty regarding the significance of biological effects associated with placement of cobbles on a sandy beach. As a result, the 12-inch minus cobble/gravel alternative has been eliminated from further consideration until the data required for an accurate assessment of the biological impacts of previous placements has been obtained.

2.3 Placement of Sand

The placement of sand has been selected as the preferred alternative. This alternative involves the placement of approximately 25,000 cubic yards of sand in three areas in January and February 2004. The sand will be excavated from the existing Half Moon Bay direct beach nourishment dredged material disposal site, which is an upland stockpile situated above the Point Chehalis revetment extension constructed in 1999. Approximately 5,000 cubic yards will be placed in two vulnerable areas on the breach fill; both of these areas are located well above the mean higher high water depth contour.[2]

[2] Since these two areas, as well as the stockpile borrow area, are located well above the mean higher high water (MHHW) depth contour, work at these sites may occur after the beginning of the fish closure period (February 15). Since placement at the shoreline site involves work below MHHW, this work will be completed by February 15.

The remaining 20,000 cubic yards will be placed in the southwest corner of Half Moon Bay. More detailed information on this placement can be found in Section 3 below, and in Figures 2 and 3. This area was selected as needing nourishment material because a comparison plot of Half Moon Bay bathymetry from 1999-2003 shows that there is scour erosion immediately south of the lowered South Jetty remnant and diffraction mound. The recent deepening of this area is on the order of 20 feet in the last 4 years. This deepening is allowing higher wave energy into to Half Moon Bay, causing severe localized erosion in the southeast corner of the breach fill.

Based upon the results of post-placement monitoring, and dependant on funding availability, the Corps may place up to 15,000 additional cubic yards of sand annually until the time when a long-term strategy for the south jetty and Grays Harbor entrance has been implemented. Any future in-water placements would occur during established in-water work windows (July 14-February 15). Other placement techniques and/or proposals for larger quantities of sand may be investigated if the current action is not found to be successful. Any such actions would be evaluated and coordinated with the public in future NEPA documents.

3. DESCRIPTION OF THE PROPOSED ACTION

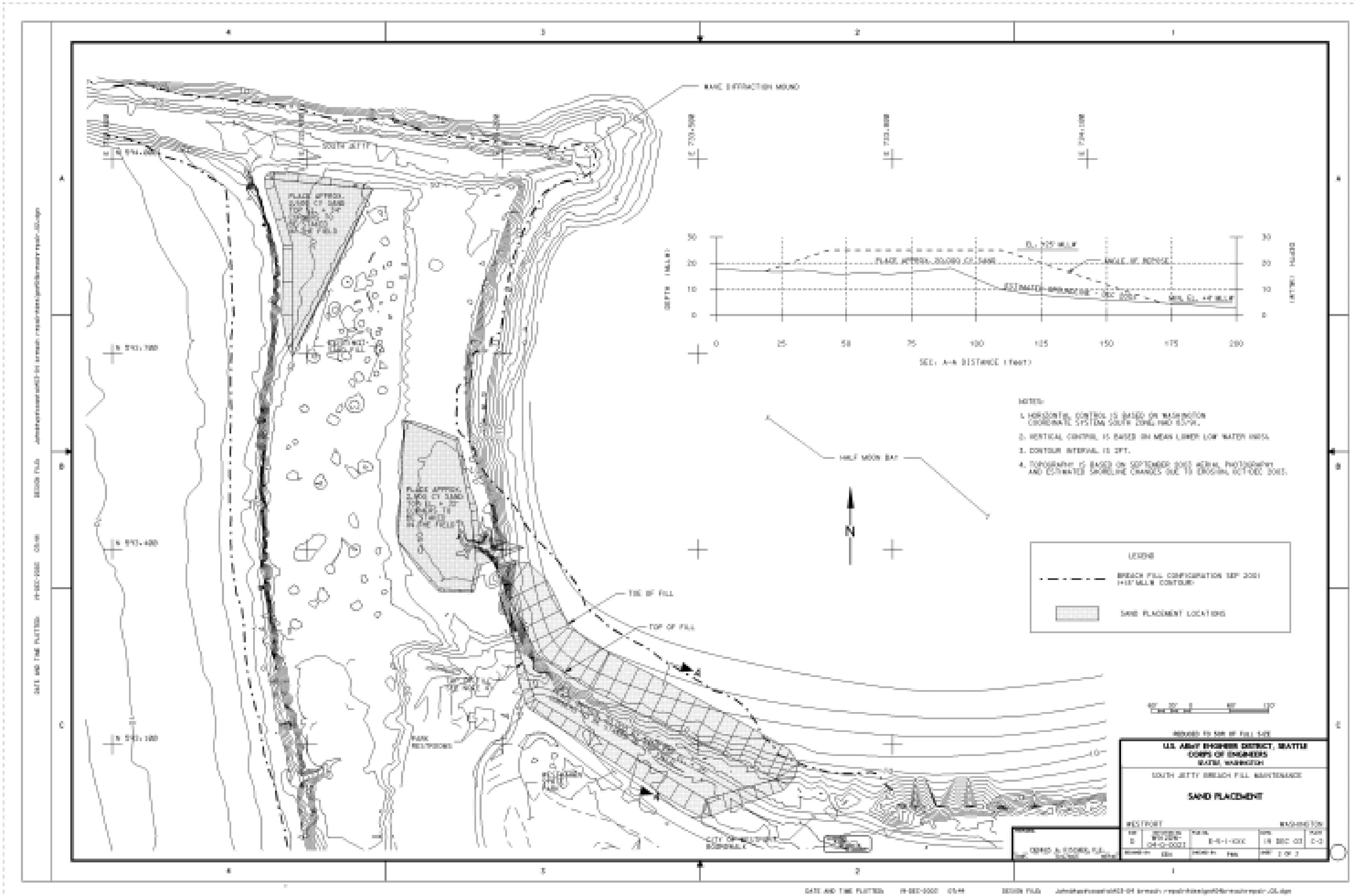
The proposed action consists of the placement of approximately25,000 cubic yards of sand on the south jetty breach fill and in the southwest corner of Half Moon Bay (see Figure 2.) in January and February 2004. Construction duration will be approximately 2 to 3 weeks. If in-water work cannot be competed prior to the closure of the "fish window," the beach fill portion of the project would occur in July 2004.

The sand will be excavated from the existing Half Moon Bay direct beach nourishment dredged material disposal site, which is an upland stockpile situated above the Point Chehalis revetment extension constructed in 1999 (see Figure 3). Material will be excavated in a uniform layer over the western portion of the stockpile, where the coarsest sand is present. The material will be placed into trucks and moved to the breach fill site via the Westhaven State Park access road. The borrow site is located approximately 2000 feet east of the placement site. Flagmen would be present at both the stockpile site and main parking area to insure park visitors are safely routed around construction activities. No crushed rock would be used to facilitate truck access to the borrow or fill sites.

Approximately 2,500 cubic yards of sand will be placed on the large rainwater runoff gullies that have formed along the southeast corner of the breach fill. Approximately 2,500 cubic yards of sand will be placed directly adjacent to the jetty in the northwest corner (ocean side) of the breach fill; this portion of the breach fill is lower in elevation than the rest of the breach fill.

Approximately 20,000 cubic yards of sand will be placed in the southeast corner of the breach fill. Rather than individual loads (~10 cubic yards in size) being end-dumped directly onto the beach, larger quantities of sand would be temporarily stockpiled on upland areas adjacent to the shoreline. The sand would then be pushed off the erosion scarp during low tides when water is not present on the placement area. By placing material uniformly over a larger area all at once, erosion of newly placed material may be minimized (i.e., no creation of small headlands to receive focused wave energy) and none of the material would be placed when water was over the

project footprint. Much of the 20,000 cubic yards will be left on top of the boardwalk and the parking area northeast of the park access road to form a sacrificial dune approximately 10 feet high. This material will likely wash into the bay through wave action.



