US Army Corps of Engineers
Portland District

ENVIRONMENTAL ASSESSMENT

COOS BAY MAINTENANCE DREDGING

Prepared For

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EXECUTIVE SUMMARY

The Coos Bay Federal Navigation Project was authorized by the Rivers and Harbors Acts of: June 25, 1910; March 2, 1919; September 22, 1922; January 21, 1927; July 3, 1930; August 30, 1935; July 24, 1946; June 30, 1948; July 14, 1960; and December 31, 1970; and the Energy and Water Developments Act of November 13, 1995 (Public Law 104-46). These authorizations include the construction, operation and maintenance of the jetty structures at the entrance to Coos Bay and navigational channels and turning basins. The local sponsor is the Oregon International Port of Coos Bay.

The purpose of the Coos Bay Federal Navigation Project (the “Project”) is for the U. S. Army Corps of Engineers, Portland District (Corps), to maintain the federal navigation channels at their authorized depths and widths by periodically removing restricting shoals of naturally occurring sediment material. These ongoing maintenance dredging activities provide adequate channel dimensions for vessel access and use upstream to river mile (RM) 15. By maintaining adequate navigational dimensions, the Project further serves to decrease waiting times and increase navigability for vessels crossing the entrance bar. Federal authorizations also exist for the Coos Bay Channel from RM 15 to RM 17 and for the Coos and Millicoma Rivers Project. However, the Corps does not currently maintain these channels and there are no plans to dredge them.

Periodic shoals develop within the Coos Bay navigation channels due to the buildup of materials from fluvial and marine origins. The transition between marine and fluvial sediment is located at approximately RM 12 in Coos Bay. Shoals and sedimentation can restrict or prohibit vessel navigation; dredging to authorized depths and widths is critical to keeping the river and harbor open and to sustaining important navigation components of the local and state economy, as well as maintaining a U.S. Coast Guard (USCG) “critical harbor of refuge” for vessels in need.

Four areas are proposed for continued maintenance dredging as part of the Project: (1) Coos River Entrance Channel (1 MCY from RM -1 to 1); (2) 300,000 cubic yards from the Coos River Navigation Channel (RM 1 to 12); (3) 1 MCY from the Coos River Navigation Channel (RM 12 to 15); and, (4) 50,000 cubic yards from the Charleston Access Channel. Dredged material is placed within multiple authorized and approved in-water material placement locations, including both ocean and in-bay sites.

Dredging and placement activities occur between about June 15 or July 1 to October 31 or November 30 depending on the specific location (of any given year) with an additional 6 days of dredging/placement completed in April or May. Ocean conditions, potential storm surges, inclement weather, and difficulty in crossing the bar to reach the authorized Offshore Dredged Material Disposal Sites (ODMDS) all preclude safe and effective operations of necessary dredging activities during the Oregon Department of Fish and Wildlife (ODFW) preferred in-water work period. Most dredging operations work 24-hours per day depending upon weather, staffing, and other factors.

Multiple environmental effects from dredging and placement activities on resources in the Project vicinity were considered in this Environmental Assessment (EA), which updates prior environmental assessments completed for the Project. The analysis finds that the Preferred Alternative would not substantially affect the quality of the environment.

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ABBREVIATIONS AND ACRONYMS

%	percent
ACEC	Area of Critical Environmental Concern
BA	Biological Assessment
BiOp	Biological Opinion
BMPs	Best Management Practices
BLM	U.S. Bureau of Land Management
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFR	Code of Federal Regulations
CO	Carbon monoxide
CO_2	Carbon dioxide
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel
dB re 1 µPa	decibels relative to one micro Pascal
DMEF	Dredge Material Evaluation Framework
DO	dissolved oxygen
DPS	Distinct Population Segments
EA	Environmental Assessment
EC	Engineering Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENSO	El Niño Southern Oscillation
ESA	Endangered Species Act
FS	Feasibility Study
ft/s	feet per second
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
GHG	greenhouse gas
HC	hydrocarbons
Hz	hertz
IPCC	Intergovernmental Panel on Climate Change
kHz	kilohertz
LNG	liquid natural gas
MCY	million cubic yards
mg/l	milligrams per liter
MLLW	Mean Lower Low Water
mm/yr	millimeters per year
MMR	Major Maintenance Report
MPRSA	Marine Protection, Research and Sanctuaries Act
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act

NO_2	nitrogen dioxide
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NTU	nephlometic turbidity units
OAR	Oregon Administrative Rules
OBMP	Oregon Beach Monitoring Program
OC	Oregon Coast
OCMP	Oregon Coastal Management Program
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODLCD	Department of Land Conservation and Development
ODMDS	Ocean Dredged Material Disposal Site(s)
ODNRA	Oregon Dunes National Recreation Area
OGMT	Oregon Gateway Marine Terminal
OHA	Oregon Department of Human Services
OPRD	Oregon Parks and Recreation Department
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PCE	Primary Constituent Element
PDO	Pacific Decadal Oscillation
$PM_{2.5}$	particulate matter (particles less than 2.5 micrometers in diameter)
PM_{10}	particulate matter (particles between 2.5 and 10 micrometers in diameter)
Port	Oregon International Port of Coos Bay
ppm	parts per million
ppb	parts per billion
PRG	Project Review Group
RFFA	reasonably foreseeable future action
RHA	Rivers and Harbors Act
RM	river mile(s)
SEF	Sediment Evaluation Framework
SHPO	State Historic Preservation Office
SL	Screening Levels
SLR	Sea-level rise
SMMP	Site Management/Monitoring Plan
SONCC	Southern Oregon/Northern California Coasts
SO_2	sulfur dioxide
SRMA	Special Recreation Management Area
SORA	Southwest Oregon Regional Airport
TBT	tributyltin oxide
TMDL	Total Maximum Daily Loads
TSS	total suspended solids
$\mu g/m^3$	microgram per cubic meter
USC	United States Code
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey

USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WQC	Water Quality Certification
WRDA	Water Resources Development

1. *INTRODUCTION*

Coos Bay is located on the Oregon coast approximately 200 miles south of the Columbia River in Coos County. It provides a harbor and water-dependent economy for the local and state community and as the second largest estuary in Oregon is an important biological resource.

This Environmental Assessment (EA) meets the requirements set forth by the Council on Environmental Quality (CEQ) in its regulations implementing the National Environmental Policy Act of 1969 (NEPA), as amended (40 Code of Federal Regulations (CFR) 1500-1508). The EA addresses continued operation and maintenance dredging by the U.S. Army Corps of Engineers (Corps), Portland District of the Coos Bay Federal Navigation Project, and updates previous NEPA documentation providing further evaluation of the potential for environmental effects from these continued maintenance activities. For example, this EA updates previous NEPA documentation for the inclusion of potential impacts to newly listed and protected species and habitat under the Endangered Species Act (ESA). Additionally, the quantity of material dredged has increased for the Charleston Access Channel (40,000 cubic yards to 50,000 cubic yards) and the in-water work period for the Charleston Access Channel has been extended slightly from July 1 through October 31 to July 1 through November 30 (described in more detail in later sections). These refinements are based on actual dredged material quantity data recorded between 2003 and 2013. Authorized channel dimensions have not changed for any of the federally authorized channels. There are no other changes to the type or nature of the proposed work as part of this updated EA.

Previous NEPA documents prepared by the Corps for ongoing maintenance dredging and dredged material placement activities at Coos Bay include (but are not limited to):

- 2002. Review and Amendment of NEPA Coverage for Coos Bay and Charleston Channels, Operation and Maintenance Dredging. May.
- 1994. Feasibility Report on Navigation Improvements with Environmental Impact Statement, Volume 1 (Final Report). January.
- 1989. Environmental Assessment, Expansion of Ocean Disposal Site F, Coos Bay, Oregon. May.
- 1989. Finding of No Significant Impact, Expansion of Ocean Disposal Site F, Coos Bay, Oregon. October.
- 1988. Finding of No Significant Impact, South Fork Coos River Operation and Maintenance Dredging, Coos County, Oregon. February.
- 1987. Environmental Assessment of the South Fork Coos River Operation and Maintenance Dredging, Coos County, Oregon.
- 1986. Final Environmental Impact Statement for Coos Bay, Oregon Dredged Material Disposal Site Designation. February.
- 1985a. Environmental Assessment, Updating Coos Bay Channel Maintenance Dredging Final Environmental Impact Statement (EIS) to Include Ocean Disposal. March.

- 1985b. Finding of No Significant Impact, Updating Coos Bay Channel Maintenance Dredging Final Environmental Impact Statement to Include Ocean Disposal. July.
- 1984. Draft Environmental Impact Statement for Coos Bay, Oregon Dredged Material Disposal Site Designation. September.
- 1983. Environmental Assessment, Coos Bay, Isthmus Slough – Dredging; Coos Bay Channel, River Mile 14 to 15 at Coos Bay; Coos County, Oregon.
- 1983. Finding of No Significant Impact, Coos Bay, Isthmus Slough – Dredging, Coos Bay, Coos County, Oregon. September.
- 1976. Final Environmental Impact Statement, Operation and Maintenance Dredging Coos Bay and Coos and Millicoma Rivers Navigation Project, Oregon. August.
- 1975. Draft Supplement to the Coos Bay Deep Draft Navigation Channel, Environmental Impact Statement, Volume II (Background Information). February.

1.1 PURPOSE AND NEED

The purpose of the proposed action is to maintain the Coos Bay Federal Navigation Project (the "Project") at its federally authorized depths and widths by periodically removing channel-restricting shoals of naturally occurring sediment material. These ongoing maintenance dredging activities provide adequate channel dimensions for vessel access and use upstream to river mile (RM) 15. By maintaining adequate navigational depths, the Project further serves to decrease vessel waiting times and increase reliable navigability of the bay.

Federal authorizations also exist for the Coos Bay channel from RM 15 to RM 17 and for the Coos and Millicoma Rivers Project. However, the Corps does not currently maintain these channels and there are no plans to dredge these channels.

The Project is needed because periodic shoals develop within the Coos Bay navigation channels due to the buildup of materials from fluvial and marine origins. The transition between marine and fluvial sediment is located at approximately RM 12 in Coos Bay. Shoals and sedimentation can restrict or prohibit vessel navigation and dredging to authorized depths and widths is critical to keeping the river and harbor open and to sustaining important navigation components of the local and state economy, as well as maintaining reliable access to a U.S. Coast Guard (USCG) "critical harbor of refuge[1]" for vessels in need.

1.2 AUTHORITY

Dredging the Coos Bay Federal Navigation Project was authorized by Congress under the Rivers and Harbors Act (RHA) of: June 25, 1910; March 2, 1919; September 22, 1922; January 21, 1927; July 3, 1930; August 30, 1935; July 24, 1946; June 30, 1948; July 14, 1960; and December 31, 1970; and, the Energy

[1] The Corps defines "critical harbor of refuge" as a harbor that provides safe haven to boaters that represent the sole site for protection based on a public safety and regional distance requirement.

and Water Developments Act of November 13, 1995 (Public Law 104-46). These authorizations include the construction, operation and maintenance of the jetty structures at the entrance to Coos Bay and navigational channels and turning basins.

Congress authorizes federal navigation channels by specific dimensions (depth and width). These authorized channel dimensions are generally based on maximizing net transportation savings considering the characteristics of the vessels using the channel and include consideration of safety, physical conditions, and vessel operating characteristics. In addition, the reliability of the channel is considered, which may result in the incorporation of advance maintenance dredging[2] and overdepth[3] into the maintenance of the channel to assure channel depth.

The Corps' dredging and in-water placement of dredged sediments to maintain the Coos Bay authorized navigation channels is conducted under the provisions of Sections 102 and 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972, Sections 401 and 404 of the Clean Water Act (CWA) of 1977, and in accordance with 33 CFR Parts 335 through 338 ("Operation and Maintenance of Army Corps of Engineers Civil Works Projects Involving Discharge of Dredged or Fill Material into Waters of the U.S. or Ocean Waters" and affiliated procedures, etc).

The local sponsor is the Oregon International Port of Coos Bay.

1.3 FUNDING

Ongoing maintenance dredging of federally authorized coastal waterways is dependent upon funding appropriated by Congress on a yearly basis. Variability in this funding source can influence the amount of dredging that can be completed each year.

1.4 PROJECT AREA

The Project Area (Figure 1-1 and Figure 1-2) includes two federally authorized projects: Coos and Millicoma Rivers, and the Coos Bay Project. The Coos and Millicoma Rivers Project authorized (Corps 1976):

- Annual dredging of 50-foot wide, three to five-foot deep channel up both the Coos and Millicoma Rivers; and
- Stabilization works (dikes and bulkheads) at the Coos River mouth. These improvements were never constructed because the anticipated scour in the Coos River did not develop. The Corps recommended that construction of the proposed stabilization be delayed until needed.

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2 Advance maintenance dredging (depth and/or width) is dredging beyond the Project's dimensions. It allows for dredging in a dynamic environment to insure the Project's dimensions are maintained until the next dredging event. Because most of the Coastal Projects are dredged only once each year, advance maintenance dredging is crucial to navigation safety.

3 Allowable overdepth is the area outside the advance maintenance prism that may be disturbed and is necessary to compensate for the dynamic environment of dredging. Providing an allowable overdepth prism allows the Corps to remove the maximum amount of advance maintenance material when needed (depending on project, cost, equipment, dredging method, etc.).

Maintenance dredging associated with the Coos and Millicoma Rivers Project was discontinued in 1991. No plans exist to maintain these channels in the future.

The Coos Bay Federal Navigation Project is currently active and includes the following authorized elements:

- Two jetties at the north and south sides of the Entrance Channel;
- A -47-foot deep as measured from the mean lower low water (MLLW[4]) line, 700-foot wide Entrance Channel form RM -1 to RM 1;
- A -37-foot deep, 300-foot wide Main Channel from RM 1 to RM 9 that widens to 400 feet from RM 9 to RM 15;
- Turning basins on the Main Channel;
- Continuation of the Main Channel at a 22-foot depth beyond RM 15;
- A 50-foot wide, -17-foot deep Charleston Access Channel from the Main Channel past the Charleston Marina, and -16 feet deep to Charleston; and,
- A mooring basin, breakwater and bulkhead at Charleston.

Many of the authorized components are outside the scope of the Preferred Alternative for the Coos Bay Federal Navigation Project, which proposes continued maintenance dredging within federally authorized channels in Coos Bay and the Charleston Access Channel only. Navigation channels currently maintained by the Corps include: (1) Coos River Entrance Channel (RM -1 to 1); (2) Coos River Navigation Channel (RM 1 to 12); (3) Coos River Navigation Channel (RM 12 to 15); and, (4) Charleston Access Channel (Table 1-1).

Table 1-1. Existing Maintenance Dredging

Name	Location	Authorized Depth, Advance Maintenance, Overdepth (feet, MLLW)	Dimensions Length x Width (feet)	Max. Dredge Volume/Event (cubic yards)**	Material Placement Location
Coos Bay Entrance Channel	RM -1 to 1	47 + 5 + 3	10,560 x 700 tapering to 300 at RM 1	1,000,000	ODMDS/ In-bay
Coos Bay Lower Navigation Channel	RM 1 to RM 12	37 + 3 + 3	RM 1 to RM 9: 47,520 x 300 RM 10 to RM 12: 15,840 x 400	300,000	ODMDS/ In-bay
Coos Bay Upper Navigation Channel	RM 12 to RM 15	37 + 3 + 3	15,840 x 400	1,000,000	ODMDS
Charleston Access Channel	Southeast of Entrance Channel	17/16 + 2 + 3*	6,500 x 50	40,000	ODMDS/ In-bay

* 17 feet deep from the Lower Navigation Channel past the Charleston Marina and 16 feet deep to Charleston.

** Volume includes advance maintenance and overdepth.

[4] All depths are measured from the MLLW surface elevation in this document, unless otherwise specified.

The Project Area includes multiple in-water material placement locations, including both ocean and in-bay sites (Table 1-2). Three Ocean Dredged Material Disposal Sites (ODMDS) have been designated by the Environmental Protection Agency (USEPA) under authority of Section 102 of the MPRSA in 1986. These ODMDS include Sites E, F (offshore and nearshore) and H, and are located between 0.6 and four miles offshore at water depths of approximately -20 to -180 feet MLLW.

Table 1-2. Existing Dredged Material Placement

Placement Site	Location (Distance/ Direction from Entrance Channel)	Material Type/Dredge Location	Dimensions Length x Width (feet)	Area (acres)	Average Depth (feet, MLLW)
Site E	~1.5 miles southwest	Sand (RM -1 to RM 12)	3,600 x 1,400	116	-56
Site F (Offshore and Nearshore)	~0.6 miles northwest		Trapezoidal (14,600 x 8,000 x 9,650)	3,075	-20 to -160
Site H	~3.7 miles northwest	Finer-grained sand and silt (RM 12 to 15)	3,600 x 1,450	120	-180

Both rehandle and flow-lane in-bay placement sites (Sites 8.4 and G, respectively) have been used for the last several decades (Table 1-3). The rehandle site (Site 8.4) is located adjacent to RM 8.4 and is used for temporary storage of dredged material from upper Coos Bay for later ocean placement. Placement of material at Site 8.4 allows for effective use of the *Yaquina,* reducing time spent hauling loads to the ODMDS. The flow-lane site (Site G) is located just inside the Entrance Channel and is occasionally used if ocean conditions are too hazardous for the dredges to access the ODMDS or if hydraulic cutterhead (pipeline) dredging is conducted in the Charleston Access Channel. The use of a hydraulic cutterhead (pipeline) dredge requires placement to occur only during an ebb tide.

Table 1-3. Existing In-bay Placement Site Summary

Site	Type	Location	Material Type/ Dredge Location	Dimensions (Length x Width; Feet)	Area (acres)	Average Depth (feet, MLLW)
Site G	Flow-lane	RM 1 (south side of channel)	Charleston Channel, Lower Navigation Channel	1,000 x 200	4.6	-40 to 45
Site 8.4	Rehandle	RM 8.4 (south side of channel)	Upper Channels	2,500 x 300	17	-30 to 35

Coos Bay is designated by the USCG as one of ten "critical harbors of refuge" along the Oregon Coast, which is a port, harbor, inlet, or other body of water normally sheltered from heavy seas by land and in which a vessel can navigate and moor. The designation provides fishermen (and boaters) anywhere along the Oregon Coast the ability to transit to the nearest "critical harbor of refuge" prior to a storm reaching the coast, ultimately reducing the hazard to navigation and protecting human life and the environment. A search and rescue station with rescue vessels and helicopter support is based out of a USCG Station in Charleston.

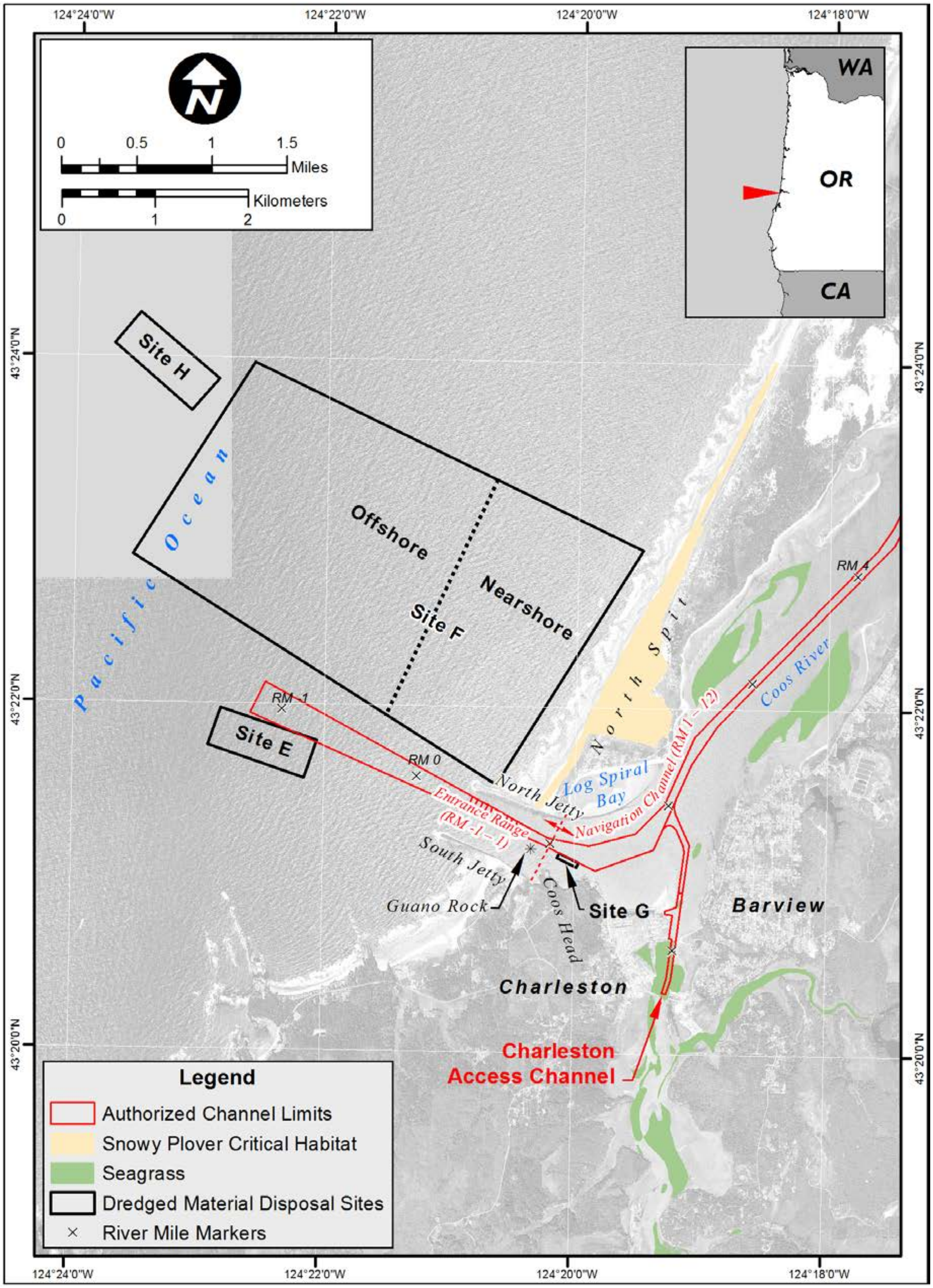

Figure 1-1. Vicinity Map – Lower Coos Bay and Coastal Offshore Project Area

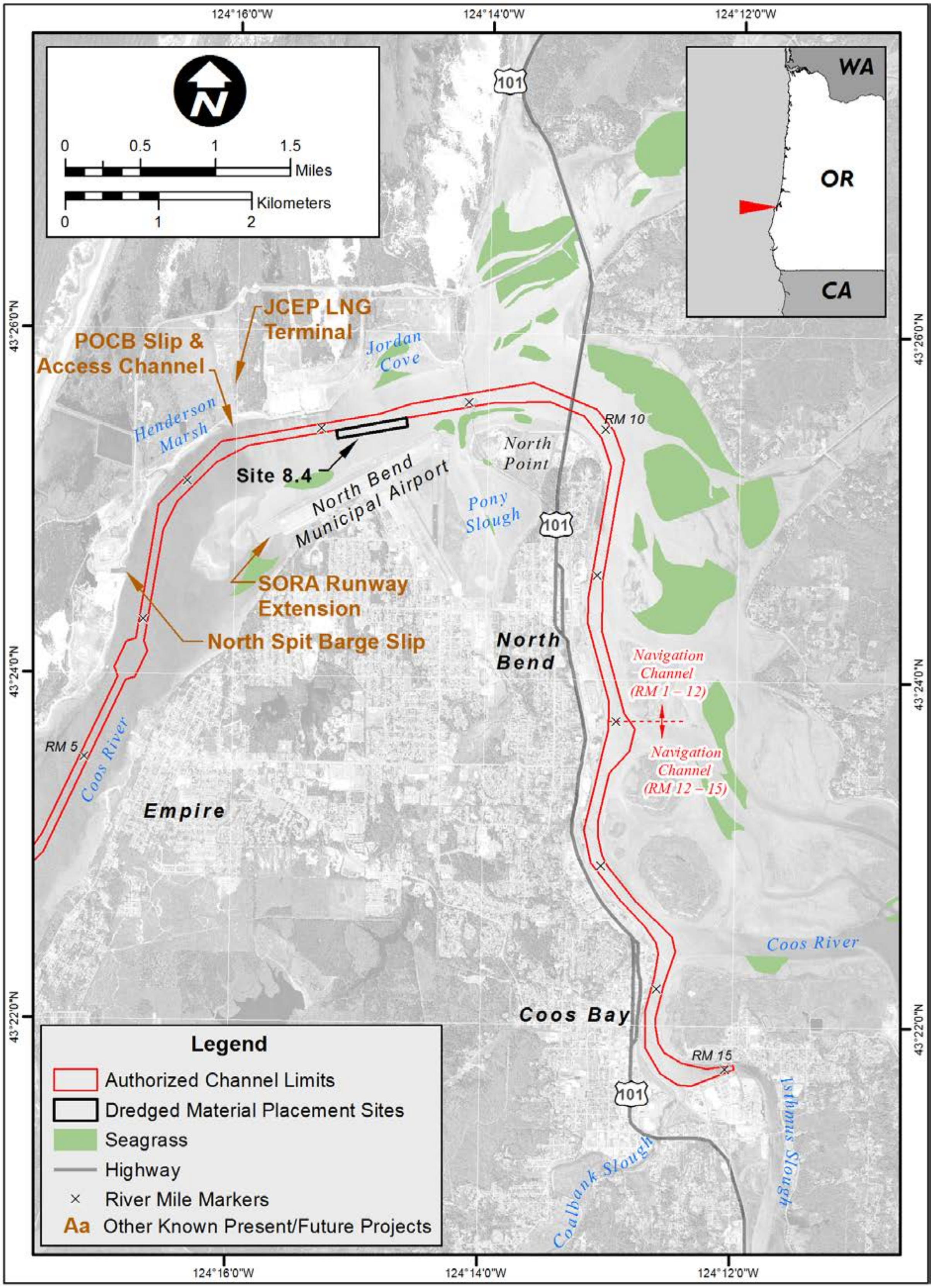

Figure 1-2. Vicinity Map – Upper Coos Bay Project Area

1.5 BACKGROUND AND HISTORY

The Corps has been responsible for maintaining navigable waterways of the North Pacific Coast since 1871. Navigational access needs at Coos Bay and River originated from the need to provide access for ocean going vessels to support coal, timber and fishery industries in the mid to late 1800's. Navigational improvements over the past century have consisted of construction of Entrance Channel jetties and the deepening and widening of channels and turning basins throughout the area to provide efficient access to vessels of increasing size and capacity. The history of navigational improvements in the Project Area is discussed in this section.

1.5.1 Jetty Construction and Repair

Original construction of the Entrance Channel jetties began with the North Jetty in 1891, which was completed in 1894 (Case 1983). The jetty extended 9,600 feet from the high-water line on the seaward side of the North Spit along a west-northwest alignment. Repairs began almost immediately in 1899 to add additional armor rock and 1901 marked the end of major construction on the North Jetty. Further major repairs did not occur until the mid-1920s and then not again until 1989. Throughout this time, the North Jetty has suffered damage from the harsh coastal wave environment. The damage has been most severe at the jetty head, resulting in landward migration of the functional end of the jetty. The North Jetty is currently more than 1,100 feet shorter than the full authorized jetty length. In 1989, the North Jetty was reconstructed with a new jetty head position; but due to progressive damage, the North Jetty is currently almost 300 feet shorter than its 1989 length.

Construction of a 4,200-foot-long South Jetty was initiated in 1924 after it had been determined that an adequate navigation channel could not be maintained with only the North Jetty. By 1930, the South Jetty had been extended seaward to 4,560 feet. The South Jetty was reconstructed in 1940 and 1941 as a monolithic concrete structure with rock at the sides and a new jetty head position. From 1962 to 1964, the South Jetty was rehabilitated approximately 300 feet shorter than the 1941 head position with additional stone placed over the existing jetty, raising and widening the structure to its current height and width. The resulting structure has performed well with little damage in terms of loss in jetty length over its near-50-year life. The South Jetty is now approximately 20 feet shorter than the 1964 length.

1.5.2 Maintenance Dredging and Improvements

The history of maintenance dredging in the Project Area includes both the Coos Bay and the Coos and Millicoma Rivers projects. Maintenance dredging associated with the Coos and Millicoma Rivers Project has been discontinued and is not proposed in the near future or as part of the Coos Bay Federal Navigation Project.

1.5.2.1 Coos Bay Project

Dredging operations at Coos Bay started in 1908. By 1910, the Main Channel was cleared to a depth of 16 feet. In 1910, Congress authorized improvement of the Entrance Channel and Main Channel to 18-foot depths and a three hundred square foot turning basin. These improvements were completed by 1912. In 1925, the channels were deepened to a depth of 22 feet.

Acts of Congress in 1930 and 1935 provided for a navigation channel 24-foot deep and 300-foot wide, and a 30-foot deep, 600-foot wide and 1,000-foot long turning basin at the mouth of Coalbank Slough near Smith's Mill. Authorization of dredging upriver to RM 17 was granted in 1922 and work was completed in 1937.

The RHA of 1946 increased all project dimensions at Coos Bay. In 1952, the depth the Entrance Channel was to be increased to a depth of 40 feet, decreasing to 30 feet at RM 1 (Guano Rock). The channel from RM 1 at the entrance to the mouth of Isthmus Slough about 15 miles away was improved to 30 feet deep and generally 300 feet wide. A large turning basin at North Bend (RM 12) and improvement of the basin at Coalbank Slough were also provided by the 1946 Act. In addition, the 1946 Act provided two 30-feet deep, 600-feet wide and 2,000-feet long anchoring basins at RM 3.5 and RM 7. Work was completed on the channel and turning basins in 1951. The 10-foot deep, 50-foot wide Charleston Access Channel was built in 1956, together with a small boat basin.

In 1974, the channel was deepened to 45 feet at the entrance and 35 feet above RM 1. Advance maintenance dredging was authorized up to four feet at the entrance and up to one foot in the upper reach. In 1996, authorization was given to deepen the channel to 47 feet at the entrance and 37 feet above RM 1. No changes to advance maintenance dredging or allowable overdepth dredging were authorized. Allowable overdepth dredging of two feet is authorized pursuant to maintenance dredging regulations (Corps 1994). The channel deepening project was completed in 1998. Current practices include up to five feet of advance maintenance dredging at the Entrance Channel and up to three feet in the Main Channel (RM 1 to 15); this is in addition to the allowable overdepth.

Past dredging activities to maintain authorized channel dimensions have resulted in the removal volumes shown in Table 1-4.

Table 1-4. Historical Corps Dredge Volumes, 2004 – 2014

Calendar Year	Dredge	Volume* (cubic yards)	Placement Method	Placement Site
2014	Essayons	370,745	Hopper	Site F – Nearshore
	Essayons	57,582	Hopper	Site F – Offshore
	Yaquina	1,880	Hopper	Site F – Nearshore
	Yaquina	25,714	Hopper	Site F – Offshore
	Yaquina	10,313	Hopper	In-bay Site G
	Contractor Clamshell	40,628	Mechanical	Site F - Offshore
2013	Essayons	457,607	Hopper	Site F – Nearshore
	Essayons	74,777	Hopper	Site F – Offshore
	Yaquina	86,071	Hopper	Site F – Nearshore
	Yaquina	19,424	Hopper	Site F – Offshore
2012	Essayons	457,607	Hopper	Site F – Nearshore
	Essayons	74,777	Hopper	Site F – Offshore
	Yaquina	86,071	Hopper	Site F – Nearshore
	Yaquina	19,424	Hopper	Site F – Offshore
2011	Essayons	405,332	Hopper	Site F – Nearshore
	Essayons	240,515	Hopper	Site F – Offshore
	Yaquina	86,797	Hopper	Site F – Nearshore

Calendar Year	Dredge	Volume* (cubic yards)	Placement Method	Placement Site
	Yaquina	81,099	Hopper	Site F – Offshore
	Yaquina	9,146	Hopper	In-bay Site G
	Contractor Pipeline	51,752	Pipeline	In-bay Site G
2010	Essayons	569,160	Hopper	Site F – Nearshore
	Essayons	29,746	Hopper	Site F – Offshore
	Yaquina	91,969	Hopper	Site F – Offshore
2009	Yaquina	77,387	Hopper	Site F – Offshore
	Yaquina	79,317	Hopper	Site F – Nearshore
	Terrapin	544,431	Hopper	Site F – Offshore
	Terrapin	233,041	Hopper	Site F – Nearshore
	Contractor Clamshell	1,081,799	Mechanical	Site H
	Contractor Clamshell	4,722	Mechanical	Site F – Offshore
2008	Yaquina	74,179	Hopper	Site F – Offshore
	Yaquina	85,987	Hopper	Site F – Nearshore
	Terrapin	154,685	Hopper	Site F – Offshore
	Terrapin	467,322	Hopper	Site F – Nearshore
	Contractor Clamshell	9,375	Mechanical	Site F
2007	Essayons	84,322	Hopper	Site F
	Essayons	333,366	Hopper	Site F – Nearshore
	Yaquina	145,697	Hopper	Site F – Nearshore
	Essayons	79,927	Hopper	Site E
	Yaquina	1,994	Hopper	In-bay Site G
	Contractor Clamshell	22,730	Mechanical	Site F
2006	Essayons	79,927	Hopper	Site E
	Essayons	84,322	Hopper	Site F
	Essayons	333,366	Hopper	Site F – Nearshore
	Yaquina	69,822	Hopper	Site F – Nearshore
2005	Essayons	440,745	Hopper	Site F
	Contractor Clamshell	262,788	Mechanical	Site H
	Contractor Pipeline	27,190	pipeline	In-bay Site G
2004	Yaquina	128,120	Hopper	Site F
	Sugar Is	385,431	Hopper	Site F

* Volume includes advanced maintenance and overdepth.

The Corps generally uses one of three dredging methods at Coos Bay: hopper dredge, hydraulic cutterhead (pipeline) dredge, or mechanical dredge (refer to Section 2.2.3 for a more detailed description of these methods).

1.5.2.2 Coos and Millicoma Rivers Project

The RHA of 1896 authorized improvements associated with the Coos and Millicoma Rivers Project. Until 1948, the Coos and Millicoma Rivers had been maintained to 3-foot depths about 13 miles upstream from Coos Bay. The RHA of 1948 authorized improvement of these channels to a width of 50 feet and a depth of five feet, which was completed in 1966. Prior to 1970, the channels were maintained intermittently. From 1970 to the 1980's, the rivers were dredged annually (about 22,000 cubic yards) via mechanical dredge methods. Maintenance dredging of the Coos and Millicoma Rivers Project was discontinued in 1991.

The Coos and Millicoma Rivers Project also provided authorization for stabilization work (dikes and bulkheads) at the mouth of the Coos River. However, the anticipated scour in the Coos River did not develop and the Corps recommended that construction of the proposed stabilization works be delayed until need was established.

1.5.3 Dredged Material Placement

The history of dredge material placement in the Project Area includes both the Coos Bay Federal Navigation Project and the Coos and Millicoma Rivers Project.

1.5.3.1 Coos Bay Federal Navigation Project

Although ocean placement has been the primary placement location for dredge materials from the Coos Bay Federal Navigation Project, materials have been placed in a variety of upland, in-bay and ocean locations throughout the Project's history. Upland and in-bay placement of dredge material was primarily associated with dredging of the Upper Channel (RM 15 to RM 17) and the Isthmus Slough. These areas are no longer maintained as part of the Project.

Channel maintenance dredge material has been placed at ODMDS E, F and H since 1977. Final designation by the USEPA under Section 102 occurred in 1986. Placement of dredge materials at these sites has evolved over time because of the dispersive characteristics of these sites. The ideal ODMDS exhibits high material dispersion and, therefore, low mounding. Dispersion rates are determined through comparison of annual bathymetric surveys of these sites. The history of material placement at each of the ODMDS is as follows:

- Site E: Although the site is dispersive, material transport is slow and complicated by past mounding that occurred in the 1980's (USEPA and Corps 2006). In 1987 placement was limited to no more than 150,000 cubic yards annually. No material was placed at this ODMDS from 1990 to 2005. In 2006, 79,900 cubic yards was placed at the site.
- Site F: Due to low dispersive rates and mounding of material, this ODMDS was expanded in size in 1989 under Section 103 authority. The USEPA designated this larger Site F under Section 102 in 2006. The ODMDS is large and allows for placement over a wider area rather than concentrating it into small areas. The site is separated into offshore and nearshore management areas. The nearshore area of this site is considered water depths less than -60 feet MLLW, which is within the littoral zone and highly dispersive. The Corps places material within nearshore portions of Site F when conditions permit. Past monitoring data suggests a very slow dispersion of material placed at depths greater than -60 feet.
- Site H: The ODMDS is used for placement of fine-grained material. Since 1986, more than 67 million cubic yards (MCY) has been placed at this location for an average annual loading of 375,000 cubic yards. Persistent mounding has not been found to occur at this site indicating that

the site capacity is substantial over the long-term. In 1997, 1.3 MCY were placed at the site. Material placed at this ODMDS is generally redistributed north and northeast.

The ODMDS are continually managed and monitored in accordance with the Site Management/ Monitoring Plan (SMMP) (USEPA and Corps 2006).

The Corps has also designated an ocean placement site (Rock Site) under Section 103 authority for the one-time placement of rock excavated during a 1995 channel improvement project. The Rock Site is located south of the Site F and west of Site E in water depth of -112 feet MLLW. No further placement has taken place at this site and none is planned at this time.

As discussed previously, both rehandle and flow-lane in-bay placement sites (Sites 8.4 and G, respectively) have been used for the last several decades in the dredging of the Coos Bay Project. The rehandle site (Site 8.4) is located adjacent to RM 8.4 and is used for temporary storage of material dredged from upper Coos Bay by the *Yaquina* for later ocean placement by contracted mechanical dredging. Placement of material at Site 8.4 allows for more effective use of the *Yaquina*, reducing time spent hauling loads to the ODMDS. The flow-lane site (Site G) is located just inside the Entrance Channel and is occasionally used if ocean conditions are too hazardous for the dredges to access the ODMDS or if cutterhead (pipeline) dredging is conducted in the Charleston Access Channel. Material placed at Site G is fully dispersive.

1.5.3.2 Coos and Millicoma Rivers Project

Dredged materials from the Coos and Millicoma Rivers Project were historically placed along the riverbank and subsequently moved by a bulldozer to adjacent lowlands (Corps 1976). Placement areas were situated as near the dredge site as possible, consistent with environmental considerations, in order to minimize hauling costs. However at times it was necessary to barge material to available in-bay placement areas. The Oregon State Land Board has documented over 1,260 acres of fill on the submerged and inter-tidal land in Coos Bay as the result of in-bay dredge placement. The bulk of created land is located along the Coos Bay, North Bend and Eastside Bayfront and amounts to over 10 percent (%) of the original area of the estuary (Dicken et al. 1961). Upland sites requiring fill have also been used in the past and have generally included private and public land.

2. ALTERNATIVES

Two alternatives were evaluated for the Coos Bay Federal Navigation Project: one No Action Alternative, and one action alternative (the Preferred Alternative).

2.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Corps would not perform any maintenance dredging and material placement for the Project. Absent such activities, shoaling would fill the navigation channels with sand and sedimentary material, thus precluding reliable navigational access.

This alternative does not meet the Project Purpose and Need. Without periodic maintenance dredging and placement, it would not be possible to sustain the authorized widths and depths of the Coos Bay Federal Navigation Project. Authorized dimensions are necessary to allow navigation and accessibility for commercial and recreational vessels. Navigation access is crucial for maintaining the existing socioeconomic systems in the local area and in the state of Oregon. Not maintaining navigation access at Coos Bay would cause economic hardship for many in local maritime fishing, industrial and commercial, and tourism-based businesses. Without maintained navigability, the ability of Coos Bay to provide a "critical harbor of refuge" with supplemented USCG vessel support services would be jeopardized.

2.2 PREFERRED ALTERNATIVE

The Preferred Alternative is the continued maintenance dredging and placement of materials by the Corps, from four channel segments associated with the Coos Bay Federal Navigation Project. Specific proposed dredge and placement details are provided in this section and are summarized in Table 2-1.

Table 2-1. Proposed Maintenance Dredging and Placement Activities

Location	Authorized Depth, Advance Maintenance, Overdepth (feet, MLLW)	Dredge Frequency (years)	Dredge Period	Approx. Duration (days)	Max. Dredge Volume (cubic yards)**	Last Dredged	Placement Location
Entrance Channel (RM -1 to 1)	47 + 5 + 3	1	15 June – 31 Oct (5 days in Apr or May)	~20	1,000,000	2013	ODMDS/ In-bay
Lower Navigation Channel (RM 1 to 12)	37 + 3 + 3	1	15 June – 31 Oct (6 days in Apr and May)	~35	300,000	2013	ODMDS/ In-bay
Upper Navigation Channel (RM 12 to 15)	37 + 3 + 3	1	1 July – 31 Oct	~100	1,000,000	2009	ODMDS/ In-bay
Charleston Access Channel	17/16 + 2 + 3*	1	1 July – 30 Nov[5] (up to 9 days in Apr, May, June)	~30	50,000[6]	2011	ODMDS/ In-bay

* 17 feet deep from the Lower Navigation Channel past the Charleston Marina and 16 feet deep to Charleston.