WAVE DIFFRACTION MOUND
SOUTH JETTY
HALF MOON BAY
N
TOE OF FILL
TOP OF FILL
PARK RESTROOMS
PLACE APPROX. 20,000 CY SAND
EL. +25' MLLW
ANGLE OF REPOSE
SEC. A-A DISTANCE (feet)
NOTES:
1. HORIZONTAL CONTROL IS BASED ON WASHINGTON COORDINATE SYSTEM SOUTH ZONE, NAD 83/91.
2. VERTICAL CONTROL IS BASED ON MEAN LOWER LOW WATER (MLLW).
3. CONTOUR INTERVAL IS 2FT.
4. TOPOGRAPHY IS BASED ON SEPTEMBER 2003 AERIAL PHOTOGRAPHY AND ESTIMATED SHORELINE CHANGES DUE TO EROSION, OCT-DEC 2003.
LEGEND
BREACH FILL CONFIGURATION SEP 2001 (+18' MLLW CONTOUR)
SAND PLACEMENT LOCATIONS
REDUCED TO 50% OF FULL SIZE
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON
SOUTH JETTY BREACH FILL MAINTENANCE
SAND PLACEMENT
WESTPORT
WASHINGTON
19 DEC 03
C-2
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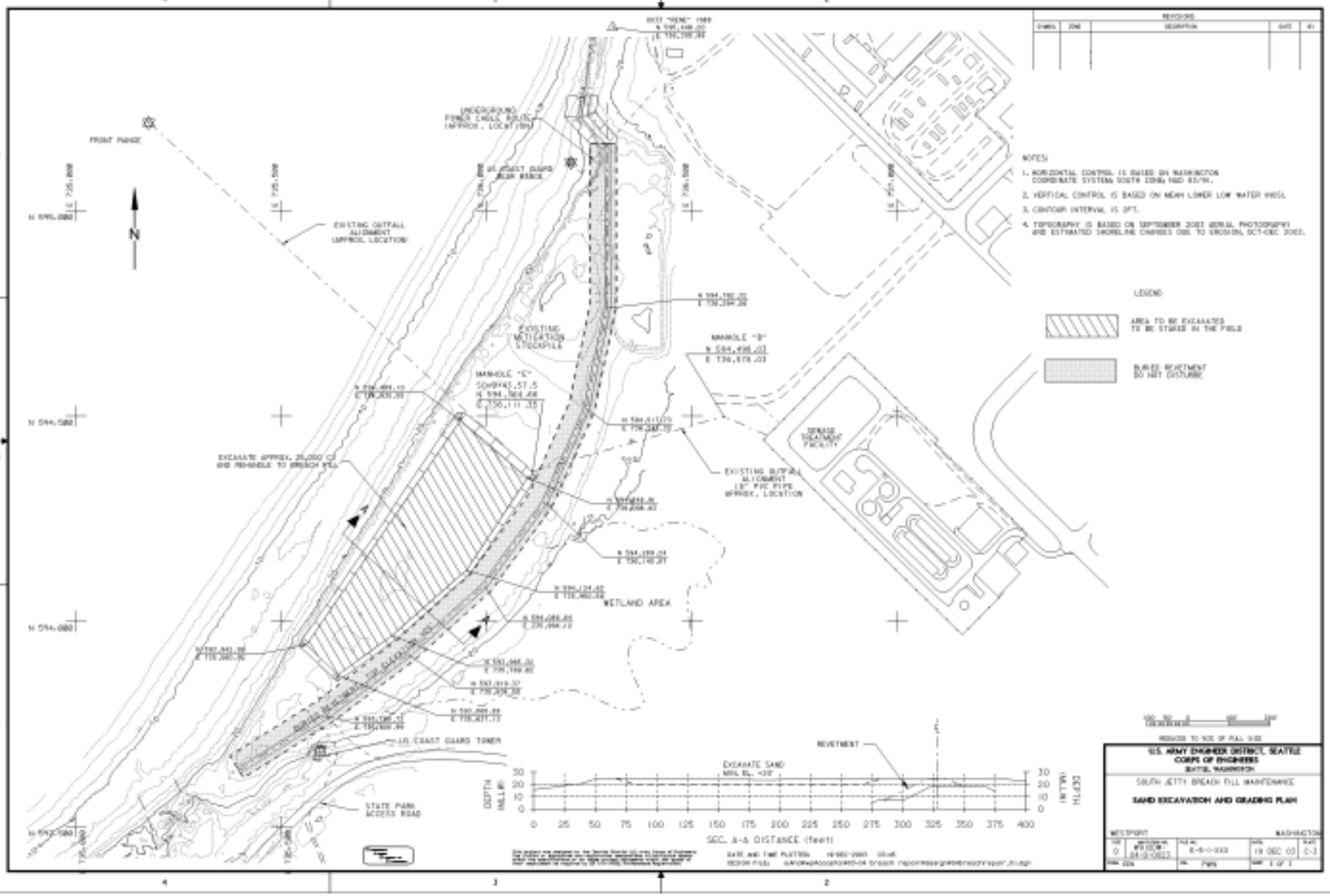
REVISIONS
NOTES:
1. HORIZONTAL CONTROL IS BASED ON WASHINGTON COORDINATE SYSTEM, SOUTH ZONE, NAD 83/91.
2. VERTICAL CONTROL IS BASED ON MEAN LOWER LOW WATER (MLLW).
3. CONTOUR INTERVAL IS 5FT.
4. TOPOGRAPHY IS BASED ON SEPTEMBER 2003 AERIAL PHOTOGRAPHY AND ESTIMATED SHORELINE CHANGES DUE TO EROSION, OCT-DEC 2003.
LEGEND
AREA TO BE EXCAVATED TO BE STAKED IN THE FIELD
BURIED REVETMENT DO NOT DISTURB
FRONT RANGE
REAR RANGE
EXISTING OUTFALL ALIGNMENT (APPROX. LOCATION)
UNDERGROUND POWER CABLE RUN (APPROX. LOCATION)
EXISTING MITIGATION STOCKPILE
MANHOLE "B"
MANHOLE "C"
EXCAVATE APPROX. 25,000 CY AND REGRADE TO BREACH WELL
EXISTING OUTFALL ALIGNMENT 18" PVC PIPE APPROX. LOCATION
SEWAGE TREATMENT FACILITY
WETLAND AREA
U.S. COAST GUARD TOWER
STATE PARK ACCESS ROAD
REVETMENT
EXCAVATE SAND MIN. EL. +10'
DEPTH (MLLW)
HEIGHT (MLLW)
SEC. A-A DISTANCE (feet)
0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400
REDUCE TO SIZE OF FULL SIZE
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON
SOUTH JETTY BREACH FILL MAINTENANCE
SAND EXCAVATION AND GRADING PLAN
WESTPORT
WASHINGTON
19 DEC 03
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4. EXISTING ENVIRONMENT

Extensive information on the existing environment of Grays Harbor has been provided in previous technical studies, as well as environmental and biological evaluations (see Section 1.5 for a list of available documents). Only summary information specific to the Westhaven/Half Moon Bay area and this project is provided in this brief assessment.

4.1 Geology

The shoreline at Point Chehalis just east of the south jetty receded during construction and after completion of the south jetty. However, the shoreline recovered during the years that the top elevation of the jetty was relatively low and the structure was in a deteriorated condition. After repairs to the south jetty were completed in 1939, erosion again occurred, initiating the formation of Half Moon Bay in 1946 and construction of the Point Chehalis revetment and groins in the 1950s. The revetment stabilized Point Chehalis, but the shoreline between the revetment and the south jetty has continued to recede. Between 1957 and 1993, the shoreline of Half Moon Bay receded at an average annual rate between 5 and 10 feet/year, destroying several U.S. Coast Guard structures and endangering the City of Westport's sewer outfall, wastewater treatment plant, and city well fields, as well as the access road to Westhaven State Park.

The formation of crenulate-shaped bays like Half Moon Bay at artificial headlands on the open coast is a commonly observed phenomenon. Several researchers have worked to establish relationships between this shoreline shape and wave direction. By evaluating physical model data and field data from crenulate bays known to be at equilibrium, one group of researchers has developed parabolic-equation curves which can be used to predict equilibrium shoreline position. Coastal engineers at the Corps' Coastal and Hydraulics Laboratory have used this technique to estimate the equilibrium shoreline shape for Half Moon Bay. Results are presented in the *South Jetty Sediment Processes Study* (April 2003). The computed equilibrium shoreline is near the existing bay shoreline. However, this does not mean that additional erosion will not occur. The shoreline is dynamic and will respond to changes in water level and incident wave conditions. Storms characterized by prolonged elevated water levels will result in increased erosion. The purpose of the previously placed gravel was to decrease risk of shoreline recession during these periods of high water level.

Field observations and shoreline positions interpreted from aerial photographs reveal that the transition gravel placed in 2000 and 2001 was successful in reducing erosion along the shoreline in the locations where it was placed. However, aerial mapping by the Corps of Engineers shows that, during the winter of 2001-2002, the sandy shoreline at the terminus of the gravel receded as much as 50-feet landward. The height of the unstable erosion scarp also increased. An evaluation of beach transect profiles can be found in the *South Jetty Sediment Processes Study* (April 2003).

The beach along Half Moon Bay is generally sandy, but in areas where transition fill material has been placed in the past the beach is composed of cobbles. Wave energy has sorted the transition material so that larger cobbles are generally present in upper intertidal areas and smaller gravels are found along the lower portion of the beach profile. In addition, adjacent sandy areas do have patches of gravels present due to down drift transport of the transition material from previous placement activities by waves and currents. Scattered chunks of asphalt and angular rock debris

are also present as a result of the previous breach and erosion of the South Jetty maintenance haul road.

4.2 Vegetation

The project footprint is unvegetated. Along the steep bank directly upland from the project footprint, erosion is actively eating away at the dune adjacent to the access road. This area is dominated by the invasive non-native European beach grass (*Ammophila arenaria*), although some native dune grass (the dune wild rye, *Elymus mollis*) is present. Other non-native invasive plants such as Scot's broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus discolor*) are present to the east along the back side of this dune and a haul road used during previous construction projects.