** Volume includes advance maintenance and overdepth.

[5] The in-water work period for dredging within the Charleston Access Channel has changed from July 1 through October 31 to July 1 through November 30. This modification was approved by the NMFS in 2011 (K. Phippen personal communications, September 27, 2011).

[6] The quantity of material dredged has increased for the Charleston Access Channel (40,000 cubic yards to 50,000 cubic yards). This refinement is based on actual dredged material quantity data recorded between 2003 and 2013. Authorized channel dimensions have not changed for any of the federally authorized channels.

This alternative meets the Purpose and Need for the Project. Ongoing maintenance dredging activities provide adequate channel dimensions for vessel access and navigability. As mentioned previously, maintenance dredging to authorized depths and widths is critical to keeping the bay and channels open, to sustaining important navigation components of the local and state economy, as well as maintaining a USCG “critical harbor of refuge” for vessels in need and an active rescue station.

2.2.1 Proposed Dredging Activities

Continued maintenance dredging at Coos Bay is part of the Corps’ overall coastal dredging program. To minimize mobilization and demobilization costs, the Corps performs successive maintenance dredging activities at selected navigation project sites along the coast each year. The maintenance dredging program schedule takes into consideration commercial and seasonal demand, dredge crew safety, mobilization costs for dredging equipment, and conservation measures, such as in-water work periods, based on Oregon Department of Fish and Wildlife (ODFW) guidance, that minimize impacts to aquatic species.

Channel areas with the greatest amount of shoaling are dredged first during a given in-water work period with the exception of the Entrance Channel. Dredging of this channel (and specifically the entrance bar) is typically postponed until August or September to allow dredging in the best weather within the in-water work period. Dredging by the *Essayons* can then be completed as efficiently as possible so that the bar will remain navigable until the next dredging season. Most dredging operations work 24 hours a day depending upon weather, staffing and other factors.

Dredging does not typically occur over the entire footprint of the dredge area equally. Within the navigation channels, dredging generally occurs at locations where shoals have developed since the previous dredging work. In the case of the turning areas and boat basin access channels, these areas are still variable but may be dredged more equally due to the time between dredging events. Since shoaling patterns change continually, hydrographic (bathymetric) surveys are frequently conducted to track channel conditions throughout the dredging season. The need for dredging is determined by a combination of factors including authorized project design, hydrographic surveys, rainfall, equipment availability, and the concerns of the USCG, local Ports, and other users. Continued maintenance dredging is also dependent on available federal funding.

Specific maintenance dredge detail for each of the proposed channel segments for the Coos Bay Federal Navigation Project is provided in the following sections.

2.2.1.1 Entrance Channel

Corps maintenance dredging of the Entrance Channel (RM -1 to 1) will continue to occur annually to a maximum dredge depth of up to -52 feet MLLW, including five feet of advance maintenance dredging. In this reach, advance maintenance dredging will continue up to 50 feet MLLW outside the channel limits in locations where there is a historical problem with infill. A maximum of 1 MCY of material will continue to be removed each dredging event from this segment, which includes all payable dredged material to the allowable overdepth. The dredging method is hopper or mechanical and dredging activities are anticipated to take about 20 days from June 15 to October 31, although a few more days may be necessary (depends on sea conditions and how much material can be safely moved to the ODMDS). An additional few days (about five) may also be necessary in April or May to clear the Entrance Channel of shoals that accumulate during winter storms.

2.2.1.2 Lower Navigation Channel RM 1 to 12

Corps maintenance dredging of the Coos River Lower Navigation Channel from RM 1 to 12 will continue to occur annually to a maximum dredge depth of -40 feet MLLW, including three feet of advance maintenance dredging. In this reach, advance maintenance dredging is also proposed to continue up to 50 feet outside the channel limits in locations where there is a historical problem with infill. A maximum of 300,000 cubic yards of material will continue to be removed each dredging event from this segment, which includes all payable dredged material to the allowable overdepth. The dredging method is hopper or mechanical. Dredging operations are anticipated to take about 35 days from June 15 to October 31, although a few more days may be necessary depending on sea conditions and how much material can be safety moved to the ODMDS. Up to an additional six days may also be necessary in April and May to clear the lower portion of the channel of shoals that accumulate during winter storms.

2.2.1.3 Upper Navigation Channel RM 12 to 15

Corps maintenance dredging of the Coos River Upper Navigation Channel from RM 12 to 15 will continue to occur annually to a maximum dredge depth of -40 feet MLLW, including three feet of advance maintenance dredging. Up to 1 MCY of material will continue to be removed each dredging effort from this reach, which includes all payable dredged material to the allowable overdepth. The dredging method is mechanical, hopper, or hydraulic cutterhead (pipeline) dredge. Depending on the dredging method, operations are anticipated to take about 100 days[7] from July 1 to October 31, although a few more days may be necessary depending on sea conditions and how much material can be safety moved to the ODMDS.

2.2.1.4 Charleston Access Channel

Corps maintenance dredging of the 6,500-foot Charleston Channel, which extends from RM 2 of the Main Channel to the Charleston Marina will continue to occur annually to a maximum dredge depth of -18 to -19 feet MLLW, including two feet of advance maintenance dredging. Up to 50,000 cubic yards of material will continue to be removed each dredging event from this channel, which includes all payable dredged material to the allowable overdepth. The dredging method is hopper, hydraulic cutterhead (pipeline) dredge or mechanical. Dredging operations are anticipated to take about 30 days from July 1 to November 30[8], although a few more days may be necessary (depends on sea conditions and how much material can be safely moved to the ODMDS, or occasionally Site G when a hydraulic cutterhead is being used). An additional few days may also be necessary in April, May and June (about three days each month) to clear the access channel of shoals that accumulate during winter storms.

[7] The 100 days accommodates mechanical dredging methods. Fewer days are required if hopper dredging is used.

[8] The in-water work period for dredging within the Charleston Access Channel has changed from July 1 through October 31 to July 1 through November 30. This modification was approved by the NMFS in 2011.

2.2.2 Proposed Dredge Material Placement

Normally, all material generated from Project maintenance dredging activities will continue to be placed at the three ODMDS (Sites E, F and H). Site E will continue to be used occasionally when the approach to the other ODMDS is unsafe (i.e. adverse weather conditions) and when littoral drift reversals occur (i.e. moving south rather than north) which would move placed material away from the Entrance Channel. Site F will continue to be used for the placement of sandy material dredged below RM 12. Site H is to be used for the placement of finer-grained sand and silt materials from above RM 12. The ODMDS are designated for use in accordance with the SMMP.

The two in-bay sites (Site 8.4 and Site G) will continue to be used for material placement as part of the Project. Site 8.4 is a re-handle site that will continue to be used for temporary storage of material dredged by the Corp's *Yaquina* hopper dredge for later ocean placement through contracted mechanical dredging. Placement of material at this site allows for more effective use of the *Yaquina* by reducing its non-productive time hauling loads to the ODMDS. Site 8.4 is non-dispersive and material will continue to be dredged from this site (usually no more than 40,000 cubic yards is removed from Site 8.4; this quantity being part of the total 300,000 cubic yards of material dredged from the lower navigation channel) on a five to 10 year frequency and placed at the ODMDS F.

Material will continue to be placed occasionally at flow-lane Site G when Entrance Channel conditions are too hazardous for the dredge to access the ODMDS or when hydraulic cutterhead (pipeline) dredge is used. Site G will continue to be used approximately 20 days each year for material taken from the Charleston Access Channel and the Main Channel. Material placed at Site G with a hydraulic cutterhead dredge will be placed during ebbing tides to allow dispersal of the material to the ocean.

Should a project sponsor (such as the Port) desire to place dredged material at an upland site at some time in the future, they will be responsible for obtaining all environmental clearances, permits and approvals for that site prior to use.

2.2.3 Proposed Dredge and Placement Methods

Dredging activities will typically be conducted by the Corps' hopper dredges (*Yaquina and Essayons*) and/or by contracted hopper, hydraulic, or mechanical dredgers to remove materials from the federal navigation channels. Proposed dredging, placement methods and management activities during dredging are described in this section.

2.2.3.1 Hopper Dredge

Hopper dredges (Figure 2-1) are typically self-propelled vessels that use hydraulic suction dragarms to load sediment as a hydraulic slurry (approximately 20% solids) into an internal hopper. Excess water is allowed to overflow the hopper via weirs, resulting in a more efficient load of 60 to 70% solids. The most common type of hopper dredges are trailing suction dredges, which lower one or two drag arms to the seabed floor to perform material suction. Once loaded, the dredge retracts the drag arms on deck and transits to the placement site. Hopper dredges can offload by either bottom dumping or by pumping off the material through a pipeline.

Hopper dredges are, generally speaking, the easiest to mobilize to a site as they do not require support vessels, and are ideally suited for working in unprotected waters. These dredges are somewhat limited in the character of material they can excavate, with soft clays, silt, sand, and gravel considered suitable, and highly compacted materials and rock generally considered not suitable due to clogging of dragheads or a resulting irregular surface. Hopper dredges are typically best suited for projects where the placement site is located within a few miles of the dredging site or where the material is being placed upland by pumpout through a pipeline. Hopper dredges have very high loading rates, but require overflow (water to flow through the hopper back into the surface water) to achieve economic loads which can result in water turbidity. Due to their size, draft and space requirements for maneuvering, hopper dredges are generally not suited to working in shallow areas such as marinas and boat basins.

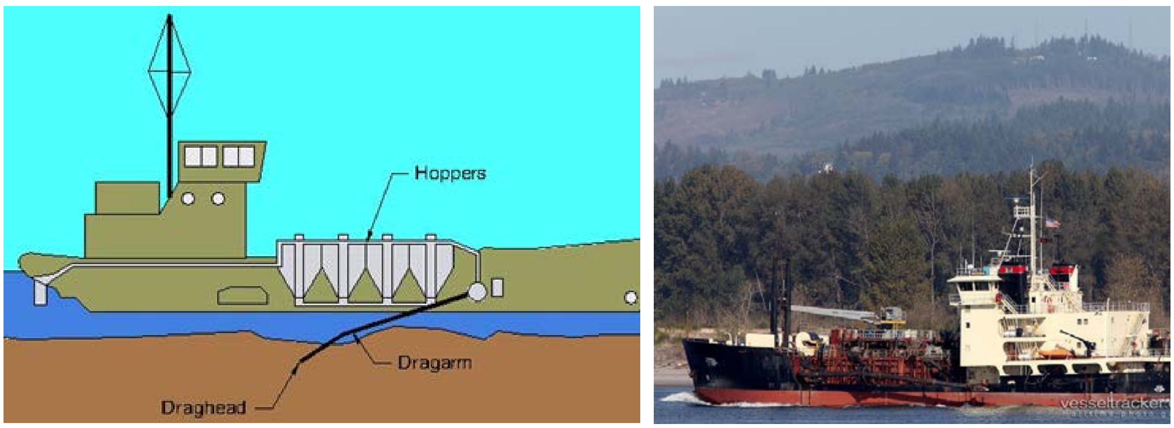

Figure 2-1. Typical Hopper Dredge Schematic (left) and the Yaquina Hopper Dredge (right)

2.2.3.2 Hydraulic Cutterhead Dredges

Hydraulic cutterhead dredges use hydraulic slurry, similar to hopper dredges as generally 80% water and 20% solids, to transport material through a pipeline to the designated placement site. The hydraulic cutterhead dredge (also often called a cutterhead pipeline dredge), is the most common and versatile of the hydraulic dredges, which has a rotating cutter on the end of the ladder used to dislodge consolidated material to improve dredge performance (Figure 2-2). A series of dredge pumps move the slurry from the cutterhead through a pipe and to the final placement site. The barge could be self-propelled, or moved around by a small powered boat or by using winches and anchors.

Hydraulic cutterhead dredges are capable of excavating a broad range of material types with very high efficiency and pumping the slurry directly to the placement site. Production rates are typically higher than mechanical dredges, particularly as material density increases.

The main advantage of a hydraulic cutterhead dredge is its ability to perform on a continuous basis (not necessary to stop and transport material to placement sites), resulting in a cost efficient operation. Smaller hydraulic cutterhead dredges also have other advantages, such as an ability to pump long distances, more precise dredging control, shallow draft hulls for working in shallow water depth areas, and lower water quality impacts in the area of dredging.

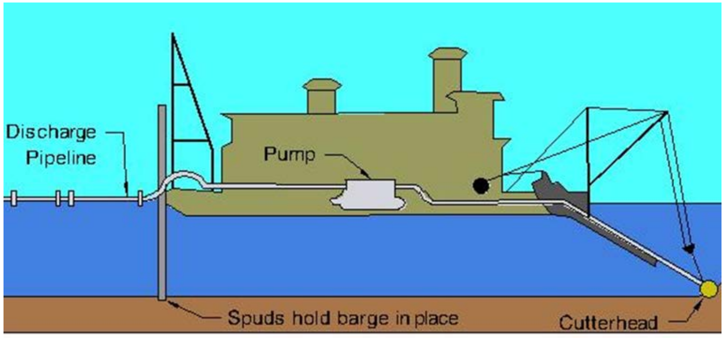

Figure 2-2. Typical Hydraulic Cutterhead Dredge Schematic (***left***) ***and Small Hydraulic Cutterhead Dredge*** (***right***)

Hydraulic cutterhead dredges do have some disadvantages. They typically have a higher mobilization cost because the pipeline and other support vessels (i.e. tugs to position the dredge, work barges for moving pipeline, crew boats, etc.) must be mobilized. The dredges can be sensitive to weather and sea conditions due to the pipeline (more difficult to maintain the line in rough weather). The dredges are typically limited by the distance they are capable of pumping, although booster pumps can be employed to extend their range of operation. The pipeline can pose a navigation hazard in some locations and debris encountered at the dredging site can cause delays. Turbidity at the placement site can be an issue due to the high percentage of water necessary for slurry transport. The use of diffusers at the point of discharge and submerging the discharge pipe can minimize this effect.

2.2.3.3 Mechanical Dredges

Mechanical dredging involves a barge mounted digging machine that uses a bucket to excavate material, which is then placed into scows or on barges, and transported to an in-water or upland offload location. The most common mechanical dredge arrangement includes a barge-mounted crane with a clamshell bucket (commonly referred to as a clamshell dredge, Figure 2-3). Another common type includes an excavator mounted on a shallow draft barge.

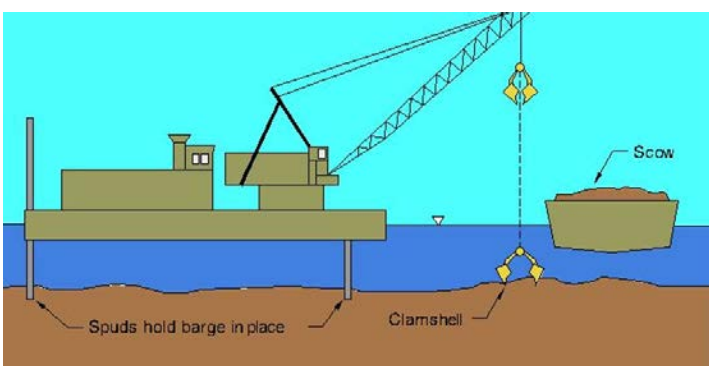

Figure 2-3. Typical Clamshell Dredge Schematic (left) and Photograph (source: POPO 2012)

For in-water placement, scows are designed to dump from the bottom (bottom-dump scow) by opening hatches, or by using split-hull barges (hull opens up). For upland locations, dredged material is removed from the scows using a crane or excavator and placed into settling ponds).

Advantages of the mechanical dredge are its ability to excavate a broad range of material and capability for handling any trash or debris within the material (which would otherwise tend to clog the pump on a hydraulic dredge). Further, they excavate material at near in-situ moisture content that minimizes the overall volume of material needed to be transported, and reduce concerns of runoff water related to upland placement. Another advantage is they can be used to remove hard, packed material such as consolidated sandstone and soft rock (or blasted rock sections).

Disadvantages of the mechanical dredge are a larger equipment spread, a higher water quality impact in the area of dredging, a slower dredging production than the hydraulic dredges, its dependence on scows or other barges to transport the material to the placement site, and increased barge traffic for transport to the storage facility. In addition, acceptable work conditions for the majority of the available fleet of equipment are very limited in a high-energy environment.

2.2.4 Channel/River Management

Prior to dredging, the Corps coordinates the work schedule with the Port, the USCG and the Crab Commission. The USCG then issues a Notice to Mariners.

During proposed dredging and placement operations, the hopper dredge operates at low speed (about one knot) and uses two radio stations to communicate with the USCG, pilots and local vessels. Vessel transit between removal and placement sites is approximately eight knots when loaded and 10 knots empty. Towed barges are slightly slower.

Corps personnel also conduct visual water quality monitoring from the dredge. In heavy fog conditions, a foghorn is used and personnel on the dredge watch from the bow.

3. AFFECTED ENVIRONMENT

The Coos Bay estuary is approximately 13,300 acres in size, averaging nearly 0.6 mile wide by 15 miles long. The estuary has approximately 30 tributaries, the largest of which is the Coos River. Three ODMDS are located just west of the Entrance Channel.

Coos Bay provides a stabilized entrance from the ocean for vessels serving the Oregon International Port of Coos Bay and other waterfront industries. Wood products, fish, and agricultural commodities pass through the Port. Commercial, industrial and recreational vessel moorage facilities are located within the bay and along the river.

The existing condition of Coos Bay is highly modified from natural conditions as a result of human settlement and commercial maritime uses described above. This section describes the existing environmental conditions of the Project Area.

3.1 PHYSICAL ENVIRONMENT

Coos Bay is located within the coastal area of Oregon, influenced by tectonic forces, glacial effects, regional uplift and fluctuating sea level. The last episode of glacial retreat began less than 20,000 years ago with sea level rising until 5,000 to 6,000 years ago. The lower regions of the river valleys have now matured into estuaries and tidal lagoons.

3.1.1 Geology

The topography surrounding the Coos Bay estuary is a combination of rugged mountain terrain and extensive sand dunes adjacent to the ocean along the North Spit. Geologically, the area is composed of a relatively thick sequence of uplifted and tilted sedimentary rocks (NOAA 2008).

The continental shelf off Coos Bay is approximately 14 miles wide. Regional offshore bathymetric contours generally run northeast to southwest, parallel to the coastline (USEPA and Corps 1986). Studies of the continental shelf sediments find that the movement of beach sand during lower sea levels was to the north, with a substantial fraction of the material on the beach sourced from the Klamath Mountains to the south rather than from the Oregon coast range (Komar 1997).

Much of the sediments within the Coos Bay estuary, up to RM 12 (Figure 1-1), is of marine origin, largely sands and silts, and is not sourced from the Coos Bay watershed (USEPA and Corps 1986). The load from the Coos Bay watershed may have decreased in recent years because of changes in forestry practices (M&N 2012b).

The Coos River and its major bay tributaries drain terrain that is composed primarily of sandstone and siltstone. The resulting sediment yields are primarily alluvial sand, silt, clay, and mud which make up the bottom material of the upper bay. Towards the mouth of the bay, the sediment characteristics shift to sand and shell fragments.

The Coos Bay region’s geology is dominated by sand and old sedimentary rock deposits. Most of the sediment deposits in the estuary are fairly new, from the Holocene or Recent Epoch (10,000 years ago to the present). To the north, the northern spit is primarily deflation plain and beach sand. To the east of the bay are old (40 to 55 million years old) deposits of sandstone, coal, and siltstone covered by sandy or silty loam. The south is composed of two million years old deposits of sand, silt, and gravel.

During the channel deepening performed in 1978 to 1979, numerous sandstone layers were identified within the lower reaches of Coos Bay. Geological investigations performed in 1974 indicate the rock types to the claystone, siltstone and sandstone from RM 2 to RM 6, with outcrops from RM 0.7 to RM 0.9 and from RM 15 to RM 15.3 above the end of the navigation channel. All known rock sources produce rock that is considerably softer and much less resistant to erosion than basalt.

Approximately half of Coos Bay’s 12,800 acres are tidal flats that consist of mud, silt, sand, clay, and organic matter and are exposed to air during low tide. Other major fractional components are 1,400 acres of eelgrass tidelands and 2,700 acres of tidal marsh composed of organic soils.