A large deflation plain wetland is present on the south side of the State Park access road. Vegetation in the wetland is dominated by shore pine (*Pinus contorta*), Hooker's willow (*Salix hookerana*), California wax myrtle (*Myrica californica*), slough sedge (*Carex obnupta*), common rush (*Juncus effusus*), and silverweed (*Potentilla anserina*). Typical of this type of dunal feature, small upland hummock areas are scattered through the wetland complex.

4.3 Fish and Wildlife

Half Moon Bay provides habitat for a variety of fish species, including smelt, Pacific herring, starry flounder, shiner perch, sand lance, northern anchovy, Pacific sanddab, lingcod, redtail surfperch, sand sole, threespine stickleback, and Pacific staghorn sculpin (R2 Resource Consultants, 1999). Salmonids, including chinook, coho, and chum salmon are also known to utilize Half Moon Bay.

R2 Resource Consultants (1999) conducted weekly beach seine surveys at two sites in Half Moon Bay between April 9 and May 21, 1999. The purpose of this effort was to document the presence of migrating juvenile salmon. Smelt, chum salmon, coho salmon, Pacific sanddab, starry flounder and shiner perch were the species most frequently captured. No other salmonid species were caught during this sampling effort. Smelt dominated the total catch, representing greater than 89 percent of the 3,032 fish captured at both sites during the study period. More juvenile coho and chum were captured at Site 1 (located in the western portion of the bay which is protected by the submerged jetty) than at Site 2 (located in the more exposed eastern portion of the bay). Since these data were obtained, the elevation of the submerged jetty was lowered from +8 feet MLLW to +2 feet MLLW.

The commercially important Dungeness crab is found in Half Moon Bay. Their numbers are monitored by the Corps in conjunction with nearshore disposal of dredged material in Half Moon Bay. The Corps does not have knowledge of any other data on benthic invertebrates, including bivalves and prey organisms for fish species, in this area.
Terrestrial mammals which may occur in the project vicinity include black-tailed deer, voles, raccoon, striped skunk, and bobcat. Marine mammals found in Grays Harbor include the harbor seal, Pacific harbor porpoise, gray whale, as well as California and Steller sea lions. A wide variety of migratory waterfowl, shorebirds, and seabirds frequent the project area. The western sandpiper and over wintering dunlins are particularly numerous species.

Grays Harbor is a major shorebird staging area, and a critical part of the Pacific Coast shorebird migration in the spring. Herman and Bulger (1981) identified the types of habitats in Grays Harbor that are of primary importance to shorebirds and the extent to which different substrates are used by various species. Small sandpipers, dowitchers, and knots forage on mudflats with a high silt content, while plovers generally prefer sandier substrates. Turnstones usually forage among cobble and rock, a substrate type the occurs only locally in Grays Harbor.

4.4 Threatened and Endangered Species

Sixteen species listed as either threatened or endangered are potentially found in Grays Harbor. Listed species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) include: the bald eagle (*Haliaeetus leucocephalus*), brown pelican (*Pelecanus occidentalis*), Western snowy plover (*Charadrius alexandrius nivosus*), marbled murrelet (*Brachyramphus marmoratus*), bull trout (*Salvelinus confluentus*), and Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Listed species under the jurisdiction of the National Marine Fisheries Service (NMFS) include: the Steller sea lion (*Eumetopias jubatus*), humpback whale (*Megaptera novaeangliae*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), Sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), green sea turtle (*Chelonia* mydas), olive ridley sea turtle (*Lepidochelys olivacea*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

Information on these species' life histories and usage of Grays Harbor, as well as impacts of maintenance of the Federal navigation project on these species, is provided in the 2001 *Programmatic Biological Evaluation: Fiscal Years 2001-2006 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Navigation Project, Grays Harbor County, Washington*, which is available online at <http://www.nws.usace.army.mil/ers/envirdocs.html>.

4.5 Water Quality, Air Quality, and Noise

Waters in the project vicinity are rated as class AA (extraordinary) by the Washington Department of Ecology. Grays Harbor County meets U.S. Environmental Protection Agency (EPA) Ambient Air Quality Standards, and those set by Washington State for suspended particulates and sulfur dioxide. Air quality is very good in the Westport area. The project site is not located in a Clean Air Act non-attainment area. At the project site, natural sources such as wind and surf are the principal source of sound.

4.6 Recreation

Westhaven State Park is located south of the jetty and adjacent to Half Moon Bay in an area which accreted after construction of the jetty. This park is composed of almost 80 acres and has 1,215 feet of ocean frontage. Westhaven State Park is a day-use facility with a parking area, picnic tables and ADA unisex restrooms. In December of 1987, winter storms washed away the restroom, 2 picnic sites and much of a paved parking area. Recreation occurring in the project area includes wave riding (standup surfing, knee boarding, body boarding, body surfing), kayaking, windsurfing, scuba diving, surf fishing, crabbing, beach combing, strolling, kite flying, picnicking, and associated activities.

Recreational use of Half Moon Bay occurs year-round. The shoreline is in close proximity to the ocean coast, yet is sheltered from the most severe elements. Public access to the beach is by

walking from either the Westhaven State Park parking area or a parking lot at the northeast end of Half Moon Bay. Parking on the mitigation stockpile, between the U.S. Coast Guard Rear Range and the U.S. Coast Guard Tower occurs.

Wave riding/surfing is a popular activity in the Westhaven State Park/Half Moon Bay area. The three prime surfing locations include South Beach near the South Jetty (The Jetty), Half Moon Bay (The Cove), and the groin area of the Point Chehalis revetment (The Groins). Surfers report that one of the three spots is usually producing a ride-able wave, making this an all-season surfing locale on the Washington coast. Half Moon Bay is sheltered from wind and direct swell conditions, unlike open ocean beaches. Deeper water in the harbor entrance allows swells to gain momentum before shoaling up offshore to produce smoothly breaking waves which are sought after by surfers.

5. ENVIRONMENTAL EFFECTS

5.1 Geology

Implementation of the preferred alternative would replace some of the breach fill material lost through erosion. Maintaining the height of the breach fill will reduce the risk of overtopping, and therefore the risk of a catastrophic breach, but will not slow erosion rates. Future renourishment will be required to maintain the height of the breach fill and/or shoreline position.

Approximately 2.27 acres of upland and 0.5 acre of intertidal habitat will be directly impacted by the 2004 placement of sand. Smaller areas would be affected by subsequent placements. The existing beach substrate is predominately sandy, so the nourishment material will be of a very similar grain size to the native material. A substantial portion of any sand placed directly along the shoreline will be redistributed along the beach and down to lower elevations by waves and currents, further extending the footprint affected by the placement action. Sand from Half Moon Bay is transported by cross and longshore currents to deeper waters in the outer bay and the Grays Harbor inlet, where tidal flushing contributes to permanent loss of sediment offshore.

The removal of material from the Point Chehalis revetment extension mitigation stockpile is not expected to affect Corps compliance with the inter-agency mitigation agreement for the Point Chehalis revetment extension project. Based on a comparison of the 2001 - 2002 survey data, the erosion rate in the vicinity of the mitigation stockpile is approximately 5,000 to 10,000 cubic yards per year (cy/yr). At this time the stockpile contains approximately 180,000 cy of sand, of which about 125,000 cy is actually located in an area that would be subject to erosion. For the proposed project, 25,000 cy will be borrowed from the mitigation site this winter, and 15,000 cy may be borrowed each subsequent year. Assuming that the erosion rate is 10,000 cy/yr, the combined loss of material from the mitigation site due to combined erosion and borrow activities would be 35,000 cy this year and 25,000 cy/yr in subsequent years. Under these assumptions, the presently available stockpile volume of 125,000 cy could provide material for both the mitigation requirements and for the proposed breach fill maintenance for at least three years without re-nourishing the stockpile with maintenance dredged material.

5.2 Vegetation

Large trucks will enter the project site via the park access road. The mitigation stockpile and access ramp from the park road are unvegetated, so there will be no vegetation impacts associated with the excavation and transport of sand. Very little, if any, vegetation will be disturbed as part of the placement along the shoreline because the dune waterward of the road has eroded away. Since no crushed rock will be placed to facilitate access, large trucks will not be able to traverse the sandy breach fill. Trucks with off-road capabilities or tracked front-end loaders will likely be used to place the 5000 cubic yards of sand on top of the breach fill. The contractor will be instructed to use, where possible, the unvegetated vehicle access way in order to reduce damage to the dune grass planted in November 2002. As described in Section 8, the Corps will replant areas affected by construction in the spring or fall after any placement occurs.

5.3 Fish and Wildlife

Fish and crabs will not be directly impacted by the shoreline portion of proposed action because sand placement will occur above the waterline at low tides so as to not directly interfere with their usage of mid and upper intertidal habitats. In addition, the placement will occur during a time of the year when particularly sensitive life history stages (e.g., out-migrating juvenile salmon, settling larval crabs) are not present at the project vicinity. Turbidity is not expected to increase substantially above ambient conditions due to the predominately sandy nature of the dredged material and the large quantity of suspended sand currently transported via longshore drift in the project area.