3.1.2 Coastal Processes

Coastal processes along the Oregon coast are extremely dynamic as a result of large winter storms that approach the coastline. These storms can produce winds exceeding 60 knots and waves greater than 20 feet several times a year. Storm events such as these have historically and are presently acting to shape the coastline by driving currents of sufficient magnitude to transport and redistribute sediment.

Changes in sea level also have substantial effects on coastal processes and the resulting geomorphology of the coastline. Sea level rose approximately 400 feet from its lowest point at the end of the last ice age, which occurred about 20,000 years ago (NRC 2012). At present, global sea levels continue to rise and are projected to accelerate in the next century. Local SLR follows this trend and is discussed further in Section 3.1.2.2.

Sediment transport and sea-level rise in the Project Area are discussed in this section.

3.1.2.1 Coastal Circulation and Sediment Transport

Coastal circulation along the Oregon Coast is propelled by winds, waves, tidal action and river discharges. These currents affect local water quality and drive sediment transport in the nearshore and littoral environments. Currents in the Project Area can be generally categorized into the domains of: fluvial, tidal, littoral, nearshore and offshore. These currents are described below:

- Fluvial currents: Freshwater inflows from rivers average approximately 500 cubic feet per second (cfs) during the summer and 4,000 cfs during the winter; peak flood flows can be ten times higher. These inflows can result in large ebb currents in the Entrance Channel and deliver sediment to the bay/estuary and littoral system. However, the largest freshwater flows have been determined to add only about 1 knot to the peak ebb tidal current (M&N 2012). These currents are discussed in greater detail in Section 3.1.3, Hydrology.
- Tidal currents: Tidal currents are rotary currents that change direction following the period of the tide. The tides of Coos Bay are of the mixed semi-diurnal type, meaning that Coos Bay experiences two daily highs and lows of unequal duration and amplitude. Tidal currents are responsible for estuary/bay circulation, commonly referred to as “flushing”. Due to the addition

of fluvial sources of water, Coos Bay Entrance Channel currents are ebb dominant. Spring tidal currents in the Entrance Channel are generally 2 knots during flood tide and 3 to 4 knots during an ebb tide (M&N 2011). Immediately outside the entrance, the ebb tidal currents set to the north and can result in a clockwise eddy on the north side.

- <u>Littoral Currents:</u> Littoral currents extend from the shoreline to just beyond the breaker zone. They primarily consist of shore-parallel wave-driven currents that are generally negligible until the waves enter shallow water (approaching and inside the breaker zone). The currents become greater with increasing wave height and period, and with decreasing water depth.
- <u>Nearshore Currents:</u> Nearshore currents extend from the littoral zone to a water depth of approximately 100 feet and consist of wind driven currents that play an important role for nearshore circulation, especially during storm events. Wind driven currents can be the dominant mode of circulation forcing on the nearshore shelf, extending 130 feet into the water column (M&N 2011). Sheet flow conditions with a uniform current of 2.3 feet/second (ft/s) have been observed to extend to water depths of -100 feet (M&N 2011). Wave activity can also result in currents in the nearshore zone; however, they are much less substantial than those found in the littoral zone.
- <u>Offshore Currents:</u> Offshore currents extend from the nearshore zone to the edge of the continental shelf. Offshore currents are large-scale, regional circulation currents such as the California Current, which is a 500 to 1,500 mile wide, south-directed, surface current that moves at a speed of 0.1 to 0.2 knots from British Columbia to California for most of the year. A narrow, relatively fast, undercurrent (i.e. the Davidson Current) flows northward at depths below 600 feet.

During the winter, strong low-pressure systems with winds and waves, predominantly from the southwest, initiate strong northward currents. During the summer, high-pressure systems dominate and consequently, waves and wind are commonly from the north. In both seasons, there are short-term fluctuations in circulation related to local wind, tidal and bathymetric effects. Nearshore currents are more varied than the regional trends, due mainly to changes in prevailing winds and waves. At any one time, the current near the beach may be moving directly opposite the offshore current and/or surface currents opposite bottom currents.

Littoral, fluvial and tidal currents are typically responsible for most sediment movement in the coastal environment. However, aeolian (wind) sediment transport can also be a substantial driver of sediment movement along the Oregon coastline and particularly near Coos Bay. Coastal zone managers commonly refer to coastal systems as belonging to littoral cells, which are geographic segments of coast within which sediment moves relatively unrestrained between two longshore sediment transport barriers. Dividing the coast into these sediment transport compartments allows sediment budgets to be developed that describe the different sediment inputs (sources) and outputs (sinks) along this segment of coastline. Sediment budgets are used to predict morphological change along a coastline over time.

The Project is located within the Coos Littoral Cell, which extends 60 miles from Heceta Head on the north to Cape Arago on the south (OCMP 2012). The coastline along the littoral cell consists of dune backed and bluff backed shoreline with the vast majority of the shoreline being sandy and dune backed. The net sediment transport direction in the cell at present is neutral (no net transport) or slightly northward (M&N 2012a).The primary present-day sediment sources to the cell include rivers (Siuslaw, Umpqua, Coos and Millicoma), coastal bluffs and dredge material placement in the littoral zone. The dominant sediment sink is coastal dunes (most notably the Coos Bay Dune Sheet) and bays in estuaries in the littoral cell.

Shoaling of the Coos Bay navigation channels (downstream of RM 12) is largely a result of littoral sediment transport from the north and south entering Coos Bay through the Entrance Channel during flood tides. Channel shoaling upstream of RM 12 has been determined to be generally derived from fluvial sources.

Contingent on existing dredge material placement activities, Coos Bay could be considered a sediment sink or to have a beneficial effect on the littoral cell. Existing material placement within nearshore portions of Site F (water depths shallower than approximately 60 feet) and at flow-lane Site G provides a sediment source to the littoral cell.

3.1.2.2 Sea-Level Rise

Sea-level rise (SLR) has occurred on a global scale over the last century and projections suggest that the rate might continue or accelerate into future planning horizons (i.e. 2050, 2100) under a range of potential scenarios. Global sea-level rise is the change in ocean water volume as a result of thermal expansion (expansion of water as the climate warms) and the contribution of water from the melting of land-based ice. However, at a given coastal site, the rate of global SLR is of less practical importance than the rate of SLR relative to the land. This rate is known as relative SLR and is the net sum of the global SLR rate with addition or subtraction of local land uplift or subsidence. SLR experienced at a specific location can differ from the global SLR rate as a result of shorter time-scale climatological effects such as the El Niño Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO).

The range of global SLR projections is due to uncertainty associated with global temperature models derived from the Intergovernmental Panel on Climate Change (IPCC). These models rely on predicted global greenhouse gas (GHG) emissions scenarios to produce future global temperature outputs. The uncertainty in deriving these emission values (a function of social behavior), in combination with the unclear and non-linear responses these temperature increases may have on the ocean, is the primary source of uncertainty in these estimates. Because of this uncertainty, SLR guidance for use in project planning is generally separated into low, medium, and high values and is based on various assumptions. The uncertainty in the SLR projections increases with time, with models in general agreement with one another until approximately mid-century (year 2050).

A number of state and federal government agencies have developed and adopted SLR guidance used in the planning and design of projects within their purview. Specific to the Project, Engineering Circular

(EC) 1165-2-212 (Corps 2011) provides guidance for all Corps Civil Works programs for incorporation of the direct and indirect physical effects of projected SLR across the Project lifetime.

This guidance requires consideration of a range of SLR scenarios over the Project lifetime, normalized to year 1992. The low SLR rate is a linear extrapolation of the historical water level data in the vicinity. The intermediate and high scenarios are modified National Research Council (NRC) scenarios NRC I and III as described in NRC (1987).

The low SLR curve was derived from the longest tidal record in the vicinity of the Project, which was located near Charleston (Station #9432780), and spanned from 1970 to 2006 (Figure 3-1). Based on this National Oceanic and Atmospheric Administration (NOAA) tidal record, mean sea level has risen at a rate of 1.29 ±1.15 millimeters/year (mm/year), or 0.42 feet/century, and the land was estimated to rise at a rate of 0.57±0.24 mm/yr, or 0.19 feet/century (NOAA 2012).

Based on the EC, the three SLR scenarios for the Project over an assumed 50-year Project lifetime (i.e. through approximately 2065) are shown in Figure 3-2. Projections depict relative SLR conditions through account of the global SLR rate (assumed 1.7 mm/yr within the EC) and local land movement. Based on this analysis, relative sea level is projected to increase by between 0.2 feet and 2.1 feet at Coos Bay relative to present levels during this period.

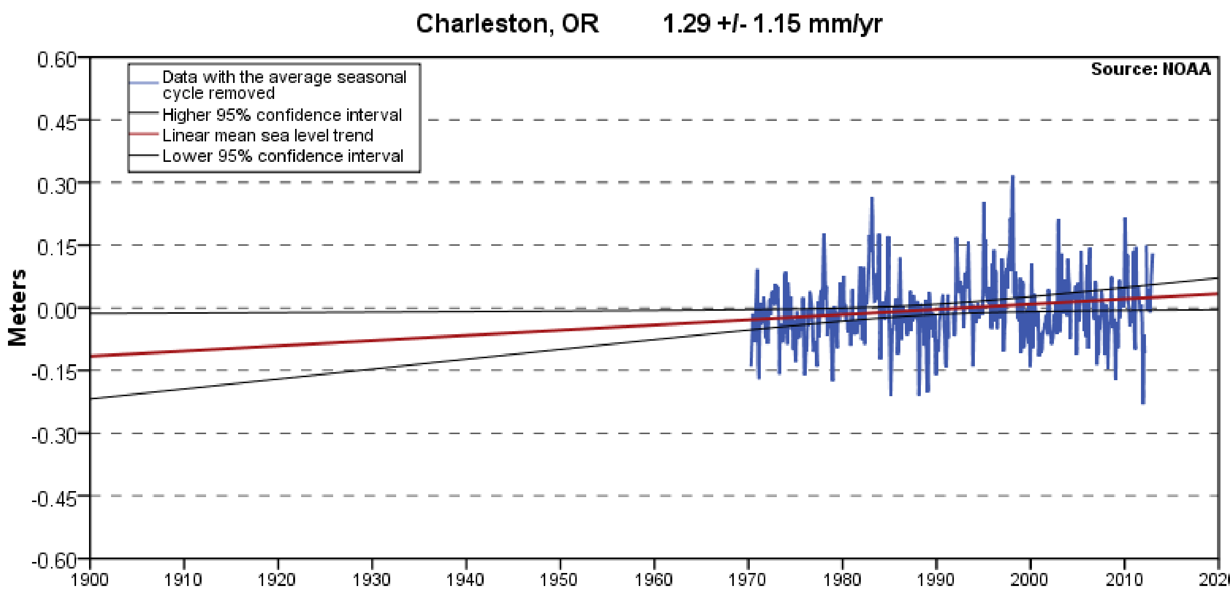

Figure 3-1. Mean Sea Level Trend at Charleston, Oregon (source: NOAA 2012)

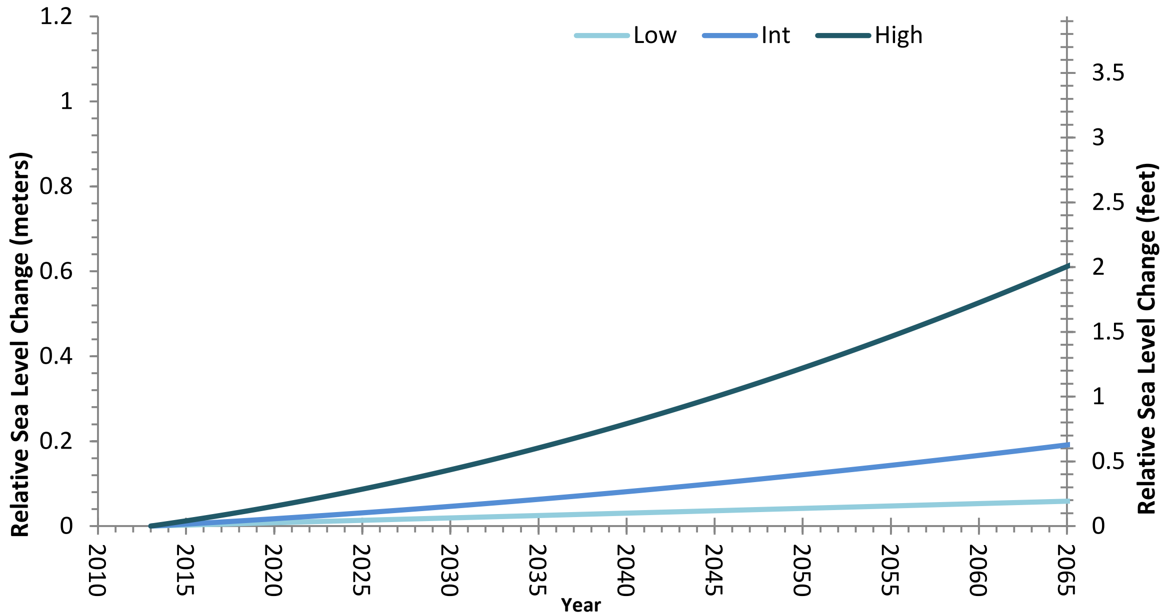

Figure 3-2. Relative Sea-Level Rise Projections for Coos Bay (derived from Charleston, Oregon tide gauge and Corps 2011)

3.1.3 Hydrology

Coos Bay is an estuary formed at the junction of the Coos River with a number of smaller tributaries, including South Slough, Isthmus Slough, Kentuck and Willanch Sloughs, and North Slough. Coos Bay, and the 30 tributaries that flow into the Bay, lie within the U.S. Geological Survey (USGS) designated watershed, Coos Bay (USGS Cataloging Unit: 17100304). The estuary is primarily fed by the Coos and Millicoma Rivers (together contributing about 60% of the fresh water entering the bay) along with a number of streams and sloughs (contributing about 40% of the fresh water entering the bay) (CCLAC and ODA 2010). Records from 1933 to 1963 show that January is the wettest month at North Bend, averaging 9.9 inches of precipitation, and July is the driest with an average of 0.38 inches (Corps 1975). According to Corps (1975) freshwater inflow may vary from 100,000 cfs in winter to 100 cfs in summer.

The Coos Bay estuary has a tidal prism of 1.86 x 10^9 cubic feet (Roye 1979). The diurnal tidal range is 7.62 feet and the mean range is 5.7 feet (NOAA 2012). The head of the tide extends up the South Fork Coos River approximately 32 miles from the mouth of the estuary and 34 miles from the mouth of the estuary up the Millicoma River (Kraeg 1979). The Corps (1975) found that the average tidal current at Coos Bay is 2.0 knots (3.4 ft/s) and that river flood currents are about 3.5 knots (5.9 ft/s).

Based on work done by Burt and McAllister (1959), Coos Bay is considered a well-mixed estuary in terms of temperature and salinity during periods of low runoff and a partially mixed estuary during periods of maximum runoff. Sediment transported to the estuary from its drainage basin averages 72,000 tons annually (Percy et al. 1974).

3.1.4 Sediment Quality

The Corps began collecting sediment quality data from the Oregon Federal Navigation Projects in the late 1970s. Prior to 2006, sediment evaluations were conducted following the procedures set forth in the Ocean Disposal Testing Manual (Corps and USEPA 1991) and the Inland Testing Manual (Corps and USEPA 1998), and used contaminant screening levels identified in the Dredged Materials Evaluation Framework (DMEF) (Corps et al. 1998), developed jointly by the Corps and the USEPA to assess dredged material to determine whether sediment is acceptable for in-water placement. Currently sediment sampling and analysis for the coastal projects follows these national guidelines and the regional screening levels (SL) that have been adopted for the Northwest Regional Sediment Evaluation Framework[9] (SEF) (Corps et al. 2009).

Coos Bay and River

Physical and chemical evaluation sampling was performed at Coos Bay in 1980, 1986, 1987, 1989, 1993, 1994, 1995, 1998, 1999, 2002, 2004 and 2009. The results of these studies have found that all channels are comprised of materials characterized as sand, except for the Upper Navigation Channel that is comprised of sandy silt. The regional data recency guidelines recommend that the Corps sample the dredged material from their Oregon maintenance dredging projects every seven years (for fine-grained materials) to 10 years (for coarse-grained materials). The dredged material suitability determinations made on the 2009 data, cover the Project through 2016-2019 (Table 3-1).

Table 3-1. Sediment Sampling and Dredge Material Suitability (source: Corps 2013a)

Area Sampled	Sediment Characteristics (material type, % fines)	Last Sampling Date	Suitability Determination	Suitable for In-water Placement (Y/N)	Sampling Frequency (years)	Sediment Evaluation Guidance Used
Entrance Channel	Sand, <1%	September 2009	March 2010	Y	10	2009 SEF
Lower Navigation Channel (RM 1 to RM 12)	Sand, 5%	September 2009	March 2010	Y	10	2009 SEF
Upper Navigation Channel (RM 12 to RM 15)	Sandy silt, 70%	September 2009	March 2010	Y	7	2009 SEF
Charleston Access Channel	Sand, <2%	September 2009	March 2010	Y	10	2009 SEF

Material from the Upper Navigation Channel has finer grained characteristics, therefore, is subject to more frequent sampling and testing. Analyses can include physical characteristics, heavy metals, tributyltin (TBT), pesticides/polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). Limited dioxin testing has also been conducted. Dredged material has been found suitable for unconfined in-water placement. Berthing areas have been found to be more contaminated and required

[9] The Sediment Evaluation Framework (SEF) is a regional framework, developed in 2009 by the Corps and USEPA in cooperation with a number of Northwest state and federal agencies, to evaluate suitability of dredged material for in-water placement. Dredging and placement projects must all undergo the Corps' sediment characterization review process by the SEF interagency Project Review Group (PRG). PRG representatives include members from many federal and state agencies including the Corps, USEPA, NMFS, USFWS, ODEQ, among others.

further biological testing. All areas in the upper bay that have been evaluated by biological testing have been found to be suitable for ocean placement.

Analyses of samples from the lower bay found the material to be predominantly coarse-grained (less than 1% fines at RM 1, less than 2% fines at the Charleston Access Channel, less than 5% fines in the main Navigation Channel (RM 1 to 12) and about 30% fines in the upper Navigation Channel to RM 15 (Corps 2010).

Sixteen box core grab samples and three gravity core samples were collected from the Project Area on September 16, 2009 to characterize the entire Navigation Channel (Corps 2010). BC-1 and BC-2 were from the Charelston Access Channel, BC-3 through BC-12 were from the main Navigation Channel (RM 0 to 12) and BC-13 to BC-17 were from the main Navigation Channel (RM 12 to 15). GC-13A and Z, and GC-14, were from Isthmus Slough. All 19 sediment samples were submitted for physical analyses, with eight samples collected from finer-grained areas further subjected to chemical analyses.

Samples BC-1 through BC-12 were composed of dredge prism material. However, the shoals between RM 12 to 15 were in the process of being dredged during the September 2009 sampling event. Since dredging was in progress in the fine-grained areas that would typically require a core sample for characterization, sampler selection varied. Where dredging had already occurred, a surface-grab sample representing the new surface material was collected and analyzed (samples BC-15 through BC-17). In fine-grained areas that had not been dredged recently a gravity and box core sample was collected, with discrete analyses representing the existing surface, the dredge prism, and the NSM (samples BC-13, GC-13A, GC-13Z, GC-14A).

Levels of metals were consistent with historical values and did not approach the SEF SLs. All of the standard chemicals of concern were either not detected, or they were below the SEF SLs and material was found to be suitable for unconfined in-water placement without further characterization.

Offshore and Nearshore Marine Areas

Sandy sediments are common along the Oregon Coast with natural variation in percent fines depending upon variations in local current patterns. The sediment at the Coos Bay ODMDS is primarily fine sand with small amounts of medium and coarse sand, including minor quantities of fines (Hancock 1981).

Annual bathymetric surveys of the ODMDS are a requirement outlined in the SMMP necessary to manage the placement sites and monitor for any mounding issues (USEPA and Corps 2006). The Corps prepares annual summary reports to the USEPA as required by their designation of the ODMDS for use.

3.1.5 Water Quality

Water quality in the Project Area is monitored by the Oregon Department of Environmental Quality (ODEQ) Ambient Water Quality Monitoring Program and the Oregon Beach Monitoring Program (OBMP).

According to the ODEQ Watershed Quality Assessment Database (2010), 303(d) water quality limited segments exist in the Coos Watershed. Water quality limited segments of the Bay and rivers within the Project Area where a Total Maximum Daily Load (TMDL) is needed are listed in Table 3-2.

Table 3-2. Water Quality Limited Areas (source: ODEQ 2010)

Waterbody	River Mile (RM)	Cause(s) of Impairment	Beneficial Use(s)	State TMDL Status
Coos Bay	0 to 7.8	Fecal Coliform	Shellfish growing	TMDL Needed
Coos Bay	7.8 to 12.3	Fecal Coliform	Shellfish growing	
Coos River	0 to 6.5	Fecal Coliform	Shellfish growing	
Millicoma River		DO, Fecal Coliform	Salmonid spawning and shellfish growing.	
Isthmus Slough	0 to 10.6	DO, Fecal Coliform, Manganese, Temperature, Water	Resident fish and aquatic life, anadromous fish passage, salmonid rearing, drinking water, fishing and shellfish growing.	
Coalbank Slough	0 to 0.5	Fecal Coliform	Shellfish growing	

All water quality limited segments were identified as needing TMDL. The ODEQ is currently in the “initial scoping and data collection phase” for the preparation of a TMDL for the watershed. A TMDL is the USEPA’s way of measuring a receiving waters loading capacity for pollutants from both point and non-point sources. The water quality limited segments listed above show no change in status between the 2010 report and the 2006 reporting year.

Water quality outside of the Bay and around the ODMDS is typical for seawater in the Pacific Ocean. In the 2012 and 2013, Oregon’s Department of Human Services (OHA) and ODEQ collectively monitored 16 locations throughout the state for Enterococcus bacteria, an indicator species for other bacteria; however, only 11 ocean water sampling sites were sampled frequently enough (at least weekly) to receive a grade in the 2012-2013 Annual Beach Report Card (Heal the Bay 2013). While all 11 monitored locations received A grades for the summer dry period and 10 of the 11 locations received A grades for the wet weather period, samples were all taken from only two northern Oregon counties (Tillamook and Clatsop). However, samples from beaches in De Norte County (the northernmost county in California) also received A grades for all periods of the year. Additionally, the Oregon Beach Monitoring Program’s latest 2011 water quality sampling results for Bastedorf Beach, just off of the Coos Bay South Jetty showed no detectable limits of Enterococcus bacteria either (OCA 2013).

3.1.6 Sound

In-air

Coos Bay is bordered by a variety of communities (Charleston, Barview, North Bend, Coos Bay, and Bunker Hill), all of which would contribute to ambient in-air sound levels along the bay. The population and size of these towns would suggest that in-air sound, measured on an “A” weighted scale (dBA), may range between 50 and 60 dBA in their proximity (FTA 2006). Southwest Oregon Regional Airport is also situated adjacent to the bay and can be expected to result in relatively high sound levels as planes can produce noise in the magnitude of 100 dBA. In addition, there are two transportation corridors crossing the bay, Highway 101 and a functioning rail bridge (used about once or twice a day) that could be expected to produce sound between 45 to 75 dBA (FTA 2006). Waterfront industrial activities can also create sounds levels in the range of 70 to 90 dBA, peaking at 99 dBA for short durations (77 FR 59904). These sounds are produced by heavy trucks, forklifts, marine vessels and tugs, tools and equipment used on piers and shoreline industrial sites. During poor weather conditions, vessels within the Project Area may use foghorns. The sounds from these horns can be quite loud, reaching levels of about 95 to 120 dBA (FTA 2006).

Taking into consideration the port and waterfront operations and strong winds and waves coming onshore from the Pacific Ocean, ambient noises may reach up to 90 dBA intermittently.

In-water

Ambient in-water sound in the Project Area is affected by many factors including: wind and waves from the Pacific Ocean, commercial and recreational vessel use, sounds from resident aquatic animals, nearby land masses and the ocean floor, currents, etc. A recent study of ambient ocean sound for Oregon's nearshore environment observed maximum and minimum levels of 136 dB referenced to a standard pressure level of one micro Pascal (re µPa) and 95 dB re 1 µPa, respectively, with an average level of 113 dB re 1 µPa over a period of one year (Haxel et al. 2012). This level could vary given different recreational and commercial vessels; up to 150 dB for smaller fishing vessels (Hildebrand 2005), up to 186 dB for large vessels, 81 to 166 dB for empty tugs and barges and up to 170 dB for loaded tugs and barges (Richardson et al. 1995) within the frequencies between 20 and 5000 hertz (Hz). Dolphins and toothed whales produce broadband clicks of 125 to 173 dB within frequencies between one kilohertz (KHz) and 200 KHz and humpback whale songs can range between 144 and 174 dB (DOSITS 2012).

3.1.7 Air Quality

The Project Area is located along the southwest coast of Oregon. Some limited industrial sources of pollution exist within and around the cities of North Bend, Charleston and Coos Bay. Air quality is discussed in this section in context to state standards and global changes in temperature.

3.1.7.1 Compliance with National Air Quality Standards

The USEPA sets national air quality standards for six common pollutants (also referred to as "criteria" pollutants). These standards, known as National Ambient Air Quality Standards (NAAQS) consist of standards for carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter ($PM_{2.5}$ and PM_{10}) and sulfur dioxide (SO_2). Detail on the NAAQS standards are provided in Table 3-3. The USEPA has separated Oregon into 25 geographic monitoring areas, which are rated hourly based on compliance with the NAAQS standards. Failure to consistently meet these levels results in the area being designated as a Nonattainment Area. An area can also be designated as a Maintenance Area if it has a history of nonattainment, but is now consistently meeting the NAAQS.

The Project Area is not located within a Nonattainment or Maintenance Area. Several Nonattainment/ Maintenance areas are located in eastern Oregon with exceedances of carbon dioxide (CO_2), ozone and particulates ($PM_{2.5}$ and PM_{10}).

Table 3-3. National Ambient Air Quality Standards (source: ODEQ 2012)

Pollutant	Average Time	National Ambient Air Quality Standard (NAAQS) Violation Determination	Federal Primary Health Standard (NAAQS) Exceedance Level	State Standard Exceedance Level
Carbon monoxide	1-hour	Not to be exceeded more than once/year.	35 ppm	35 ppm
	8-hour	Not to be exceeded more than once/year.	9 ppm	9 ppm
Lead	Calendar Quarter	Quarterly arithmetic mean.	0.15 µg/m^3	0.15 µg/m^3
Nitrogen dioxide	Annual	Annual arithmetic mean.	53 ppb	53 ppb
	1-hour	3-year average of the maximum daily 98th percentile one hour average.	100 ppb	NA
Ozone	8-hour	3-year average of the annual 4th highest daily maximum 8-hour average concentration.	75 ppb	75 ppb
PM2.5	24 hour	98th percentile of the 24-hour values determined for each year. 3-year average of the 98th percentile values.	35 µg/m^3	35 µg/m^3
	Annual Average	3-year average of the annual arithmetic mean.	15 µg/m^3	15 µg/m^3
PM_{10}	24 hour	The expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than 1 over a 3-year period.	150 µg/m^3	150 µg/m^3
Sulfur dioxide	1 hour	3-year average of the maximum daily 99th percentile one hour average.	75 ppb	NA

ppm (parts per million), ppb (parts per billion), µg/m^3 (microgram per cubic meter)

3.1.7.2 Climate Change

Climate is governed by incoming solar radiation and the greenhouse effect. The greenhouse effect is the result of certain naturally occurring, atmospheric gases absorbing long-wave radiation emitted from the Earth. Absorption of this long-wave radiation in the atmosphere, as opposed to being transmitted into space, warms the Earth. GHGs include (in order of importance to the greenhouse effect) water vapor, carbon dioxide, methane, nitrous oxide and ozone.

Human (anthropogenic) activities such as the burning of fossil fuels (adding more GHGs to the atmosphere) and clearing of forests (removing a natural sink for carbon dioxide), have intensified the natural greenhouse effect, causing global warming. Carbon dioxide emissions from the burning of fossil fuels are the most substantial source of anthropogenic GHG emissions. Global atmospheric concentrations of carbon dioxide have risen almost 100 parts per million (ppm) since their pre-industrial (1750) value of 280 ppm (OCCRI 2010).

Natural factors, which include solar variation and volcanic activity, also contribute to climate change. However, strong scientific evidence suggests that these factors alone do not fully explain the observed accelerated global warming of the past few decades (OCCRI 2010).

3.2 BIOLOGICAL RESOURCES

The Project Area is located in the Coos Bay estuary, the largest estuary entirely in Oregon. The estuary is the sixth largest on the Pacific coast. Similar to the other larger estuaries in the state (Columbia River and Yaquina Bay), Coos Bay has been altered by heavy development over the past century (forestry, fishing, coal mining, dredging, filling and diking).

3.2.1 Aquatic Plants, Animals and Habitat

Coos Bay is a drowned river mouth fed by 30 tributaries and surrounded by steep forested hillsides. The estuary is approximately 13,300 acres in size and the tidelands encompass about 6,200 acres (50%) while tidal wetlands cover about 2,738 acres (13%) (Akins and Jefferson 1973). Much of the lower elevation lands are diked and have been used for either agriculture or urban development (i.e. downtown Coos Bay is located on a former salt marsh). The remaining shallow water habitat provides important transitional habitat for marine and freshwater aquatic and terrestrial species including marine (deep water to beaches and shallow sub tidal, estuary, mudflats, seagrass beds, salt marsh), freshwater (wetlands, marshes, rivers), and upland (grasslands, coastal forests).

Along the southern arm of the Coos Bay estuary is the South Slough, which has been designated the South Slough National Estuarine Research Reserve, one of only 27 such reserves in the country (NERRS 2013). The 4,771-acre reserve includes 3,855 acres of upland forest, 115 acres of riparian habitat and 800 acres of tidelands. The estuary is connected to Coos Bay near Charleston and is one of seven tidal inlets that collectively form the Coos estuary. Over 80% of the tidal wetlands have been lost over the past century to diking, draining and development.

There are at least 67 non-indigenous aquatic species in Coos Bay, one of the most invaded ports of the west coast (PCW 2013). They include: the Green crab (*Cancer maenas*), which compete strongly with the Dungeness crab (*Metacarcinus magister*); a colonial tunicate (*Didemnum vexillum*), which smother biological communities on the seafloor; and smooth cordgrass (*Spartina alterniflora*), a concern in low intertidal areas. Other non-native invertebrates include two snails found in the brackish and freshwater areas of the estuary: the New Zealand mud snail (*Potamopyrgus antipodarum*) and the Asian marsh snail (*Assiminea parasitologica*).

The Coos Bay estuary supports a tremendous diversity of flora and fauna. The diversity of avian life at Coos Bay deserves special note. Coos Bay is of special importance to migrating waterfowl due to the presence of extensive seagrass beds. The bay is a resting place, feeding area and wintering grounds for migratory birds that use the Pacific Flyway. About 250 species of birds including waterfowl, shorebirds, seabirds, and marsh-birds (some of which are mentioned in the following sections) are resident or regular visitors of the Coos Bay area.

Marine Subsystem through Lower Bay

Aquatic habitat within the lower portions of Coos Bay (up to about RM 9) includes sandy and cobble beaches and rocky substrate (especially near the Entrance Channel), from about RM 0 to RM 2.5. This marine subsystem is biologically diverse and most influenced by the ocean.

The lower bay system extends up to about RM 9 and includes mudflats and seagrass beds. The area is still under considerable tidal influence. Small subtidal kelp (*Nereocystis leutkeana*) beds are located in the lower sections of the estuary, and free-floating, seasonally occurring mats of various green algae sometimes cover large areas of the upper bay (Ednoff 1970). Marshes and wetlands are also located on the North Spit and Henderson Marsh is a large wetland located on upper north end of the North Spit.

Coos Bay contains large seagrass beds in the lower and middle portions of the bay (Figure 1-1 and Figure 1-2), which provide an important foundation for complex food webs and habitat for many species of invertebrates, algae, birds and fish. Seagrass abundance varies seasonally, with winter die-off and spring and summer re-growth. There is considerable annual variation in abundance due to factors, such as physical and chemical disturbance, changes in nutrient availability and light, and changes in water quality parameters such as turbidity and salinity. The majority of recently documented seagrass beds in Coos Bay[10] (Shafer and Bourne 2012) are located outside of the authorized channels, the channels generally being deeper with faster flow rates than that preferred by seagrasses (except for the Charleston Channel). Although there are at least six different species of seagrass in coastal Oregon, most of the focus has been on native eelgrass (*Zostera marina*).

Between RM 5 and 9, phytoplankton species transition from *Chaetoceros*, *Skeletonema*, and *Thalassiosira* to *Melosira* and *Skeletonema* in the upper bay (McGowan and Lyons 1973). Zooplankton taxa decrease with increasing distance from the Entrance Channel. Invertebrates include polychaetes, such as *Streblospio benedict,* and crustaceans including *Corophium*, an important food for salmonids and other fish in the estuary. Commercially and recreationally important invertebrates includes several species of clams, the Dungeness crab, the red rock crab (*Cancer productus*), oysters, bay mussels (*Mytilus edulis*), ghost shrimp, kelp worms, and mud shrimp (Roye 1979). Species of clams harvested in Coos Bay include gapers (*Tresus capax*), cockles (*Clinocardium nuttallii*), butter clams (*Saxidomus giganteus*), littlenecks (*Protothaca staminea*), softshell clams (*Mya arenaria*), and razor clams (*Siligua patula*). Softshell clams are usually found only below the railroad bridge (RM 9). Clams are more frequent within the tideflats adjacent to North Spit and Pigeon Point as well as the flats just south of Charleston Bridge (Gaumer et al. 1973). Both Dungeness and red rock crabs are found throughout the bay, the lower bay being the primary area for recreational crab fishing. Crab larvae are abundant within Coos Bay and the offshore area in the late spring and early summer, while smaller crabs can be found in upper reaches of the bay. Ghost shrimp (*Callianassa californiensis*), and mud shrimp (*Upogebia pugettensis*), are also found within the bay (Gaumer et al. 1973).

Fishery resources in Coos Bay include a variety of both demersal and pelagic fish species. At least 66 species of fish are known to use the Coos Bay estuary (Cummings and Schwartz 1971), the greatest variety being found within the lower bay. Five anadromous species of salmon and trout use the bay including coho salmon (*Oncorhynchus kisutch*), chinook salmon (*Oncorhynchus tschawytscha*), steelhead trout (*Oncorhynchus mykiss*), searun cutthroat trout (*Oncorhynchus clarki clarki*), and occasionally chum salmon (*Oncorhynchus keta*). Salmonids use Coos Bay as a feeding and nursery area, as well as a migration route to spawning areas in the tributary streams.

[10] Three separate GIS data sets were compiled into a summary report (Shafer and Bourne 2012) in order to map seagrass using existing aerial photography, field surveys, sonar, videography, and other forms of data: TerraLogic GIS, Inc.; the USEPA, and the Engineer Research and Development Center (ERDC). These datasets vary in the age of the source and age of the data, the species of seagrass mapped, and degree of quality control and again, only show seagrasses from the above listed sources.

Steelhead, cutthroat trout and salmon can be found in the bay during most of the year. Adult migration of these species varies: chinook, July through November; coho, September through December; chum, October through November; steelhead, November through February; searun cutthroat trout, July through October. Depending on the species, young fish enter or pass through the bay when only a few days to two years old. Juveniles, particularly of chinook salmon use the bay as a nursery area throughout the year. Emigration of chinook salmon occurs during May through July; coho, April through June; chum, March through May; steelhead and cutthroat, April-June. Emigration of yearling coho salmon, steelhead, and cutthroat trout also occurs during early fall freshets.

Pacific herring (*Clupea pallasi*) use the bay as a spawning and nursery ground and herring eggs can be found between January and March on rocks, pilings, seaweed and seagrass. Mature and immature herring occur in the bay during spring and summer months. Young herring have been found as far upriver as RM 20, though they are more numerous below RM 15 (Cummings 1971). After spawning in the open ocean, young and adult northern anchovies (*Engraulis mordax*) enter Coos Bay where they occur in high numbers between April and September. Large numbers of anchovies have been observed between RM's 10 and 14 during April and May (Cummings 1971). Salmonids and striped bass (*Morone saxatilis*) are common anchovy predators (McConnaughey 1971). Other common species include a variety of smelt. Adult shad (*Alosa sapsidissimia*) migrate through the bay during late spring and early summer on their way to spawning areas in the Coos River. Yearling shad are present in the river in June when they occur between RM's 15 and 25 (Cummings 1971). They move downstream in mid-July and arrive at the ocean by the end of August. Young shad occur throughout the upper estuary as far down as RM 9 in August and as far up as RM 31 in September (Cummings and Schwartz 1971).

A variety of demersal fish occur in Coos Bay, particularly in the marine and lower bay subsystems. These fish include starry flounder (*Platichthys stellatus*), English sole (*Parophrys vetulus*), a variety of rockfish, kelp greenling (*Hexagrammos decagrammus*), Pacific sand lance (*Ammodytes hexapterus*), gunnels, and sculpins among others. Green sturgeon (*Acipenser medirostris*) and white sturgeon (*Acipenser transmontanus*) both occur in Coos Bay. The green sturgeon appears to be the most abundant, and is found in the Coos River up to RM 25. White sturgeon have been found as far up as RM 10 (Cummings and Schwartz 1971).

The lower bay is used intensively by a variety of birds. The shallow mudflats between Pigeon Point and RM 8 provide a wintering area and migratory stopover for Pacific flyway waterfowl, as well as shorebirds. The islands along the North Spit provide nesting habitat for a variety of gulls, Caspian terns (*Sterna caspia*) and double-crested cormorants (*Phalacrocorax auritus*) as well as roosting areas for brown pelicans (*Pelecanus occidentalis*) and various shorebirds (discussed in more detail in Section 3.2.2). The largest concentration of spring migratory black brant (*Branta bernicla*) in the state are found almost exclusively in the tidewater area between Fossil Point and Pigeon Point, and across the bay on the North Spit.

Upper Bay through Riverine

The upper bay system extends from about RM 9 to RM 17 and is probably the most altered within the Coos Bay estuary (Corps 1994). The upper bay includes a number of shallow tideflats through which the federally authorized navigation channel is maintained on the west side. These flats provide important feeding habitat for a variety of juvenile and adult fish including striped bass (*Morone saxatilis*), shad and salmonids.

The Sloughs of Coos Bay include North Slough, Haynes Inlet, Kentuck Slough, Pony Slough, Willanch Slough, Isthmus Slough, Coalbank Slough, and Catching Slough. The Coos and Millicoma Rivers are the largest rivers feeding Coos Bay.

Benthic invertebrate species diversity decreases in the upper bay compared to that of the lower bay (Jefferts 1977). Coho salmon apparently remain in the river or fresh-water portion of the estuary during the summer. Coho yearlings have been collected from the estuary en route to the ocean between March and May (Cummings and Schwartz 1971). Striped bass also occur in the South Slough during the winter. Spawning begins in May and June when various groups of bass begin to school and move upriver towards the spawning grounds in the Coos River. They are thought to migrate to the ocean by the end of their first year (Cummings and Schwartz 1971).

The Upper bay supports large numbers of feeding puddle ducks throughout the year. Wintering waterfowl include American wigeon (*Anas americana*), northern pintails (*Anas acuta*), gadwalls (*Anas strepera*), green-winged teal (*Anas carolinensis*), mallards (*Anas platyrhynchos*), northern shovelers, (*Anas clypeata*), among others. Diving and sea ducks are most abundant in the channels of South Slough and lower Coos Bay. Numerous shorebirds also feed in the upper bay (discussed in more detail in Section 3.2.2). Other common birds in the upper bay include double-crested cormorants, western grebes (*Aechmophorus occidentalis*), great blue herons (*Ardea herodias*), and great egrets (*Ardea alba*).

Offshore and Nearshore Marine Areas

The infaunal community of the Project Area, including the ODMDS, is dominated by gammarid amphipods and polychaete worms. The benthos in the area is typical of the communities found near other ocean placement sites along the Oregon Coast, consisting, dominated largely by very mobile organisms, provides an important link in the marine food web. Organisms include polychaete annelids (marine worms), such as such as *Maielona sacculata*, *Chaetozone setosa*, or *Spiophanes bombyx*, small crustaceans (amphipods and cumaceans), mollusks (clams and snails), and echinoderms, such as sand dollars (*Dendraster excentricus*). The sand cobble community is characterized by the scale worm (*Hesionura coineaui difficilis*), barnacles, and archiannelids, in addition to the more typical polychaetes, cumaceans, and amphipods. These organisms serve as a direct food source for other benthic organisms and demersal fishes. They also play an active role in the breakdown of organic debris and the tube-building species help stabilize the marine sediments. Many of the benthic species in the area are able to survive in this dynamic environment since they are either very mobile or are able to react both to natural or human perturbations. Dominant macroinvertebrates include shellfish, Dungeness crab and squid.