Placement of sand in areas closest to the source will physically disturb, cover and eliminate infauna and small, slower moving epifauna in the area of direct placement. Mobile epifaunal species may be able to escape the material depending on their rate of motility and depth of material. Benthic communities in areas of thin, or slowly accreting fill will be able to survive the placement.

Because benthic organisms in the Half Moon Bay intertidal zone have adapted to a highly energetic, eroding beach face regime, the fact that material of like composition (grain size) is being placed, and due to the methods of placement described above, it is expected that a new benthic assemblage similar in species composition to that existing will become established in a relatively short time frame, perhaps within six months. This expectation is supported by numerous studies, some of which are summarized in this memorandum, that focus on recovery rates of benthic communities following various physical events including beach nourishment and erosion control projects. Recovery of the impact area at Half Moon Bay will occur as larval and adult forms of infauna and epifauna are recruited from adjacent (primarily from the east) sandy beaches. Mobile epifauna will move into the area and infaunal larvae will quickly begin to colonize the area also. Time for establishment of an equivalent assemblage to what exists prior to placement will be dependent on weather conditions and tidal actions. The degree of sand movement down beach from the stockpiled area could be gradual throughout the winter or could occur in larger pulses, the latter of which could delay full establishment of the community until the following spring or summer. However, based on our literature review, HMB intertidal assemblages should recover within 6-12 months following sand placement.

A documented surf smelt spawning area is located along the Pacific Ocean southwest of the project and herring spawning occurs in the Elk River estuary and South Bay to the southeast, but no forage fish spawning is known to occur in Half Moon Bay. Given the high wave energies and steep bathymetry of Half Moon Bay, no marine vegetation is present so no herring spawning occurs in the bay. The preferred substrate for surf smelt spawning is coarse sand and pea gravel. Substrate on the Half Moon Bay shoreline is either of a small grain size, or much larger grain size in the case of previously placed transition gravel/cobble, so it is not suitable for surf smelt spawning. Washington Department of Fish and Wildlife (WDFW) has surveyed the Half Moon Bay shoreline for evidence of sand lance spawning, but has not found any eggs. Wave energy is likely too high in this area to support sand lance reproduction (Robert Burkle, WDFW, pers. comm., 12/18/03).

Wildlife in the vicinity of construction activities may be disturbed by the noise associated with operation of heavy machinery. They will likely avoid the immediate construction zone and shift foraging activities to adjacent areas. This effect will be temporary, and end once construction is complete.

5.4 Threatened and Endangered Species

Based on the evaluations submitted to USFWS and NOAA-Fisheries in August, the Corps has determined that the project will have **no effect** on the marine mammal and sea turtle species under the jurisdiction of NOAA Fisheries, and may affect, but is **not likely to adversely affect** species under the jurisdiction of USFWS.

5.5 Water Quality, Air Quality, and Noise

Impacts to water quality are not expected to result from the proposed project. Turbidity is not expected to increase substantially above ambient conditions due to the predominately sandy nature of the dredged material, and the large quantities of suspended sand currently transported via longshore drift in the project area.

There will be a temporary and localized reduction in air quality due to the emissions of equipment operating during transport and placement of the transition beach material. The impact of this increase will be temporary, highly localized, and will not result in violation of applicable air quality standards. Ambient noise levels will also increase during operation of equipment at the project site. The noise type will shift somewhat from natural sources to the noise of heavy machinery. This shift will also be highly localized and temporary.

5.6 Recreation

The proposed placement will occur in a day-use State park. Over the 2-3 week-long construction period, parking and pedestrian access to the stockpile and the western Half Moon Bay shoreline would be closed. The northeastern portion of the main parking area and the City of Westport boardwalk would be closed both during construction and until the sacrificial dune erodes into the bay (possibly as long as fall 2004). Other parking areas would not be affected by the project. Access to the ocean beach will remain open at all times.

Assuming 10 to 25 cubic yards per load, between 1000 and 2500 truck trips may be needed to move 25,000 cubic yards of sand. Flagmen would be present at both the stockpile site and main

parking area to insure park visitors are safely routed around construction activities. Park visitors would be inconvenienced by the construction activity. Visitors may be delayed in entering and exiting the park, and prevented from accessing some areas of the Half Moon Bay shoreline. These impacts would be worse if placement were delayed until July 2004, since visitation is much higher during the summer months. However, these disruptions will be temporary and localized.

6. INDIRECT EFFECTS

Indirect effects are caused by an action, usually later in time or farther removed in distance, but are still reasonably foreseeable. It is not the intent of this action to promote development in the area, however development may become more attractive because of the Corps attempts to slow erosion along the Half Moon Bay shoreline.

A review of permit applications submitted to Seattle District Regulatory Branch indicates that there is at least one reasonably foreseeable future action currently planned for the immediate project area. There is an application on file for development of a destination hotel, conference center, "Scottish Links" style golf course, ocean-front condominiums, and supporting commercial development adjacent to the Westhaven State Park access road (Reference Application Number 200301009). This development, commonly known as Links at Half Moon Bay, would occupy 243 acres south and east of Half Moon Bay.

One part of the Links at Half Moon Bay proposal, the construction of 200 condominiums in eight 5-story buildings directly south of the park access road, would be particularly at risk if erosion along the southern shoreline of Half Moon Bay continued unabated. The park access road is currently depicted as the only means of accessing the condominiums. The project would require either a separate access road or protecting the existing road from erosion.

The Corps provided comments on the Draft EIS and Final EIS for the Links at Half Moon Bay development. In the comment letters, the Corps made clear that there is a long-term potential for shoreline erosion and associated storm-induced backshore flooding in the area proposed for the Links development, and that the Corps has no existing authority to maintain the South Beach or Half Moon Bay shorelines. However, any project to stabilize the shoreline with a view towards protecting the road would also offer some level of protection for any development relying on the road for access. For this reason, the impacts of the development must be included in the evaluation of Corps projects in this area which could directly or indirectly protect the park access road.

Since the condominium development may be dependant on the park access road, it is reasonable to assume that at some point in the future there may be a need to stabilize the Half Moon Bay shoreline in order to protect the road. In fact, some efforts have already occurred. During October 2003, the City of Westport requested a permit from the Corps to address bank erosion in Half Moon Bay (Reference Application Number 200301101). The City of Westport, Port of Grays Harbor, or the Links at Half Moon Bay developer may pursue longer-term shoreline erosion control. The Corps may or may not be requested to use one of its authorities to assist in this effort. However, the Corps does not have authority to directly assist private property owners

with shoreline erosion. Regardless of which entity implemented a shoreline stabilization project, it would have to be evaluated within the context of past efforts (see Section 7 on cumulative effects).

The sand placement actions proposed in this document will only forestall shoreline retreat—not prevent further retreat—so these placements of sand cannot be considered an erosion control action. At this time, the Corps is not committing to continue to place sand as needed to protect the park access road. The focus of this effort is maintaining the breach fill, and future efforts to protect the breach fill may focus more on other vulnerable areas (e.g., the ocean side). This action will not protect the road, so growth-inducing effects are unlikely and thus the indirect effects are insignificant.

7. 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.

The Corps reviewed the history of actions within all of Grays Harbor for a watershed-scale perspective of cumulative impacts (see Appendix B). The time period considered in this analysis was 1852, prior to construction of the south jetty, to present. Since it was apparent that actions associated with the south jetty had the most profound historic effects in the project vicinity (Half Moon Bay, South Beach, Westhaven Park, Point Chehalis, and the City of Westport), the analysis focused on this area for assessing cumulative impacts.

The analysis presented in Appendix B shows that the major activities which have contributed to, and continue to contribute to, potential cumulative impacts to the area are the construction of structures associated with the navigation projects and human occupation of the coastal strand and sand dune communities. Over the past decade, numerous construction actions have occurred in the vicinity of Half Moon Bay (see Table 1 and Figure 3). Some of these actions have modified structures associated with the navigation project, and may have contributed to cumulative degradation of biological function and recreational use of Half Moon Bay.

In addition, several dredged material disposal sites are located in and near Half Moon Bay. Over the past decade, millions of cubic yards of dredged material have been placed in these sites (see Table 2). The two sites located in and directly adjacent to Half Moon Bay have received over 2.3 million cubic yards of sand dredged from the outer Harbor. Despite all of this material being placed into the bay, it continues to deepen. The effects of the navigation structures overwhelm the impact of the placement activities; sand does not accumulate but rather is transported to deeper waters in the outer bay and Grays Harbor inlet, where tidal flushing results in permanent loss of sediment offshore.