The nearshore ocean environment outside the mouth of Coos Bay supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi et al. 2007, Chase et al. 2007). In addition to supporting a commercial salmon fishery, the estuary also provides important spawning or rearing habitat for several species of marine fish including starry flounder (*Platichthys stellatus*), sand sole (Psettichthys melanostictus), and Pacific Ocean perch (*Sebastes alutus*).

Since 1982, four species of marine turtles have been recorded from strandings along the coastline. These include the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), olive (Pacific) ridley (*Lepidochelys olivacea*), and leatherback (*Dermochelys coriacea*) Marine turtles are unusual in their occurrence along the Pacific Coast and are typically associated with warmer marine waters.

There is also a variety of marine mammals along the Oregon Coast including a number of pinnipeds, such as the Steller sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*), and harbor seal (*Phoca vitulina*). Most of these species are migratory or transient in nature with only harbor seals being resident, breeding in the estuary and on nearshore rocks. Cape Arago, located outside the jetties and a few miles south, provides extensive feeding grounds for pinnipeds, including the Steller sea lion, and provides habitat for the only breeding colony of northern elephant seals (*Mirounga angustirostris*) in Oregon.

Harbor porpoises (*Phocoena phocoena*) are residents of Coos Bay, while many other observed cetaceans in the Project Area are more migratory. Gray whales (*Eschrichtius robustus*) migrate south along the Oregon coastline between early December and mid-February (Herzing and Mate 1984). While they tend to migrate in deeper offshore waters, gray whales have been observed within Coos Bay (Corps 1994). The northbound migration is comprised of two groups of whales migrating between mid-February and April and then again between late April and May (Herzing and Mate 1984). Killer whales (*Orcinus orca)* have also been observed patrolling the Oregon Coast.

Pelagic birds are extremely numerous in the offshore area and include shearwaters, storm petrels, gulls, and common murres (*Uria aalge*). Phalaropes, fulmars and California gulls *(Larus californicus*) are numerous in the fall. The principal species in the winter are phalaropes, fulmars, other gulls, murres, and auklets. Red-throated loons (*Gavia stellate*), Pacific loons (*Gavia pacifica*) and common loons (*Gavia immer*) occur as spring and fall migrants. Brown pelicans occur from late spring to mid-fall along the coast. Other birds include grebes and tufted puffins (*Fratercula cirrhata*).

3.2.2 Shoreline and Terrestrial Plants, Animals and Habitat

The Project Area is a mixture of natural and developed shore and upland areas reflecting the current land uses in the watershed (rural-residential, commercial-industrial, undeveloped, etc.). Riparian vegetation is mostly limited to areas immediately alongside the bay. The developed shorelines of Charleston, Coos Bay, and North Bend are intermixed with the less disturbed shorelines of Empire, Eastside and the North Spit. Sand beaches are located on the north and south sides of the jetties.

Coos Bay is one of the six most important areas for shorebirds between San Francisco Bay and British Columbia (OWJV 1994). A few common shorebirds include the black oystercatcher (*Haematopus bachmani*), rock sandpiper (*Calidris ptilocnemis*), wandering tattler (*Tringa incanus*), Western sandpiper (*Calidris mauri*), whimbrel (*Numenius phaeopus*), dunlin (*Calidris alpine*), and the black-bellied plover (*Pluvialis squatarola*). Raptors in the area include the peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*). Most eagles nest within one mile of water to take advantage of fish, their primary prey species. An important wintering and breeding area for the western snowy plover (*Charadrius alexandrinus nivosus*) is located on the North Spit, directly inland from ODMDS F.

Freshwater mammal species using the estuary include mink, otter, beaver, raccoon, and muskrat.

3.2.3 Threatened and Endangered Species

Section 7 of the ESA requires Federal agencies to use their legal authorities to promote the conservation purposes of the ESA and to consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), as appropriate, to ensure that effects of actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species. Table 3-4 summarizes ESA-listed species under the jurisdiction of the NMFS and the USFWS that may be present in the Project Area.

ESA-listed upland animals and plants (excluding birds that may forage in or near the area) are highly unlikely to be in the Project Area or be affected by continued maintenance dredging activities, and are not included in Table 3-4.

The Project Area also includes habitat, designated as Essential Fish Habitat (EFH) for various life stages of groundfish, coastal pelagics and Pacific salmon (PFMC 2012).

Table 3-4. ESA-listed Fish, Marine Mammals and Birds That May Occur in the Project Area

Species	Status	Federal Register (FR) Listing	Critical Habitat
Oregon Coast (OC) Coho Salmon *Oncorhynchus kisutch*	Threatened	76 FR 35755; 6/20/2008	73 FR 7816; 2/11/2008
Southern Oregon/Northern California Coasts (SONCC) Coho Salmon (*Oncorhynchus kisutch*)	Threatened	70 FR 37160; 6/28/2005	64 FR 24049; 5/5/1999
Lower Columbia River Coho Salmon *Oncorhynchus kisutch*	Threatened	70 FR 37160; 6/28/2005	Proposed; 1/14/2013
Lower Columbia River Chinook *Oncorhynchus* tshawytscha	Threatened	70 FR 37160; 6/28/2005	70 FR 52630; 9/2/2005
Upper Willamette River Spring Run Chinook *Oncorhynchus tshawytscha*	Threatened	70 FR 37160; 6/28/2005	70 FR 52630; 9/2/2005
Snake River Spring/Summer Run Chinook *Oncorhynchus tshawytscha*	Threatened	70 FR 37160; 6/28/2005	64 FR 57399; 10/25/1999
Southern DPS* Green Sturgeon *Acipenser medirostris*	Threatened	71 FR 17757; 4/7/2006	74 FR 52300; 11/9/2009
Southern DPS* Pacific Eulachon *Thaleichthys pacificus*	Threatened	75 FR 13012; 3/8/2010	76 FR 515; 01/05/2011
Eastern DPS* Steller Sea Lion *Eumetopias jubatus*	Threatened	62 FR 24345; 5/5/1997	58 FR 45269; 8/27/1993

Species	Status	Federal Register (FR) Listing	Critical Habitat
Blue Whale *Balaenoptera musculus*	Endangered	35 FR 18319; 12/2/1970	None designated
Fin Whale *Balaenoptera physalus*	Endangered	35 FR 18319; 12/2/1970	None designated
Humpback Whale *Megaptera novaeangliae*	Endangered	35 FR 18319; 12/2/1970	None designated
Southern Resident Killer Whale *Orcinus orca*	Endangered	70 FR 69903; 11/18/2005	71 FR 69054; 11/29/2006
Sei Whale *Balaenoptera borealis*	Endangered	35 FR 18319; 12/2/1970	None designated
Sperm Whale *Physeter macrocephalus*	Endangered	35 FR 18319; 12/2/1970	None designated
Loggerhead Sea Turtle *Caretta caretta*	Threatened	43 FR 32800; 7/28/1978	None designated
Green Sea Turtle *Chelonia mydas*	Endangered	43 FR 32800; 7/28/1978	63 FR 46693; 9/2/1998
Leatherback Sea Turtle *Dermochelys coriacea*	Endangered	35 FR 18319; 12/2/1970	77 FR 4170; 1/26/2012
Olive (Pacific) Ridley Sea Turtle *Lepidochelys olivacea*	Endangered	43 FR 32800; 7/28/1978	None designated
Marbled Murrelet *Brachyramphus marmoratus*	Threatened	57 FR 45328; 10/1/1992	61 FR 26255; 5/24/1996
Short-tailed Albatross *Phoebastria albatrus*	Endangered	35 FR 8491; 6/2/1970	None designated
Western Snowy Plover *Charadrius alexandrinus nivosus*	Threatened	58 FR 12864; 3/5/1993	70 FR 56969; 9/29/2005

* DPS: A Distinct Population Segment (DPS) is a discrete population of a species, significant in the relation to that entire species that can be protected under the ESA.

Table Source: USFWS Oregon Office list for Coos County last updated 01/31/2013; NMFS Northwest Regional Office website last updated 01/31/2013.

3.2.3.1 NMFS Jurisdictional Species

Marine Whales

The blue whale (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis*), sperm (*Physeter macrocephalus*), humpback (*Megaptera novaeangliae*), and Southern Resident killer whales (*Orcinus orca*) all occur as migrants off the Oregon Coast, typically in waters much farther offshore than the entrance to Coos Bay.

According to Maser et al. (1981), blue whales occur off the Oregon coast in May and June, as well as August through October. Blue whales typically occur offshore as individuals or in small groups and winter well south of Oregon. Fin whales also winter far south of Oregon and range off the coast during summer. Whaling records indicated that fin whales were harvested off the Oregon coast from May to September. Humpback whales occur primarily off the Oregon coast from April to October with peak numbers from June through August. Humpback whales were observed near Heceta Bank (approximately 15 to 30 miles off the Oregon coast in Lincoln and Lane counties) in June 1990 (Green et al. 1991). They noted that humpback whales were particularly concentrated in Oregon along the southern edge of Heceta Bank and found this species primarily on the continental shelf and slope.

Members of the Southern Resident killer whale population (*Orcinus orca)* have been observed in shallow waters (L pod at Depoe Bay April 1999 and Yaquina Bay March 2000). The Southern Resident killer whale population consists of 84 individuals in three pods, designated J, K, and L pods that reside from late spring to fall in the inland waterways of Washington State and British Columbia (Orca Network 2013). During winter, pods can move into Pacific coastal waters and are known to travel as far south as central California. In February 2013, a tagged member of K pod was tracked just north of Coos Bay (NMFS 2013). In January of 2013, this same individual was tracked north of Cape Blanco.

Critical habitat for the larger whales listed above has not been designated. Although critical habitat for the Southern Resident killer whale is designated, it does not include nearshore ocean areas adjacent to the Coos Bay Project Area.

Eastern DPS Steller Sea Lion

The Eastern Distinct Population Segment (DPS) of Steller sea lion (*Thaleichthys pacificus*) breeds along the West Coast of North America from California's Channel Islands to the Kurile Islands and the Okshotsk Sea in the northwestern Pacific Ocean. They are yearlong residents and forage at river mouths and nearshore areas along the Oregon Coast. Roffe and Mate (1984) determined that proximity to the mouth of a river was the most important factor in determination of forage areas. Steller sea lions are found year-round at Cape Arago, about three miles south of the Coos Bay Entrance Channel.

Designated critical habitat is located at both Rogue and Orford Reefs but is not designated in or near the Project Area.

Marine Turtles

The loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and olive (*Pacific*) ridley sea turtle (*Lepidochelys olivacea*) have been documented along the Oregon and Washington coasts either through observations or strandings. The occurrence of sea turtles off the coast is usually associated with the appearance of albacore (*Thunnus alalunga*) and jellyfish, common food sources associated with the warm waters of the Japanese current. These warm waters generally occur 30 to 60 miles offshore from the Oregon Coast. Marine turtles are unlikely inhabitants of Coos Bay. Because some food sources (jellyfish) can occur closer to shore and given their wide range of distribution, marine turtles could occur within the Coos Bay Project Area ODMDS.

Designated critical habitat for the leatherback sea turtle is located off the Oregon Coast and includes the ODMDS. It includes the nearshore area from Cape Flattery, Washington, to Cape Blanco, Oregon and offshore to the 2,000 meter isobath and a depth of 80 meters from the ocean surface (75 FR 4170). The essential Primary Constituent Element[11] (PCE) for the leatherback sea turtle is the occurrence of sufficient prey species to support individual and population reproduction and development. Critical habitat for the green sea turtle is designated around Puerto Rico only.

Southern DPS Green Sturgeon

The southern DPS of green sturgeon (*Acipenser medirostris*) includes all green sturgeon that spawn within the Sacramento-San Joaquin Rivers. Green sturgeon that spawn to the north, primarily in the Klamath and Rogue Rivers, constitute the northern DPS, which is not federally listed. The principal factor for the decline of southern DPS green sturgeon is the reduction of its spawning area to the Sacramento River. The southern DPS is currently at risk of extinction primarily due to human activities (i.e. the elimination of freshwater spawning habitat, degradation of freshwater and estuarine habitat quality, water diversions, fishing, and other causes) (Kahn and Mohead 2010).

The southern DPS green sturgeon spawn in their natal rivers and migrate to the ocean after three to five years. They reach sexual maturity between 13 to 20 years of age and spawn only about once every two to five years between March and July (Moyle et al. 1992). When not spawning, the southern DPS green sturgeon is broadly distributed in the nearshore marine areas between the Bering Sea and Mexico (Adams et al. 2002). However, more detailed information on their distribution and timing of estuarine use is less understood. Additionally, the feeding habits of green sturgeon are not well known but they are believed to feed primarily on benthic organisms similar to other sturgeon.

Several activities that threaten the PCEs in coastal bays and estuaries include: activities that could adversely affect prey resources or degrade water quality (i.e. commercial shipping and activities generating point source pollution and non-point source pollution that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon); placement of dredged materials that bury prey resources; and, bottom trawl fisheries that disturb the bottom but result in beneficial or adverse effects on prey resources for green sturgeon) (NMFS 2009).

Southern DPS green sturgeon, radio-tagged in the Sacramento River, have been shown to occur seasonally in Willapa Bay and the Columbia River estuary during the summer and early fall (Moser and Lindley 2007). While there is spatial overlap of the two DPS, the southern DPS appears to use smaller river estuaries to a lesser extent than the northern DPS (NMFS 2009).

Coos Bay is occupied by green sturgeon year-round (NMFS 2009) and southern DPS green sturgeon from San Pablo Bay have been tagged within the bay (NMFS 2009). Southern DPS green sturgeon do not spawn in the Coos River but subadults and adults could be present within the Project Area up to the head of the tide up the Coos and Millicoma Rivers. PCEs in the estuary include food, water quality and flow, and migratory corridors and both adults and subadults could use the Project Area for foraging, growth and development and for migration as they move north and south to different estuaries during the summer and fall.

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[11] A PCE is a physical or biological feature essential to the conservation of a species for which it is designated or proposed critical habitat is based on (i.e. space for individual and population growth, normal behavior; food, water; cover or shelter; sites for breeding or rearing; etc.).

Designated critical habitat for southern DPS green sturgeon includes Yaquina Bay, Winchester Bay (Umpqua River), and Coos Bay, as well as all U.S. coastal marine waters out to the 60 fathom depth bathymetry line from Monterey Bay, California north and east to include waters in the Strait of Juan de Fuca, Washington.

Oregon Coast Coho Salmon

Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*) includes all naturally spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco and includes five hatchery stocks. The major factors limiting recovery of OC coho salmon include altered stream morphology, reduced habitat complexity, loss of overwintering habitat, excessive sediment, high water temperature, and variation in ocean conditions (NMFS 2006). Habitat changes from land development have contributed to the decline of ESA-listed fish species in the area including the OC coho. There is reduced connectivity between streams, riparian areas and wetlands, floodplains and uplands and degradation and alteration of these habitats.

All coho salmon outmigrating or returning to the Coos River move through both the navigation channels the ocean nearshore portions of the Project Area, which include the ODMDS. Estimates of returning Coos Basin adult coho spawners show considerable variability in the annual abundance from year to year (NMFS 2010). Adult OC coho return to Coos Bay in the fall/winter, migrating upstream to spawn, with a peak from October through December. Outmigration of juveniles to the ocean occurs from February through mid-July, with a peak from mid-March to mid-May.

Critical habitat is designated in the estuarine portion of the Coos Bay Project Area; nearshore ocean areas have not been identified as critical habitat. OC coho salmon use critical habitat for feeding and migration. PCEs of critical habitat designated for OC salmon include forage and water quality elements of estuarine areas.

Other ESA-listed Salmon

A number of other ESU salmon, which do not spawn within or near Coos Bay, may occur off the Oregon coast to forage and migrate. These include both coho salmon (*Oncorhynchus kisutch*) and chinook salmon (*Oncorhynchus tshawytscha*): the Lower Columbia River coho salmon, the southern Oregon/Northern California Coasts (SONCC) coho salmon, the Lower Columbia River chinook, Upper Willamette River spring-run chinook, and the Snake River spring/summer run.

All of these ESUs have designated or proposed critical habitat, none of which is located within the Coos Bay Project Area.

Southern DPS Pacific Eulachon

Eulachon (*Thaleichthys pacificus*), commonly called smelt, candlefish or hooligan, are a small anadromous fish from the eastern Pacific Ocean. They typically spend three to five years in saltwater before returning to freshwater to spawn from late winter through early summer. Eulachon occur in nearshore ocean waters and to 1,000 feet in depth, except for the brief spawning runs into their natal (birth) streams during the spring. Spawning occurs over sand, coarse gravel, or detrital substrates.

Shortly after hatching, larvae are carried downstream and dispersed by estuarine and ocean currents. After leaving estuarine rearing areas, juvenile eulachon move from shallow nearshore areas to deeper areas over the continental shelf. Larvae and young juveniles become widely distributed in coastal waters and are found mostly at depths up to about 49 feet. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers, and the Klamath River in California; the Rogue and Umpqua rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington (75 FR 13012).

Willson et al. (2006) lists the Coos, Siuslaw, Umpqua, and Yaquina rivers as supporting spawning populations and cites personal communications with ODFW biologists, but notes that not all spawning streams are used every year.

There is no directed harvest of eulachon in the ocean and the species is not actively monitored or managed, resulting in little available information. Eulachon appear to inhabit a wide range of depths; however, the marine distribution of eulachon remains poorly understood.

The primary factors responsible for the decline of the southern DPS of eulachon are changes in ocean conditions due to climate change (Gustafson et al. 2010, 2011), particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success.

Designated critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington (76 FR 65323) designated as migration and spawning habitat. In Oregon, this includes 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, 0.2 miles of Tenmile Creek, and 143.2 miles of the Columbia River. The Project Area does not include designated habitat.

3.2.3.2 USFWS Jurisdictional Species

Federally listed birds that may be present in or near Coos Bay or the ODMDS areas include the marbled murrelet (*Brachyramphus marmoratus*), short-tailed albatross (*Phoebastria albatrus*), and western snowy plover (*Charadrius alexandrinus nivosus*).

Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) is a nearshore marine bird observed within about 1.5 miles of the coastal shoreline. It forages just beyond the breaker-line and along the sides of river mouths where greater upwelling and less turbulence occurs. Murrelets forage within the water column feeding on invertebrates, anchovies, herring, and sand lance. Most marbled murrelets are found off the central Oregon Coast between Depoe Bay and Coos Bay, with the highest densities being recorded within about 0.3 miles of beach and mixed rocky shorelines (Marshall 1988; Strong et al., 1993) between Newport and Florence. Marbled murrelets nest in old growth/mature coniferous forests. The low incidence of marbled murrelets at coastal locations is probably related to the loss of old growth coniferous forest from harvest and/or fire (56 FR 28362). Marbled murrelets could forage within the Project Area.

Critical habitat for the marbled murrelet is designated within Oregon but is not located in or near the Coos Bay Project Area.

Short-tailed Albatross

Two breeding colonies of the short-tailed albatross (*Phoebastria albatrus*) are currently active: Torishima Island and Minami-kojima Island in Japan (USFWS 2001). A few single breeding pairs have also been documented outside of Japan (USFWS 2012). Short-tailed albatrosses forage widely across the temperate and subarctic North Pacific and can be seen in the Gulf of Alaska, along the Aleutian Islands, in the Bering Sea and in open water areas off the Oregon Coast. The short-tailed albatross is unlikely to forage in the relatively shallow depths of Coos Bay where its prey is less commonly found. However, the ODMDS are located in open ocean waters (in water depths of about -30 to -200 feet), and while the short-tailed albatross prefers to forage along the deeper more productive shelf slope regions (at depths of around 600 feet) they could occur within the open water portion of the Project Area. Sightings in Oregon are still extremely rare and occur more commonly between October and March (ABC 2011).

Critical habitat for the short-tailed albatross is not designated.

Western Snowy Plover

The ESA-listed Pacific Coast population of the western snowy plover (*Charadrius alexandrinus nivosus)* nest adjacent to tidal waters of the Pacific Ocean above the high tide line, and includes all nesting birds on the mainland coast, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers. They breed in coastal areas in California, Oregon and Washington and typically forage for small invertebrates in wet or dry beach-sand, tide-cast kelp, or within low foredune vegetation. The breeding season in the United States extends from March 1 through September 30, although courtship activities have been observed during February. Clutches, which most commonly consist of three eggs, are laid in shallow scrapes or depressions in the sand. Plovers usually return to the same breeding sites every year.

Wintering birds often roost in small flocks. Roosting western snowy plovers usually sit in small depressions in the sand, or in the lee of kelp, other debris or dunes (USFWS 2007).

Snowy plovers have been recorded to both nest and winter on the North Spit. The log-spiral bay is located along the North Spit’s east side and adjacent to the western snowy plover critical habitat and the Coos Bay North Spit nesting site (Figure 1-1).

Critical habitat for the snowy plover was first designated in 1999. On the Coos Bay North Spit there are four distinct habitat restoration areas on lands owned by the U.S. Bureau of Land Management (BLM) and the Corps. The first habitat restoration area was a 51 acre site created in 1994. Additional areas were created in 1995, 1998, and 2000 for a total of 170 acres (ICF 2010). Recent changes in 2012 to western snowy plover critical habitat expanded this area to 273 acres (FR 77-36728).

3.3 OTHER RESOURCES

3.3.1 Cultural and Historic

The initial colonization of North America is thought to have occurred during the last phases of the Pleistocene, approximately 12,000 to 60,000 years ago, when sea levels ranged from about 197 to 984 feet lower than their present position, a consequence of the glacial phases of the time. Lowering of the sea level left a broad exposed coastal plain, which, in many places, extended miles beyond the present coastline. Archeologists investigating the arrival of humans to North America point to a coastal route as a likely path for these early migrants (Fladmark 1983). While it is possible that some of the earliest prehistoric sites may be present on the seabed within the nearshore environment of the Oregon coastline, current professional opinion suggests the first movement of humans to North America probably falls within a period of 13,000 to 20,000 years ago.

Archeological characteristics (artifacts, features, site location and chronology) of the Oregon Coast nearshore may include the tools and camps of wandering bands of hunters using the resources of a broad coastal plain or members of a maritime-based cultural group moving down the coast in boats. A recent review of early prehistoric cultural resources suggests that land sites from near the end of this period (about 12,000 years ago) occupy small surface areas that are widely dispersed and have low artifact densities (Kelly and Todd 1988). Sites with these characteristics are difficult to locate on dry ground and are even more difficult to locate in inundated environments where the ground surface is buried under deposits of sand and silts and the wave and current energy is high. The probability is also remote that there are more recent prehistoric sites. Prehistoric Indians gathered clams and mussels from the tidal zones and caught fish from the estuaries and surf zones (Minor et al. 1985). Recent investigations have recovered evidence suggesting that certain coastal Indian groups made use of whale materials. Whether the whales were hunted or scavenged from strandings is uncertain (Minor and Toepel 1986). Regardless, the evidence of whale hunting and scavenging, as well as the procurement of shellfish, along with an offshore fishery, is unlikely to leave substantial archeological deposits, other than possible fishhooks and stone weights, especially given the dynamic coastal processes.

Research along the Oregon Coast has mostly been directed at documenting the presence of shipwrecks in offshore areas defining the most likely cultural resources in coastal project areas (Northern Shipwrecks Database 2007). Examination of wreck sites suggests that most of the wrecks are deposited on beaches and not on the seabed, although offshore wreck sites cannot be completely discounted.

The Coos River estuary area is considered an important cultural resource area for the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians. The original inhabitation of Coos Bay is unknown but estimates are that 1,500 to 2,000 Native Americans lived along the bay shore in as many as 40 to 50 villages (Ruby 2010), the largest of which was located at the position of current day Charleston (Marschner 2008).

Prehistoric sites are documented in the vicinity. In addition, prehistoric sites have been identified on some of the low marsh mudflats and islands within the bay (Corps 1994). None of these sites are located within the Project Area.

The National Register of Historic Places database is the official list of the nation's historic places worthy of preservation nominated through Oregon's State Historic Preservation Office (SHPO). There are a number of eligible or listed historical sites within the general Coos Bay area. Most are upland sites not located within the Project Area (i.e. many are historical buildings located within the cities of Coos Bay or Northbend). One unique registered site that crosses the Coos Bay navigation channel is Highway 101 Coos Bay Bridge (crosses at about RM 9). The closest registered site to the Coos Bay ODMDS, is the Cape Arago Lighthouse (SHPO 2013).

Shipwrecks are the most probable cultural resources anticipated within the Project Area. There have been 114 documented shipwrecks in the Coos Bay area. The majority of these wrecks occurred along the beaches and entrance to Coos Bay. Thirteen vessels wrecked within Coos Bay itself and of these, nine sank, were not salvaged, and are presumably preserved within the sediments of the bay (Corps 1994).

Previous cultural and historical resource surveys have been completed and the results provided to the SHPO for concurrence with the conclusion that adverse adverse impacts to cultural and historical resources are unlikely:

- Letter from the SHPO dated November 16, 1982 Disposal Site Designation EIS for Coos Bay (Corps 1984).
- Letter from Oregon Archaeology Society dated April, 1976 as part of the Coos Bay Maintenance Dredging EIS (Corps 1976).

3.3.2 Socioeconomic

According to the 2010 Census, Coos County had a total population of 63,043 people and 0.4% population growth from 2000 to 2010, down from a growth of 4.2% from 1990 to 2000. The 2010 Census indicates that 6.6% of the employed population works in agriculture, forestry, fishing, hunting, and mining industries. Another 14.2% works in retail, 10.9% in arts/entertainment, recreation and accommodation/food services, 22.2% in educational, health and social services, 7.7% in construction, and 4.6% in transportation and warehousing, and utilities. Of those employed, 16.5% work in government. The unemployment rate was 9.4%, the median household income $37,491, and per capita income $21,981. About 16.4% of the population was living below poverty level (US Census 2010).

3.3.2.1 Navigation

The Coos Bay Federal Navigation Project currently provides a stabilized Entrance Channel and Main Channel for vessels serving the cities of Coos Bay. Navigation through the Entrance Channel can be hazardous during certain ocean conditions. It is common for the USCG to restrict entrance to the Coos Bay Entrance Channel for vessels, primarily recreational class vessels. The channel is designed for one-way traffic of large vessels with two turning basins located upriver (Corps 1994).

Waterborne deep-draft commerce is supported by supplemental upland rail and road service. The Port now owns and operates the Coos Bay rail link (formerly serviced by the Southern Pacific Transportation Company). The rail line connects to a network of state and federal highways. U.S. Highway 101 serves the Port by providing north-south access, and Interstate 5 is accessible by State highways 38 and 42.

Coos Bay is designated by the USCG as a “critical harbor of refuge”. A search and rescue station with rescue vessels and helicopter support is based out of a USCG Station in Charleston.

3.3.2.2 Commerce

Coos Bay is the largest coastal deep-draft harbor between San Francisco Bay and Puget Sound and is the second busiest maritime commerce center in Oregon. Although the wood products and fishing industries still play an important role in the local economy, employment throughout the Bay Area has diversified greatly during the past 10 to 15 years to include technology and service industries (Port 2012). The principal markets for forest products transported by waterborne commerce from the Coos Bay area include Asia, the South Pacific and Europe (Corps 1994). Other local facilities include the Southwestern Oregon Community College, the Port with its marine terminal facilities, the Charleston Marina, and the North Bend Medical Center.

Principal exports shipped from the Port are wood chips, logs, lumber, and other wood and paper products. The Port was the largest forest products shipper in the world until late 2005 when raw log exports via transport ship were suspended (Coos Bay Chamber of Commerce). Cargo volumes handled at different marine facilities in Coos Bay declined from 5.5 million tons in 1990 to 1.6 million tons in 2010 (Corps 2010). The largest volume of marine cargo consists of exports to foreign countries, which accounted for 88% of total cargo volumes in 2010. Major imports consist primarily of petroleum products. Some containerized products also are shipped and received (Port 2012).

Commercial and recreational fishing are major industries in the Coos Bay area. In general, the commercial fishing resource area, immediately attributable to the Port, extends 30 miles to the north, south and offshore of the Entrance Channel. Fisheries include salmon, tuna, sturgeon, cod, sole, clams, shrimp and crab. Numerous full-time commercial fishing boats are berthed in Coos Bay. Charter operation and recreational boating are also popular activities (Corps 1994). Coos Bay is also the largest producer of commercial shellfish in Oregon and recreational shellfish beds are located in mudflats along the channel. Most of the Coos Bay sloughs have been modified and altered over the past century by dike systems that protect farmland from flooding (Borde et. al. 2003).

The Port is used by commercial fishing vessels on a year-round basis, when conditions allow. Some of the commercial fish landings at Charleston for 2012 are provided in Table 3-5. Total commercial catch for 2012 was about $26.8 million dollars (ODFW 2012).

Table 3-5. Commerical Fish Landings in Charleston (source: ODFW 2012)

Species	Landings (pounds/value)
Flounder, arrowtooth	335,567 pounds/$36,440
Hagfish	1,226,232 pounds/$880,050
Sablefish	961,307 pounds/$1,972,056
Salmon, chinook	222,350 pounds/$1,183,354
Sole, Dover	2,356,296 pounds/$996,081
Tuna, albacore	2,236,865 pounds/$3,259,684
Crab, bay and ocean	1,875,063 pounds/$6,393,718

Species	Landings (pounds/value)
Shrimp	21,739,579 pounds/$10,878,107
Clams	12,536 pounds/$11,896

3.3.3 Recreation

Coos Bay offers a variety of recreation opportunities throughout the year. The primary activities include fishing, boating, diving, birding, photography and shellfish harvesting. Nearby beaches receive a continual influx of recreationists. Recreational shellfish harvesting is prevalent throughout the Coos Bay area (Figure 3-3).

For sport fishing, Coos Bay was home to at least one outfitter guide business and two licensed charter vessel businesses in 2003 with several sportfishing license vendors. In 2000, the number of licenses sold by active agents was 6,201 at a value of $102,897 (NMFS 2007). For the community of Coos Bay, the 2000 recreational salmonid catch in the Ocean Boat Fishery was 4,078 chinook and 1,641 coho salmon. The recreational non-salmonid catch was a total of 54,234 fish. The top species landed include black rockfish, blue rockfish, canary rockfish, lingcod, yellowtail rockfish, widow rockfish, and yelloweye rockfish (NMFS 2007).

The North Spit has been designated by the BLM, land owner of approximately 1,800 acres on the spit, as a Special Recreation Management Area (SRMA). SRMAs are areas where specific recreational activities are provided on a sustained yield basis (BLM 2006). BLM further designated 725 acres of the North Spit an Area of Critical Environmental Concern (ACEC), public lands where special management attention is required to protect important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes. The Oregon Parks and Recreation Department (OPRD) manages the Pacific Ocean beaches except for submerged lands including estuaries and river mouths under management of the Oregon Department of State Lands (ODSL), or federal lands within the ocean shore which extend between the mean high tide and the actual or statutory vegetation line.

Several state parks are located in the vicinity of Coos Bay including the Oregon Dunes National Recreation Area (ODNRA), north of Coos Bay and managed by the U.S. Forest Service. These dunes are the largest expanse of sand dune areas in North America and offer vast opportunities for recreationalists year round including hiking, off-road vehicle use and camping. Bastendorff Beach and County Park is located at the South Jetty, about two miles west of Charleston.

A number of recreational boat launches are located within Coos Bay (Charleston Boat Ramp within the Charleston marina, the BLM boat ramp on the east shore of the bay, the Empire boat ramp and the California Street boat ramp in North Bend (Figure 3-3). Charleston is also the gateway to three other state parks: Sunset Bay, Shore Acres, and Cape Arago (about two miles south of the Coos Bay Entrance Channel) along with the South Slough National Estuarine Research Reserve, a 4,771-acre natural area on Oregon's south coast.

Recreational boaters are drawn by the thousands to Charleston Marina, which offers complete moorage facilities and other services for nearly 600 boats.

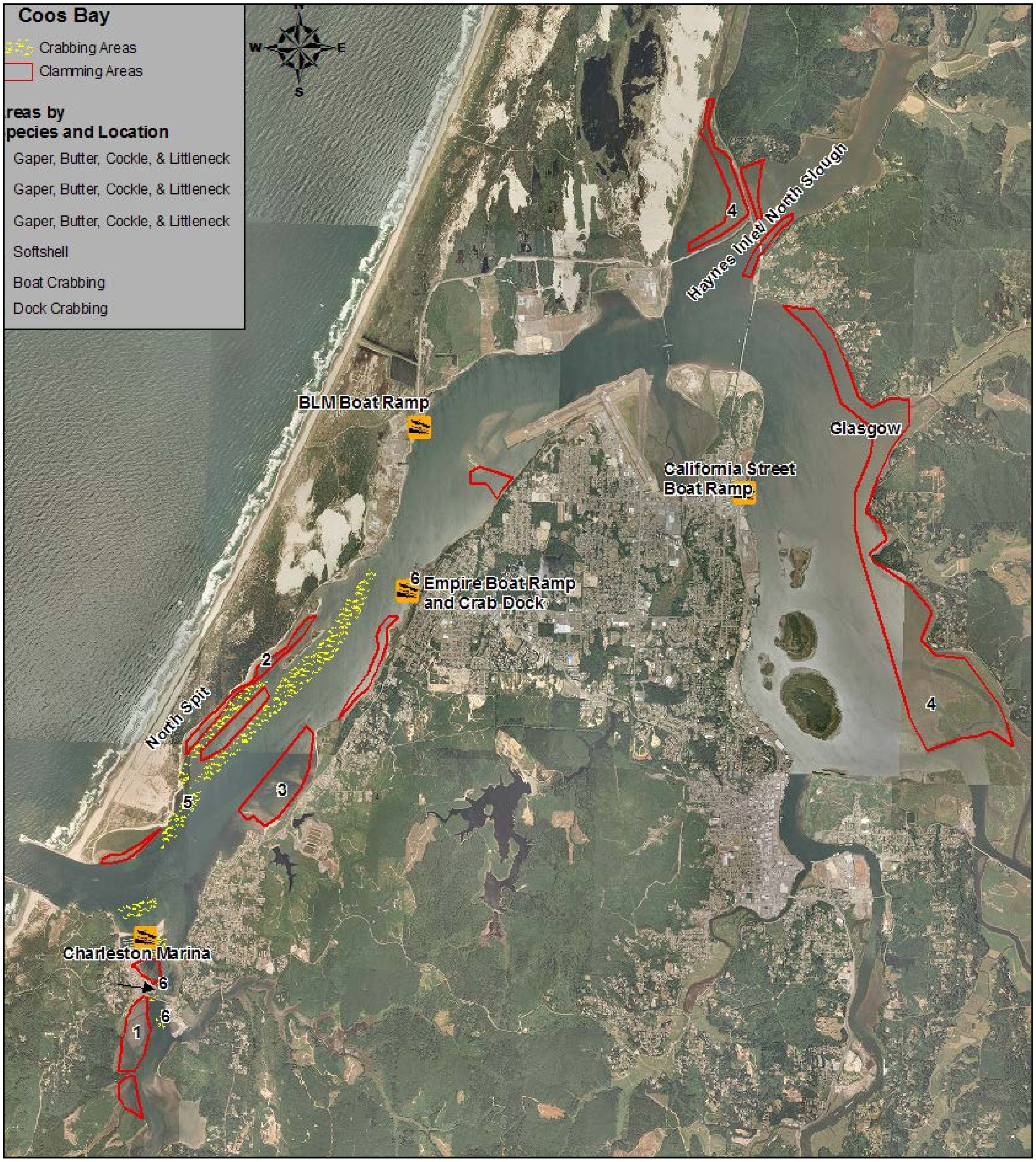

Figure 3-3. Recreational Shellfish Harvesting (***source: ODFW 2012***)

4. ENVIRONMENTAL CONSEQUENCES

This section assesses and discusses the potential consequences (or effects) to the environment from the Project including potential short-term or long-term impacts, and direct, indirect and cumulative impacts. Project effects are described in terms of the Project Area, which includes: the Entrance Channel from RM -1 to 1; Coos River Navigation Channel (RM 1 to 12); Coos River Navigation Channel (RM 12 to 15); the Charleston Access Channel; and the in-bay and open ocean placement sites.

The Preferred Alternative refers to continued Corps dredging and placement activities as described in Section 2. The No Action Alternative would cease Corps maintenance dredging and placement activities. The No Action Alternative does not meet the Purpose and Need but is used as a baseline against which to measure the impacts of the Preferred Alternative. Proposed avoidance, minimization and conservation measures for each resource are identified where applicable and further described in Section 4.4.

Based on the nature and location of this Project, some resources were not evaluated further. Specifically, there are no unique or prime farmlands or hazardous material sites in or near the Project site. There are also no low-income or minority populations specifically or disproportionately impacted by this Project, so no detailed Environmental Justice evaluation was required or included.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Geology

4.1.1.1 Preferred Alternative

Given the evidence of site geology before and after maintenance dredging and placement activities began over 100 years ago, the Preferred Alternative is not anticipated to change the geology of the site over the short- or long-term.

4.1.1.2 No Action Alternative

Similarly for the No Action Alternative, the evidence of site geology before and after maintenance dredging began (over 100 years ago), suggests that the No Action Alternative would have no substantial effects to the geology of the site over the short- or long-term.

4.1.2 Coastal Processes

4.1.2.1 Coastal Circulation and Sediment Transport

Preferred Alternative

The Preferred Alternative is not anticipated to adversely impact existing tidal or fluvial currents in the Project Area, as the channels would be maintained in their current configurations. However, sediment placement within nearshore portions of Site F may result in wave refraction over offshore mounds during certain wave conditions. The nearshore portion of Site F has been determined to be highly dispersive, therefore, impacts would be temporary in nature. Furthermore, placement of material at the ODMDS is required to comply with the SMMP. The SMMP requires monitoring of the ODMDS for mounding or adverse effects to the surrounding environment. No substantial adverse impacts to coastal circulation are anticipated from the Preferred Alternative due to the temporary nature of any offshore mounding that may occur and compliance with the SMMP.

Contingent on the dredge material placement location, the Preferred Alternative could result in beneficial or neutral impacts to the sediment budget. Placement of the dredge material in nearshore portions of Site F or at flow-lane Site G would provide sediment to the littoral cell, thereby providing a balance to the Coos Littoral Cell sediment budget. Placement of material of marine origin outside of the littoral cell (ODMDS E, H and offshore portions of Site F) could result in neutral impacts to the sediment budget, as this would be similar to the No Project condition. Beneficial impacts to sediment transport are anticipated if all or a portion of dredged material is placed within the littoral cell.

No Action Alternative

The No Action Alternative would result in shoaling of the navigation channels toward a quasi-equilibrium position. This quasi-equilibrium channel configuration would likely be narrower and shallower, which could result in higher current velocities. Shoaling of the Entrance Channel may also result in increased wave breaking within the channel, which could decrease the wave propagation into Coos Bay. These changes would not be considered a substantial impact to coastal circulation or sediment transport; however, could adversely affect vessel access and navigation.

Discontinuation of dredge material placement at nearshore sites could result in impacts to the Coos Littoral Cell sediment budget. Coos Bay would return to a greater sediment sink in the region, which may result in short-term recession of shorelines within the littoral cell. In the long-term (several decades) morphological changes are possible that may result in a new equilibrium condition being established, potentially lessening these impacts. In general, the discontinuation of dredged material placement in the littoral cell would have an adverse impact to sediment transport.

4.1.2.2 Sea Level Rise

Preferred Alternative

Corps dredging and placement activities release GHG emissions through the use of combustion engines (i.e. dredging equipment or dredges and/or dredge support vessels). Accumulation of GHG in the atmosphere may contribute to global climate change that in turn may contribute to SLR. However, the Corps has replaced the older combustion engines on their dredges, which qualified them for California's Portable Engine Registration Program (PERP). The replaced engines meet the stringent California air quality standards, thereby allowing the Corps to use the dredges south of Oregon. By meeting the stricter air quality standards of California, the Corps has minimized, to the maximum extent practicable, GHG emissions from dredging and placement activities. Additionally, GHG emissions from dredging activities would be very minor considering the amount of GHGs from other sources in the area. Therefore no impacts to SLR are anticipated from the Preferred Alternative.

No Action Alternative

The No Action Alternative would reduce the contribution of GHG to the atmosphere from periodic Corps dredging and placement activities, thus, would not contribute to SLR.

Indirectly over the long-term, navigational usage of Coos Bay would be impaired without ongoing maintenance dredging. This could result in reduced emissions from large vessels locally; however, this would not necessarily reduce global GHG emissions released from maritime commerce as this industry would likely continue and use a different port. The No Action Alternative is anticipated to have a neutral impact on SLR.