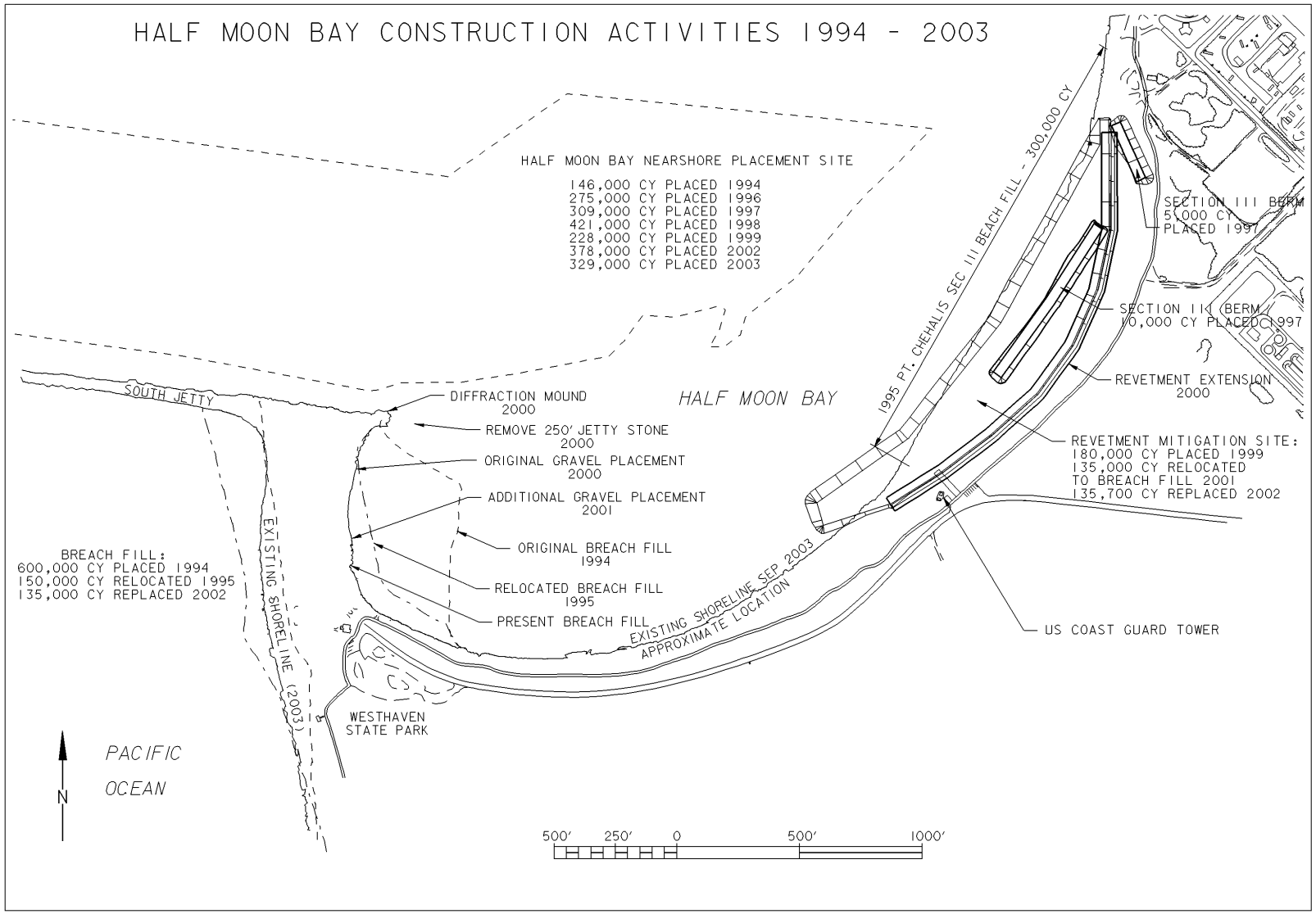
Table 1. Construction Activities in the Vicinity of Half Moon Bay since 1994

1993	Breach occurs between south jetty and adjacent shore
1994	Placement of 600,000 cubic yards (cy) of dredged material to close breach.
1995	Placement of 82,000 cy of sand along eastern Half Moon Bay (HMB) shoreline by City of Westport to protect sewer outfall line
1995	Placement of 300,000 cy of dredged material along eastern Half Moon Bay shoreline (Section 111 project)
1995	Relocation of 150,000 cy of breach fill material from Half Moon Bay to ocean side of fill
1997	Placement of 5000 cy sand berm at Section 111 project
1997	Placement of 10,000 cy sand berm at Section 111 project
1998-1999	Extension of Point Chehalis revetment by 1900 feet
1999-2000	South Jetty Repair Project: (1) construction of wave diffraction mound at landward end of south jetty, (2) removal of eastern 250' of the south jetty to elevation +2' MLLW, and (3) placement of 11,600 cy of 12-inch minus transition material adjacent to diffraction mound.
1999-2002	South Jetty Rehabilitation Project: (1) structure rehabilitation, sta. 87+00 to 120+00, and (2) placement of 16,100 cy of 12-inch minus cobble/gravel material to extend transition beach and protect construction access road
2002	Relocation of 135,000 cy of dredged material from HMB mitigation stockpile to breach fill

Table 2. Grays Harbor Dredged Material Disposal Site Usage, 1994-2003

Disposal Site	Volume Placed (cubic yards)	Number of Placements 1994 - 2003
Half Moon Bay - Nearshore	2,086,875	7
Half Moon Bay - Direct	229,669	2
South Beach	541,794	4
South Jetty Breach Fill	735,000	2
Point Chehalis	7,549,859	10
South Jetty	8,565,560	10
3.9 Mile	541,794	4
TOTAL	20,250,551	

Figure 3. Construction Activities in the Vicinity of Half Moon Bay since 1994



Considering the small—relative to the amount of dredged material placed annually and the volume of material moved by waves and currents—volume proposed here, this action would be of little consequence. The proposed placement consists of less than 1% of the total volume of material placed in Half Moon Bay over the past 10 years. In the context of all that has occurred in the past, the placement of 25,000 cubic yards of sand along the Half Moon Bay shoreline and on the breach fill will cause only a tiny increment more harm to biological function. The same would be true for future annual placements of up to 15,000 cubic yards. The impacts would likely be so small as to be immeasurable. The project will not change the characteristics of the function or extent of the existing navigation project, so it will not affect other shoreline processes. The project will also not result in any changes to the human occupancy of the project area. The Corps concludes that there will not be a significant cumulative effect associated with this action.

8. MITIGATION

In order to address unavoidable impacts associated with the proposed action, the Corps will plant approximately 20,000 sprigs of native dune grass (*Elymus mollis*) on the breach fill during the spring of 2004. This effort will concentrate on areas that were disturbed as part of construction activities, and areas not densely planted as part of the 2002 revegetation effort. The dune grass will reduce wind erosion of the breach fill.

9. ENVIRONMENTAL COMPLIANCE

9.1 National Environmental Policy Act

This Environmental Assessment (EA) satisfies the documentation requirements of NEPA. A draft Finding of No Significant Impact (FONSI) can be found in Appendix B. After a 30-day public comment period, a final assessment will be prepared.

9.2 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.

In August 2003, the Corps prepared a biological evaluation (BE) for the proposed placement of gravel and cobble material along the Half Moon Bay shoreline. In the BE, determinations were made that the project would have “no effect” on species under the jurisdiction of the NOAA Fisheries and may affect, but is “not likely to adversely affect” species under the jurisdiction of USFWS. Letters concurring with the determinations made in the BE were received on November 10, 2003 (NOAA-Fisheries) and November 7, 2003 (USFWS).

Since the biological impacts of this proposed sand placement would be less severe than those of the previously recommended gravel/cobble placement, the Corps will re-consult with USFWS and NOAA-Fisheries regarding the modified proposal. The effect determinations made in the August 2003 BE will not change.

9.3 Clean Water Act

9.3.1. Section 404

The Corps has issued a revised public notice for the proposed project (CENWS-OD-TS-NS-21R), concurrent with the issuance of this draft EA. A copy of the public notice can be found in Appendix A.

The Corps must demonstrate compliance with the substantive requirements of the Clean Water Act prior to discharging fill material into waters of the United States. The Corps will prepare a revised 404(b)(1) evaluation to document the Corps' findings regarding this project pursuant to Section 404 of the Act.

9.3.2. Section 401

On October 31, 2003, the Corps received a Section 401 Water Quality Certification for the proposed placement of gravel and cobble material from the Washington Department of Ecology (Ecology). The Corps will send a letter to Ecology requesting an amendment to that 401 certification to cover the placement of sand.

9.4 Coastal Zone Management Act

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved state Coastal Zone Management Program.

The Corps prepared a Coastal Zone Management Act Consistency Determination for the previously proposed placement of gravel and cobble material to ensure that the proposed work complies with the policies, general conditions, and general activities specified in the City of Westport Shoreline Management Master Plan and the State of Washington Shoreline Management Program. A letter concurring with this determination was received from the Department of Ecology on October 31, 2003. The Corps will send a letter to Ecology requesting their concurrence with the modified proposal.

9.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. The project area is composed of fill material and recently deposited sand deposits which precludes the possibility of prehistoric or early historic-period archeological deposits being present. A professional pedestrian archeological survey of the project area conducted by the Corps did not produce evidence of possible shipwreck remains. Background research indicates that there are no reported shipwrecks within the project area. The Corps sent a letter report to the Washington State Historic Preservation Officer (SHPO) stating the negative results of the archeological survey and background research and recommending a determination of no historic properties affected for the project. A letter concurring with this determination was received from the SHPO on September 30, 2003.

9.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with the NOAA-Fisheries 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. Descriptions of EFH are provided in Fishery Management Plans produced by the Pacific Fisheries Management Council.

An EFH analysis was included in the August 2003 biological evaluation for the previously proposed gravel/cobble alternative submitted to NOAA-Fisheries. The Corps received a letter from NOAA-Fisheries making conservation recommendations on November 10, 2003. By modifying the proposed project, the Corps is implementing two of the conservation recommendations suggested by NOAA-Fisheries. Recommendation 3 suggested placing smaller transition material on the beach, which we have done. The modified proposal reduces the project footprint (recommendation 2), which we have also done. Only 0.5 acre of intertidal habitat would be directly affected by the sand placement; the remainder of the total 2.77 acre project footprint would be located at higher elevations. Most of the original 2 acre project footprint would have been in intertidal areas.

10. CONCLUSION

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

11. REFERENCES

Atwater, B.F. 1987. "Evidence for great Holocene earthquakes along the outer coast of Washington State." *Science*, 336:942-944.

Ballard, R. L. 1964. *Distribution of beach sediment near the Columbia River, Washington*. M.S. thesis, University of Washington, Seattle, WA.

Burch, T .L., and Sherwood, C .R. 1992. *Historical bathymetric changes near the entrance to Grays Harbor, Washington*. Battelle/Marine Sciences Laboratory, Pacific Northwest Laboratory, Richland, WA.

Doyle, D. 1996. *Beach response to subsidence following a Cascadia subduction zone earthquake along the Washington-Oregon coast*. M. S. Thesis, Portland State University, Portland, Oregon, 113 p.

Gelfenbaum, G., Sherwood, C.R., Peterson, C.D., Kaminsky, G.M., Buijsman, M., Twichell, D.C., Ruggiero, P., Gibbs, A.E., and Reed, C. 1999. "The Columbia River littoral cell: A

sediment budget overview." *Proceedings of Coastal Sediments '99*, ASCE, Long Island, NY, pp. 1660-1675.

Herman, S.G. and J.B. Bulger. 1981. *The Distribution and Abundance of Shorebirds during the 1981 Spring Migration at Grays Harbor, Washington.* Grays Harbor and Chehalis River Improvements to Navigation Environmental Studies. U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

Kaminsky, G.M. and G. Gelfenbaum. 1999. "The Southwest Washington Coastal Erosion Study: Research in support of coastal management." *Proceedings of Coastal Zone '99*, San Diego, CA, pp. 737-739

Kaminsky G.M., Daniels, R.C., Huxford, R., McCandless, D., and Ruggiero, P. 1999. "Mapping erosion hazard areas in Pacific County, Washington." *Journal of Coastal Research, Special Issue #28*, pp. 158-170.

Kaminsky, G.M., Buijsman, M.C., and Ruggiero, P. 2000. "Predicting shoreline change at decadal scale in the Pacific Northwest, USA." *Proceedings of the 27th International Conference on Coastal Engineering*, ASCE, Sydney, Australia, pp. 2400-2413.

Phipps, J., and Smith, J. 1978. *Coastal accretion and erosion in southwest Washington.* Washington State Department of Ecology, Olympia, WA.

R2 Resource Consultants. 1999. *Juvenile Salmonid Use of Half Moon Bay, Grays Harbor, Washington*. Report to the U.S. Army Corps of Engineers, Seattle District.

Sternberg, R. W. 1986. "Transport and accumulation of river-derived sediment on the Washington continental shelf, USA." *Journal of Geological Society of London* 143, 945-956.

U.S. Army Corps of Engineers. 2003. *Half Moon Bay Transition Gravel and Cobble Placement Final Environmental Assessment*. U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

U.S. Army Corps of Engineers. 2003. *South Jetty Sediment Processes Study, Grays Harbor Washington: Evaluation of Engineering Structures and Maintenance Measures*. U.S. Army Corps of Engineers, Engineer and Research Development Center, Coastal and Hydraulics Laboratory, Vicksburg, MS. ERDC/CHL TR-03-4.
http://libweb.wes.army.mil/uhtbin/hyperion/CHL-TR-03-4.pdf

U.S. Army Corps of Engineers. 2002. *South Jetty Breach Fill Final Environmental Assessment*. U.S. Army Corps of Engineers, Seattle District, Seattle, WA.
http://www.nws.usace.army.mil/ers/reposit/Breach_Fill_EA.pdf

U.S. Army Corps of Engineers. 2001. *Final Environmental Assessment: Fiscal Years 2001-2006 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Navigation Project, Grays Harbor County, Washington.* U.S. Army Corps of Engineers, Seattle District, Seattle, WA. http://www.nws.usace.army.mil/ers/reposit/Final_EA_GH_OM_FY01-06.pdf

U.S. Army Corps of Engineers. 2001. *Programmatic Biological Evaluation: Fiscal Years 2001-2006 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Navigation Project, Grays Harbor County, Washington.* U.S. Army Corps of Engineers, Seattle District, Seattle, WA. http://www.nws.usace.army.mil/ers/reposit/GraysHarborBA.pdf

U.S. Army Corps of Engineers. 1999. *Design Analysis (Revised), Grays Harbor, Washington FY 1999 South Jetty Repair* . U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

U.S. Army Corps of Engineers. 1999. *South Jetty Repair Final Environmental Assessment* . U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

U.S. Army Corps of Engineers, Port of Grays Harbor, Washington Department of Ecology, Washington Department of Fish and Wildlife, City of Westport, and U.S. Fish and Wildlife Service. 1998. *Point Chehalis Revetment Extension Project, Westport, Washington, Interagency Mitigation Agreement.* U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

U.S. Army Corps of Engineers. 1997. *Long Term Maintenance of the South Jetty at Grays Harbor, Washington, Evaluation Report.* U.S. Army Corps of Engineers, Seattle District, Seattle, WA.

U.S. Army Corps of Engineers. 1995. *Review of Long-Term Maintenance Plans for the South Jetty, Grays Harbor, Washington*. U.S. Army Corps of Engineers, joint subcommittee of the Committee on Tidal Hydraulics and Coastal Engineering Research Board, Vicksburg, MS.

Wiedemann, A.M. 1966. *Contributions to the plant ecology of the Oregon coastal sand dunes*. Ph.D. thesis. Oregon State University.

Woxell, L.K. 1998. "Prehistoric beach accretion rates used to predict long-term response to sediment depletion in the Columbia River littoral system." Abstract, *Oregon Academy of Science Conference*, Salem, OR.

Appendix A
Draft Finding 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

SOUTH JETTY BREACH FILL MAINTENANCE
WESTPORT, GRAYS HARBOR COUNTY, WASHINGTON

FINDING OF NO SIGNIFICANT IMPACT

1. Background. After winter storms breached the sand spit adjacent to the Grays Harbor south jetty in 1993, there were concerns about the stability of the south jetty structure and potential damages to the navigation channel. In response, the Corps placed about 600,000 cubic yards of sand to close the breach. The Corps has undertaken a number of measures to extend the life of the existing breach fill and these efforts do show promise for extending the fill life well into the future. However, the integrity of the breach fill may be compromised if erosion in the southeast corner of the breach fill is allowed to continue.

2. Purpose and Need. The purpose of the proposed work is to extend the life of the breach fill area adjacent to the south jetty. This will protect the south jetty and navigation channel from damage which could be caused in the event of another breach. Preventative maintenance of the breach fill is required to insure the integrity of the breach fill, south jetty and entrance channel until a long-term strategy for the south jetty and Grays Harbor entrance is implemented. This action is a much more cost-effective strategy than after-the-fact emergency repairs, and requires a relatively small quantity of material to restore the height and width of the fill area. The proposed project will also partially nourish the area which has been eroded adjacent to previous gravel placements.

3. Proposed Action. The proposed action consists of the placement of up to 25,000 cubic yards of sand on the south jetty breach fill and in the southeast corner of breach fill prior to February 14, 2004 or after July 16, 2004. The sand will be excavated from the existing Half Moon Bay direct beach nourishment dredged material disposal site, which is an upland stockpile situated above the Point Chehalis revetment extension constructed in 1999. Approximately 2,500 cubic yards of sand will be placed on the large rainwater runoff gullies that have formed along the southeast corner of the breach fill. Approximately 2,500 cubic yards of sand will be placed directly adjacent to the jetty in the northwest corner of the breach fill. Approximately 20,000 cubic yards of sand will be placed in the southwest corner of the bay, adjacent to the Westhaven State Park access road and parking lot where severe end-cutting erosion is threatening the breach fill. Of that 20,000 cubic yards, approximately 10,000 cubic yards will be placed in upland areas along the shoreline.

Based upon the results of post-placement monitoring, and dependant on funding availability, the Corps may place up to 15,000 additional cubic yards of sand annually until the time when a long-term erosion management strategy has been implemented. The source of this sand would also be

the direct beach nourishment disposal site. Other placement techniques and/or proposals for larger quantities of sand may be investigated if the current action is not found to be successful. Any such actions would be evaluated in future NEPA documents.

3. Summary of Impacts. Fish and crabs will not be directly impacted by the proposed action because sand placement will occur above the waterline at low tides so as to not directly interfere with their usage of mid and upper intertidal habitats. Benthic organisms in and adjacent to the project footprint would be directly impacted by implementation of the project, but the impacts are expected to be temporary in nature and limited in extent. The temporary reduction in benthic invertebrate abundance may affect fish, birds, and other species which prey on these organisms. However, this impact is expected to be temporary because any invertebrates which have colonized this high-energy, rapidly eroding area are highly mobile and adapted to heavy disturbance regimes, and are thus expected to recolonize the nourishment area relatively quickly. Since there will not be a major change in substrate size distribution as a result of the fill placement, no major shifts in the composition of benthic invertebrate community structure are anticipated over time.

The proposed placement will occur in a day-use State park. Over the 2- to 3-week long construction period, parking and pedestrian access to the stockpile and the western Half Moon Bay shoreline would be closed. The northeastern portion of the main parking area and City of Westport boardwalk would be closed both during construction and until the sacrificial dune erodes into the bay. Access to the ocean beach will be unaffected. Between 1000 and 2500 truck trips may be needed to move 25,000 cubic yards of sand. Flagmen would be present at both the stockpile site and main parking area to insure park visitors are safely routed around construction activities. Park visitors would be inconvenienced by the construction activity, but this impact is not expected to be significant because of the temporary and localized nature of the disruptions.

Based on our cumulative effects analysis, the Corps concluded that there will not be a significant cumulative effects associated with the proposed action.

4. Finding. Based on the evaluation provided in the attached EA, and summarized here, Seattle District has determined that this 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.

_____ _____

Date

Debra M. Lewis
Colonel, Corps of Engineers
District Engineer

Appendix B
Detailed Cumulative Effects Analysis

South Jetty Breach Fill Maintenance Cumulative Effects Analysis

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. The Corps reviewed the history of actions within all of Grays Harbor for a watershed scale perspective of cumulative impacts. For further details, see COE 2001.

During the course of this review, it was apparent that actions associated with the South Jetty had the most profound historic effects in the project vicinity (Half Moon Bay, South Beach, Westhaven Park, Point Chehalis, and the City of Westport). Accordingly, the Corps cumulative impact analysis focused on this area for assessing cumulative impacts. For a complete historic analysis of past impacts, refer to COE 2003.

The major kind of activities that have contributed to, and continue to contribute to, potential cumulative impacts to the area are the construction of structures associated with the navigation projects and human occupation of the coastal strand and sand dune communities. The Corps determined the potential primary impact for each activity then the functional changes and consequences of the changes. This assessment does not represent a compilation of every potential impact or change possible, but it does address the notable impacts, changes, and consequences in these watersheds.

Historic Landscape Conditions.

The earliest mapping of Grays Harbor from 1852 shows a relatively narrow channel between Point Chehalis and Point Brown with Eld Island just south of Point Brown. Maps from 1862 through 1891 show that Eld Island eroded completely and Point Brown receded in a northeasterly direction about 4,300 feet. During the same time period, Point Chehalis accreted about 4,300 feet in a northwesterly direction (Phipps and Smith 1978). During the same time, European-American settlement on the Grays Harbor side of Point Chehalis resulted in the development of the community of Westport. By 1914, Westport was an incorporated town and a small center for fishing, shellfish harvesting, seafood processing and tourism.

The engineering history at Grays Harbor started with the construction of the south jetty to prevent shoaling of the navigation bar channel. South jetty construction began in 1898 and was completed in 1902 at a total length of 13,734 feet, of which 11,950 feet extended seaward of the high water line at that time. The construction of a second jetty north of the harbor entrance began in 1907. The north jetty was completed in 1913 to a length of 17,000 feet. Once the north jetty was reconstructed, the existing channel adjacent to the south jetty shoaled and a new wider and deeper channel developed north of the older channel. Westhaven Cove formed naturally at Point Chehalis after construction of the south jetty, and the Port of Grays Harbor constructed a harbor there in 1929.

The south jetty was reconstructed between 1935 and 1939. The first shoreline trace of Half Moon Bay appeared after 1940, following the completion of the south jetty rehabilitation. Surveys show that Point Chehalis continued to build to the north, west, and east until the

reconstruction of the jetty. The sand that built Point Chehalis apparently came from the south and passed over or through the south jetty. The reconstructed jetty prevented the passage of material over and through the jetty, cutting off the longshore supply of sediment. The result was continued erosion of Point Chehalis. Considerable deterioration of the south jetty continued after its completion in 1937. By 1953, surveys showed that nearly 6,000 feet of the jetty had experienced subsidence.

In August 1950, the Corps initiated a study with the purpose of developing a comprehensive plan for the protection of Point Chehalis (and the City of Westport), the City's harbor, and the south jetty from erosion. The study concluded that erosion at Point Chehalis would eventually threaten the community infrastructure at Westport. Four groins were under construction at Point Chehalis before the initiation of the study. The study recommended that three additional groins also be constructed. The additional groins were constructed in 1951 and 1952. In 1952, the Corps intentionally breached the westernmost groin to permit the passage of sand to the west. Between 1953 and 1956, the Corps constructed a 2,880-feet-long rock revetment as an additional erosion protection measure. In 1966, the Corps rehabilitated 4,000 feet of the south jetty. The outer 6,000 feet was left in its degraded condition (COE 1965).

The ocean beach just south of the south jetty receded at an average rate of 15 to 20 feet/year between 1967 and 1986. Sometime during this same period, the State of Washington began to do some development of a State park facility (Westhaven State Park) on the accreted lands south of the south jetty. This consisted of a parking lot and restroom facility. By 1986, the rate of shoreline recession increased to about 60 feet/year, which resulted in the abandonment of the original park facilities. The State later constructed new, less permanent facilities (self-contained port-o-let restrooms) that could be more easily moved if erosion later threatened the structures.

The landward side of the spit at Half Moon Bay was also eroding. In May 1992, the Corps constructed a submerged berm in Half Moon Bay to help slow erosion. About the time the berm was constructed, the Corps conducted a review of historical data to determine trends in erosion and accretion that occurred since the construction of the jetties. The report (Burch and Sherwood 1992) found that South Beach erosion was part of a much more significant, long-term loss of sediment from the entire inlet system. The report concluded, "although the long-term erosion may be related to long-term changes in sediment supply, it is most likely part of the slow adjustment to construction of the entrance jetties" (Burch and Sherwood 1992).

During a storm on 10 December 1993, a breach formed between the jetty and the adjacent South Beach (north of the State park facilities, but within park boundaries). The storm lasted from 8 December until 15 December. The breach widened rapidly, exposing the landward end of the jetty. Much of the material that was washed out of the breach was deposited in Half Moon Bay. The breach was filled in the fall of 1994 with 600,000 cubic yards of sand dredged from the bar channel.

In May 1994, the Corps placed an additional 146,000 cubic yards of dredged sand in the Half Moon Bay berm. The erosion along Point Chehalis (and the now eastern shoreline of Half Moon Bay) continued so that by 1995 the City of Westport placed approximately 82,000 cubic yards of sand along the eroded area of Half Moon Bay. They were concerned about threats to public

infrastructure by erosion (existing sewer lines). In the fall of 1995, the Corps placed and additional 300,000 cubic yards of dredged material in the same area. Most of the material from both actions eroded away. The Corps eventually constructed a revetment extension with additional fill in the area of concern to the City. This was completed in March 1999. The Corps also constructed a wave diffraction mound as a protection measure for the 1994 breach fill, which was completed in February 2000 and rehabilitated the emergent portion of the south jetty (completed in 2001).

During the winter of 2001-2002, a series of storms resulted in exacerbated erosion to the shoreline south of the jetty (South Beach), the Half Moon Bay shoreline, and erosion of the breach fill and revetment fill areas. In May 2002, the Corps placed approximately 135,000 cubic yards of dredged material over approximately 8 acres in the breach-fill area. This fill was planted with a native species of dune grass (*Elymus mollus*) in November 2002 to reduce wind erosion of the dune.

Regional Sediment Transport

The major source of sediment to the Washington shelf and the beaches of the southwest Washington coast is the Columbia River. Studies by Ballard (1964) showed that sand is moved northward from the Columbia by seasonally reversing longshore currents. The regional regime of longshore movement is locally altered by wave refraction, which may produce deviations from the general trend of movement. The historical northward flow of sand is evidenced by diagnostic mineralogy studies that have traced Columbia River sands as far north as Ocean Shores and by the northward movement of the mouth of Willapa Bay and the mouth of Grays Harbor before jetty construction.

Sediment supply

The Columbia River is the primary sediment source for the continental shelf and littoral zones of the southwest Washington coast. Sternberg (1986) suggests that 84 percent of the annual Columbia River sediment discharge has accumulated on the shelf or in the deep sea. The remainder accumulates in the estuaries and on the beaches. Gelfenbaum et al (1999) estimated the accumulation rate available for beach nourishment since 1878 is about 400,000 cubic yards/year.

The construction of dams on the Columbia River during the past 75 years has decreased the sediment discharge of the system and reduced the sediment budget of Washington's beaches. Gelfenbaum et al (1999) estimated that the dams have reduced the sand supply to the estuary by 67 percent. In 1978, concern over the possibility of a diminished sand supply to the southwest Washington beaches was a major factor in initiating a coastal accretion and erosion study. One of the conclusions of the study was that any reduced discharge by the Columbia River had not yet affected the sand supply to the beaches (see also Phipps and Smith 1978).

Subsequent study indicated that a probable source of sand for Washington beach accretion was Peacock Spit, created by sand jetted out of the Columbia after construction of the jetties. The shoal injected sand into the longshore system over the years but by the 1990s was essentially no longer a source (Phipps 1990). More recently, sediment has slowly been removed from the outer

bar of the Columbia and, as the system approaches equilibrium, changes are occurring more slowly. Therefore, perhaps more important than the reduction in sediment supply from the river is the erosion of the sand sources at the mouth of the Columbia. Burch and Sherwood (1992) conclude, "a reasonable hypothesis is that sediment supply from the Columbia River entrance region has decreased, and that decrease in supply has affected the Grays Harbor entrance sediment budget…." The Grays Harbor entrance area has itself also seen a decrease in sediment supply with the deflation of the ebb shoal following the structuring of that inlet.

The shoreline sand accretion rates from the early part of the 1900s are much greater than rates from before this time and greater than recent accretion rates. Gelfenbaum et al (1999) concluded that the timing of the rapid accretion and the longshore variation in the accretion suggest the changes in the ebb-tidal deltas after jetty construction are the primary cause for much of the beach accretion. The current deflated state of the Columbia River and Grays Harbor deltas signals an end of this once vast source of sediment, eventually reducing the sediment supply at Grays Harbor. The area around Grays Harbor is likely evolving because of a reduction in sediment supply from both internal (ebb-tidal deltas) and external (Columbia River) sources (Kaminsky et al 2001). The reduction of internal sources appears to be the dominant factor in the recent reversal of historical shoreline advance.

Longshore transport

Ocean circulation and severe winter storms that create intense waves from the southwest combine to produce northerly transport of sediments along the Washington Shelf. Recent modeling studies have suggested that shoreline reorientation caused by structures at the Grays Harbor entrance has caused localized reversal of net sediment transport along the northern Grayland beaches adjacent to the entrance. Despite these localized reversals, the balance of evidence suggests that the regional trend for sediment transport is from the south to the north. Sediment bypasses the Grays Harbor entrance and feeds North Beach. A possible localized reversal of net transport and the rip current that forms adjacent to the south jetty contribute to the persistent erosion at South Beach adjacent to the jetty.

Primary Impacts Associated with Navigation Projects

The geologic record for the study area demonstrates several long-term cycles of erosion and deposition along the southwest Washington Coast. For the past five thousand years, the beaches accumulated Columbia River sediment, creating broad coastal barrier plains and dune fields. However, coastal Washington also experienced seismic uplift and subsidence associated with great Cascadia earthquakes (Atwater, 1987). Doyle (1996) provides that the Cascadia events resulted in abrupt tectonic subsidence of 4-5 feet resulted in 600 to 100 feet of catastrophic beach retreat throughout the Columbia littoral cell. Between the earthquakes, rapid shoreline accretion occurred from rebound-uplift, the abundant sand supply from the Columbia River, and effective longshore dispersion of the available sand.

Before the development of navigation projects, the coastal plains and sand dune fields were highly dynamic and adaptive ecosystems that both influenced and were influenced by shifting sands. Plant community diversity was high, which supported a variety and diversity of animal species. Many of the species found in the coastal plains were endemic species uniquely adapted

to the dynamic nature of rapid erosion and accretion. Even in periods of rapid erosion, recolonization of accreted lands was rapid as long as remnant habitats remained to 'seed' the newly accreted lands (for in-depth evaluation of community dynamics sand dune and strand communities, see Wiedemann 1966).

The installation of jetties in the early 1900s at the entrances to Grays Harbor was followed by rapid accretion within several miles of the jetties (Kaminsky et al 1999). In stark contrast to the relatively low shoreline change rates over the past 4,000 years, some coastal areas accreted nearly 130 feet a year during the first half of this century (Woxell 1998). Vegetation quickly colonized the accreted lands. This trend began somewhere in the late 1940s and became much more apparent in the last 20 years, especially in certain 'hot spots' along the Oregon and Washington Coast. The proposed project is in one of the rapid erosion areas. This trend is likely in response to the influences the construction of jetties, activities on the Columbia River, sea-level rise, and other yet identified causes.

Erosion at the study site has resulted in a significant loss of the lands accreted since the construction of the south jetty. The erosion has reduced the availability of coastal strand and dune communities to both plant and animals. In some areas, it has increased the availability of shallow marine or estuarine aquatic communities. While this effect may be locally profound, the highly dynamic nature of coastal ecosystems supports those species that can adapt well to rapid change. What researchers cannot predict is if long-term erosion trends will ever reverse. Many ecosystems are endemic to the coastal areas and extensive erosion (and/or development) could imperil or eradicate the functions associated with them. These include plant and animal diversity, endangered species habitat, and shorebird support habitat.

Primary Impacts Associated Human Occupation of Coastal Strand and Sand Dune Communities

The historically developed areas of southwest Washington were built on or behind a rapidly accreting shoreline. Land use planning issues usually dealt with the problem of accreting and drifting dunes that interrupted views and limited public access. Traditional coastal erosion and development hazards in the region were treated as localized problems with negligible regional impacts. However, recent sustained erosion at a number of sites has damaged infrastructure that required millions of Federal, State, and local dollars to be spent for shore protection. In many areas, long-term accretion appears to have slowed or reversed, indicating a regional trend toward erosion. In order to predict coastal behavior at management scale (over decades), the State of Washington investigated long-term coastal evolution and shoreline responses (see Kaminsky and Gelfenbaum 2000). Until long-term management strategies are developed, localized shoreline erosion projects are likely to increase in number and extent.

Human occupation of the coastal strand and dune ecosystem will continue to require shoreline protection measures. Given the apparent long-term erosion trend, these activities will continue to increase. Additional occupation of the coastal zone will also necessitate additional erosion protection features, such as shoreline armoring or hardening, bulkheads, dikes, seawalls, and/or beach nourishment.

The long-term impacts of hardened shoreline protection measures are unknown. Hardening of the dynamic shoreline may result in erosion or scour elsewhere along the shore or may prove to be only a temporary solution to a large scale, long-term problem. Unlike the natural dynamics of the shifting coastal strand and sand dune ecosystems, which result in shifts of habitat types over time, hardening represents a loss or degradation of habitat by creating a static feature within the landscape. Erosion may continue to occur around the static feature, resulting in both loss and gain of habitat types. To date, hardening measures have usually resulted in a loss of habitat because of the location of most projects (along eroding shorelines). The loss of habitat results in impacts to shorebird resting and feeding habitat, migratory and resident fish resting, feeding, and spawning habitat, and loss of human access to shorelines. Development of the coastal sand and dune areas also result in loss of unique dune and interdunal ecosystems that support a variety of plant and animal species. Between development pressures and erosion, the vegetated dune communities are most at risk because of the lack of opportunity for them to re-establish elsewhere. That is, there is a finite amount of space for these communities to exist along the coastal shelf.

Reasonably Foreseeable Future Impacts

Current studies by the State of Washington are ongoing with hopes to provide local communities with some management strategies for what appears to be long-term erosion issues (Kaminsky and Gelfenbaum 1999). Those management strategies have yet to be developed. Erosion control and development will continue to be active within the project area in the foreseeable future. New developments are proposed along the coastal strand and protection of existing infrastructure will be an on-going concern for the City of Westport, the State of Washington, and private landowners. These will likely include a multitude of shoreline stabilization projects, channel diversion projects, and other proposals to either dissipate energy or provide additional sand sources to the littoral processes.

Current Actions

No other known projects are being implemented in the project area at this time. The Corps is planning a study of long-term solutions to assure continued function of the navigation channel. A development project (golf course and condominium complex) has also been proposed south of the project area, but this project has not received all of the necessary permits to begin construction (see discussion under Indirect Impacts in Section 6).

Cumulative Impacts Associated with the Proposed Project

The placement of sand along the Half Moon Bay shoreline for protection of the breach fill will mimic natural accretion patterns of the coastal strand and sand dune ecosystems. The additional sand will likely experience water and wind erosion and deposition much like the existing landscape. The project will not change the characteristics of the function or extent of the existing navigation project so therefore will not affect other shoreline processes. The project will also not result in any changes to the human occupancy of the project area. The Corps concludes that there will not be a significant cumulative effect associated with this action.