4.1.3 Hydrology

4.1.3.1 Preferred Alternative

The Preferred Alternative would maintain the existing bathymetric configuration of the estuary. The volume, residence time and drainage area of bay would be unchanged in this condition. Thus, no short-term or long-term changes to the hydrology of Coos Bay are anticipated.

4.1.3.2 No Action Alternative

Without ongoing Corps maintenance dredging, marine and fluvial sediments would accrete within the channels of Coos Bay. This may modify the current hydrodynamics of the estuary, possibly increasing flow rates in some areas and decreasing them in others. In the short term, the most likely places that would experience shoaling would be the Entrance Channel, the Jarvis Range (RM 6 to RM 9), in the vicinity of the railroad bridge (RM 9) and at the confluence of the North Slough and the Main Channel; as these reaches have required the most extensive dredging in the past to maintain channel depths. In the long-term, all areas of the maintained navigation channels, turning basins, and other artificially maintained features would likely experience shoaling.

These changes may modify the volume and the residence time of water in the bay. Over the long-term, impacts to hydrology would be neutral as a new equilibrium is established.

4.1.4 Sediment Quality

4.1.4.1 Preferred Alternative

Over the short-term, the Preferred Alternative would physically transport sediment from navigation channels to the ODMDS. Placement of in-bay material at the ODMDS would result in sediment of differing quality (in terms of grain size and chemistry) being introduced to these locations. This material would not be anticipated to degrade sediment quality at the ODMDS over the short- or long-term since materials are required to meet SEF standards for unconfined in-water placement. Additionally, the ODMDS SMMP regulates what grain-size of material can be placed in which ODMDS. Compliance with these standards would minimize the potential for any adverse impacts.

Sediment analysis within Coos Bay shows that material has always been approved for open water placement. While trace levels of various compounds may occasionally be observed, these concentrations continue to meet the guidelines established in the SEF for unconfined in-water placement.

4.1.4.2 No Action Alternative

The No Action Alternative would eliminate any short-term shifts in grain size and chemistry caused by placement of maintenance dredge material at the ODMDS.

Over the long-term, shoaling within the bay and river would continue bringing in sand (riverine and marine), which could lead to both beneficial and adverse indirect effects. For example, reduced navigability of the channels could result in an increase in vessel accidents and possible petroleum spills, thereby reducing sediment quality. On the other hand, poorer navigability within the channels for larger vessels could slow waterfront-dependent industry in the area lowering the potential for sediment contamination from point sources (boatyards, docks, etc.). Impacts to sediment quality are generally anticipated to be beneficial for the No Action Alternative over the long-term. Although, infrequent and episodic increases in sediment contamination are possible if the number of vessel groundings increase.

4.1.5 Water Quality

4.1.5.1 Preferred Alternative

The Preferred Alternative may result in temporary, localized, impacts to water quality at dredge and placement locations. Impacts may be in the form of increased turbidity, suspended sediments, DO and a higher likelihood of minor spills from physically dredging materials from the channels (via hopper or mechanical means) and placement at the ODMDS.

Over the short-term, suspended sediments are not likely to substantially increase because of the proposed maintenance dredging and placement activities. During hopper dredging, water is discharged through the overflow until the dredge hopper load is achieved. The overflow is designed to minimize sediment discharge into the water column. Water is skimmed from the top of the hopper, which is the area that has the lowest turbidity. Hydraulic dredges generally do not produce large amounts of turbidity or total suspended solids during dredging because of the suction action of the dredge pump, and the cutterhead is buried in the sediment during dredging. Dredging and placement operations using a hydraulic cutterhead (pipeline) dredge will only be performed during ebb (outgoing) tides to minimize disturbed sediment flows from moving up into the river. This will decrease turbidity impacts during dredging and in-bay placement activities. The amount of turbidity produced by mechanical dredging depends on the type of bucket used. Return water from mechanical dredging comes from the bucket as it is raised above the water surface and from the barge as the material is loaded. It can come from overflow over the sides or through a skimmer if the barge is equipped with one. An open bucket can produce the highest amount of turbidity, whereas a closing bucket generally produces less turbidity.

Average resuspension rates for dredged sediments have been developed to provide a consistent measure of the amounts of sediment initially resuspended by dredging in the water column and allow a relative comparison between hydraulic and mechanical dredge types. Average resuspension rates for hydraulic dredging are about 0.77% while that for mechanical dredging is about 2.1% (Anchor 2003). Given similar sediment characteristics, this shows that mechanical dredges usually produce higher suspended sediment concentrations than hydraulic dredges (Anchor 2003) although operational methods can result in overlapping results and both can be used in a sensitive manner.

Most of the Corps dredged material is sand and substantially high turbidity levels or suspended solids for extended periods of time are not anticipated. A 100-foot plume around the dredge area is anticipated with a 200-foot plume at the placement sites. This is supported by studies in Coos Bay showing that total suspended solids (TSS) levels for a hydraulic cutterhead dredge are anticipated to reach a maximum of 500 milligrams/liter (mg/l) at a new dredge site (at about RM 9 in Coos Bay) and quickly decrease to 1 mg/l at about 80 feet (within a low current velocity area) well below the normal fluctuations of 5.7 mg/l to 45.7 mg/l TSS found in Coos Bay throughout the year (M&N 2006). Average turbidity fluctuations could range between 3.7 nephlometic turbidity units (NTU) and 18.1 NTU. Using similar modeling methods for mechanical dredging fine clay material, it is anticipated that higher sediment concentrations near the dredge site will occur (about 800 mg/l), which would rapidly decrease to about 100 mg/l at 650 feet in a low current velocity area (M&N 2006). In cases of higher velocity (i.e. 1.9 knots), concentrations at the dredge site would again be much lower even for mechanical dredging (90 mg/l) and decrease to 25 mg/l at 330 feet. In the modeling completed for the new site described above, mean concentrations did not exceed 20 mg/l outside the dredging location, which is well within the natural turbidity level ranges (M&N 2006). The estimated 100- or 200- foot plumes are appropriate given the courser sandy material that the Corps dredges annually, and the conservation measures in place for both the lower and upper reaches of Coos Bay. The plumes are anticipated to dissipate relatively quickly outside the dredge/drop areas (within less than two hours), especially in areas of higher current velocities.

Substantial adverse increases in suspended solids and turbidity are not anticipated at the offshore ODMDS. Turbidity levels are likely to increase for a short time with the highest concentrations occurring at the point or placement and dispersing from that point, being much lower at greater depths. Oregon's offshore is generally a region of shifting sand and aquatic species in this area often experience episodic benthic and water disturbances from ocean storms.

There is some evidence that dredging of fine sediments can decrease DO in the water column if the sediments contain constituents with a high chemical oxygen demand (Frankenberg and Weeterfield 1968). Finer-grained material dredged from upper Coos Bay may result in slight, short-term reductions in DO. This material is typically placed at Site 8.4, which will continue to be dredged and placed at ODMDS on a five to eight year cycle, so the effects from this activity are relatively infrequent. Additionally, placement operations using a hydraulic cutterhead (pipeline) dredge will only be performed during ebb (outgoing) tides to minimize disturbed sediment flows from moving up into the river.

Dredging operations can increase the risk of pollutants entering the water from dredge equipment and vessels. A reduction in water quality from any leak or spill from the dredge or its equipment is another short-term potential adverse impact. However, compliance with operational Best Management Practices (BMPs) on the dredge vessels are strictly adhered to, which reduces the probability and magnitude of a leak or spill. Over the past 14 years, the Corps has averaged about one "minor" incident a year along the entire west coast (California to Alaska) during dredging activities by the *Essayons* or *Yaquina* dredges. By definition, minor spills do not reach the navigable water and/or have no visible sheen on the water surface while major spills do reach navigable waters and have a visible sheen on the water surface. Only one major incident was recorded in 2012 at Humboldt Bay in northern California.

Materials for Corps dredging and placement activities also meet the SEF criteria for unconfined in-water placement, which indicates a low risk for contamination impacts to aquatic life (see Section 4.3.1 for a more detailed discussion on impacts to aquatic species and habitat). Based on previous work at Coos Bay, dredging and placement of either sandy or fine-grained material would not have any long-term impact on the water quality. Material placement would result in an increase in suspended solids at the flow-lane site as it falls to the bottom and/or is carried with the current. This impact should be temporary and localized. NMFS anticipates turbidity will dissipate due to river flow, tidal action, currents, and wave action within a few hours (NMFS 2010).

Visual turbidity monitoring is conducted during dredge and placement operations. When visual monitoring detects an increase in turbidity, dredging stops and the barge transits dredged material to the placement site before a second visual sample is taken. This allows for turbidity levels at the dredge site to return to background levels before dredging. When working in areas where sediment sampling indicates equal to or greater than 20% fine-grained sediments, usually between RM 12 to 15, the Corps (or contractor) is required to use a turbidimeter to quantify changes in NTUs that may occur because of re-suspending fine-grained material during dredging operations. In Coos Bay, a turbidimeter is required during the dredging and placement of materials from the Upper Navigation Channel.

In order to further minimize impacts to water quality, the existing ODEQ State 401 Water Quality Certification (WQC) requires BMPs to be adhered to such that turbidity is minimized and monitoring guidelines and exceedance windows are met to limit the duration and concentration of turbidity to which species are exposed. These BMPs are considered conservation measures and are listed in Section 4.4.

Over the long-term, substantial adverse impacts to water quality are not anticipated although sustained vessel traffic itself does support commercial use of the bay, which can result in reductions in water quality from anthropogenic sources.

4.1.5.2 No Action Alternative

Without ongoing Corps maintenance dredging, there would be no short-term and temporary reductions in water quality from dredging- and placement-related activities. Increased shoaling of channels could increase the risk of vessel groundings and associated fuel and debris spills. Over the long-term, the risk from these spills could decrease if fewer recreational and commercial vessels are able to navigate the Project Area.

4.1.6 Sound

4.1.6.1 Preferred Alternative

In-air

In-air noise emanating from the Preferred Alternative will increase intermittently over the short-term. Barge and equipment in-air sound could produce sound levels up to 80 dBA (FTA 2006). During periods of poor visibility, foghorns are mandated aids to navigation, which produce an omnidirectional intermittent sound to warn approaching vessels of a barge's location during periods of poor visibility. The foghorn must meet USCG requirements and can reach levels of about 84 to 120 dBA (FTA 2006).

In-air sound from the barge's foghorn can be quite loud and could disturb local residents during nighttime dredging. Complaints have been received by the Corps in the past. These disturbances are temporary and are necessary to protect the safety of other boaters within the Project Area and Corps barge crew during maintenance dredging activities.

Disturbances to local aquatic or terrestrial species are not anticipated as they are familiar with in-air background sound from commercial and recreational vessels within the area. While many terrestrial and shoreline animals and birds are susceptible to in-air sounds, those animals in the area are already exposed to variable sounds from nearby urban and industrial activities. Maintenance dredging and placement-related noise could displace birds by causing flushing, altering flight patterns, or causing other behavioral changes, however, effects are not expected to rise to the level of harm or harassment. Disturbances from the in-air noise resulting from maintenance dredging activities are not anticipated.

Over the long-term, anthropogenic in-air sound from vessels and waterfront activities will continue as ongoing maintenance dredging does not change the quantity or size of vessels using the area. Substantial adverse impacts to the surrounding communities and wildlife are not anticipated as elevated sound levels are intermittent and temporary, occurring only during foggy conditions.

In-water

In-water noise emanating from the Preferred Alternative will also increase intermittently over the short-term. Studies have found that mechanical and hopper dredging emit sounds generally in line with those expected for a cargo ship travelling at a modest pace, between 150 and 188 dB (Clarke et al. 2002, Miles et al. 1986, etc.). It was also found that source levels at frequencies above 1 kHz show elevated levels of broadband sound generated by the aggregate extraction process; however, these sounds attenuate rapidly with distance (Robinson et al. 2011). All in-water sound impacts would be minor and temporary in nature, and would cease once dredging and dredged material placement is completed. Noise and vibration from the dredge vessel and draghead or cutterhead during operation may discourage most fish from getting close to the draghead and thereby avoid encountering the zone of influence.

While many marine mammals, seabirds and fish are susceptible to in-water sound, animals in the Project Area are already exposed to higher than average background sound levels from nearby commercial and recreational vessels. A fishing boat can generate sound levels of 151 dB 1uPa (Greene 1985) and a container ship can produce 177 to 188 dB (McKenna et al. 2012). Any juvenile salmonids or marine mammals not familiar with the harbor environment could temporarily avoid the area being dredged.

Additionally, the in-water work period for the Project Area (Table 2-1) will be adhered to avoid conducting maintenance dredging during key migration or usage periods for ESA-listed anadromous salmonids. Given the intermittent nature of maintenance dredging, and the fact species of concern (i.e.

anadromous salmonids) are not typically present during dredging and placement operations, in-water noise disturbances are not anticipated.

Long-term increases in in-water noise are not anticipated as maintenance dredging does not change the quantity or size of vessels using the Project Area.

4.1.6.2 No Action Alternative

Without ongoing Corps maintenance dredging, in-air and in-water sound from dredging activities would cease. Over the short-term, surrounding shoreline and in-water activities (industry, boating, etc.) would continue. Over the long-term, a reduction in in-air and in-water sound could result due to reduced navigational access within the federally authorized channels and less in-water access to the Port, Charleston marina and the surrounding private and commercial docks.

4.1.7 Air Quality

4.1.7.1 Compliance with National Air Quality Standards

Preferred Alternative

The Preferred Alternative would result in the release of criteria pollutants from operation of the Corps hopper dredges *Yaquina* and the *Essayons* over the short-term. These hopper dredges consist of diesel powered dredge pumps, generator engines and propulsion engines. Both dredges were recently upgraded to meet stringent California air quality standards. The Essayons underwent a major engine overhaul in 2009. In 2011, the *Yaquina's* dredge pump and engines were replaced and now meet Category 1, USEPA Tier II standards for main diesel and auxiliary engines.

Emission estimates from the dredging and placement of materials associated with the Project were calculated using engine information for the *Yaquina* (Table 4-1). Estimations were based on maximum quantities of dredged material in a year when all areas were being dredged and will vary below these levels for smaller dredge volumes.

Table 4-1. Estimated Emissions from Dredging and Placement Activities

	Duration (days)	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Hydro Carbons (HC)	PM10	PM2.5	Oxides of Sulfur (SOx)	Carbon dioxide (CO_2)
Average Daily (tons/day)		0.07	0.43	0.01	0.01	0.01	0.00	49.22
Entrance Channel (tons/event)	20	1.44	8.63	0.28	0.17	0.17	0.01	984.43
Upper Navigation Channel (tons/event)	35	2.52	15.10	0.50	0.30	0.29	0.02	1,722.76
Lower Navigation Channel (tons/event)	100	7.19	43.13	1.42	0.85	0.83	0.05	4,922.16
Charleston Channel (tons/event)	30	2.16	12.94	0.43	0.26	0.25	0.01	1,476.65

The estimated emissions of criteria pollutants are not considered a substantial impact to meeting NAAQS in the area over the long-term. Dredging has occurred in the Project Area for decades and has not resulted in classification of the monitoring area as non-attainment or a maintenance area. The *Yaquina* and *Essayon's* compliance with USEPA Tier II further minimizes air quality impacts.

No Action Alternative

The No Action Alternative would not adversely, and could possibly improve, the monitoring area's ability to meet air quality standards.

4.1.7.2 Climate Change

Preferred Alternative

The Preferred Alternative would result in nominal increases in GHG levels in the atmosphere (most notably carbon dioxide). As discussed in Section 4.1.7.1, this increase in emissions would be episodic and not substantial on a global scale. Therefore, no substantial impacts to climate change are anticipated from the Preferred Alternative.

No Action Alternative

The discontinuation of Corps dredging and placement activities would not contribute intermittently to climate change through GHG emissions. Overall, small and incremental reductions in GHG emissions could result.

4.2 BIOLOGICAL RESOURCES

4.2.1 Aquatic Plants, Animals and Habitat

4.2.1.1 Preferred Alternative

The Preferred Alternative could result in the following direct or indirect impacts to aquatic plants, animals and habitat, which could cause physical injury or mortality to aquatic plants, animals and habitat.

Water and Sediment Quality

Physical injury or mortality is attributable to increases in water column turbidity and suspended sediments, adversely affecting any fish, which prefers clear to turbid water. Excessive fine sediment in the channel substrate can reduce the survival of embryos and emerging fry (Chapman 1988) and adversely affect the growth and survival of juvenile salmonids (Suttle et al. 2004). Increased turbidity can also affect primary production by reducing light transmission into the water (Parr et al. 1998, Wallen 1951). Both the dosage and time of exposure to turbidity and suspended sediments impact the effect. In general, dredged material from the dredge areas is mostly sand material, which settles quickly out of the water column. Where turbidity and DO issues may be of more concern is within areas with finer materials (i.e. between RM 12 and 15). However, exposure to turbidity and suspended sediments is minimized by the adherence to the in-water work periods, adherence to water quality monitoring as outlined in Section 4.4, the temporary nature of the activity, and the fact that dredging does not occur evenly over the channel footprint.

The release of sediment contaminants could also cause injury or mortality. The material in the navigation channels has been tested and found to be clean marine sand. As discussed in Section 3.1.4, recent sediment sampling efforts within the bay meet the guidelines established in SEF for in-water placement without further characterization. Exposure of salmonids, other fish, crabs and other aquatic organisms to contaminants from dredging and placement activities are not expected.

Corps maintenance dredging activities are temporary and short-term generally occurring between June and November of any given year, with a few days in April or May to do preliminary dredging within the Entrance Channel. The in-water work period varies for each dredge area and takes into account peak migration periods for ESA-listed salmon in the Project Area. During this time, dredging and placement activities are also intermittent as the dredge/dredge equipment moves to different areas for placement. Other conservation measures in place to avoid and minimize impacts on aquatic organisms in the Project Area are listed in Section 4.4. Water quality impacts are minimized with an exceedance window limiting the duration that a turbidity plume from authorized dredging may exceed 10% above background levels. This further limits aquatic exposure to long-term disturbance activities from dredging.

Entrainment

Any type of hydraulic suction dredging, including the dragheads on hopper dredges or the cutterhead of a hydraulic cutterhead dredge, can cause entrainment of fish and aquatic organisms when they move up off the seafloor. This can occur when the pumps are being primed, the lines and hoppers are being flushed, or when vessels are being maneuvered.

Physical Injury or mortality to benthic organisms (i.e. polychaetes, oligochaetes, clams, and amphipods) will occur during dredging, which can disrupt the benthic community in the immediate vicinity of dredging activities until the area is recolonized. This can cause a slight, temporary reduction in prey species for aquatic animals, such as pelagic fish (i.e. ESA-listed salmon, etc.).

The navigation channels tend to be areas of higher energy, with localized deposition and scour and frequent sediment disturbance and transport from river flow, ocean conditions, and tidal fluctuations. This environment is not as biologically productive as the surrounding off-channel, subtidal and intertidal habitats; the navigational channels are likely to contain less diversity and abundance of invertebrate prey than surrounding shallow water habitat. In addition, dredging most often occurs at specific locations within the navigational channels where annual shoaling has occurred and does not routinely occur across the entire navigational channel footprint equally or uniformly. For example, the Corps currently only dredges about 10% of the federally authorized channels. This percentage is further reduced as dredging does not occur uniformly, thereby reducing the area where mortality of benthic organisms occurs. Recolonization can take up to one year or longer depending on the site, sediments and species of organisms (Hitchcock et al. 1996). Disturbance tolerant species will often recolonize the area first and more rapidly, within a few months (Pemberton and MacEachern 1997). They are usually more mobile and/or rapid builders or burrowers, such as crabs, sand dollars, bristleworms and tubeworms. Channel areas where shoaling and dredging occurs frequently (i.e. annually), may never have time to fully recolonize. In this case, a permanent shift in substrate or topographic condition could occur. However, the importance of the navigation channels as a rearing area for juvenile fish, such as salmonids, is limited, and the disturbance to the benthic community within these areas likely will not alter feeding opportunities for fish and birds moving through the Project Area.

Studies have been completed to better understand the impact that entrainment may have on aquatic resources (R2 Resource Consultants 1999, Reine 1998). Samples were collected in 1997 and 1998 during operation of the Corps' hopper dredge, the *Yaquina,* during the spring and early summer at two sites in the Columbia River and five sites along the Oregon Coast (Yaquina, Siuslaw, Umpqua, Rogue, and Chetco). No juvenile salmonids were captured at any of the coastal stations during the course of sampling. The study concluded that juvenile salmonids would likely be present at all of the sites sampled, but dredging operations, as currently practiced, pose little risk of entrainment of salmonids (R2 Resource Consultants 1999). Buell (1992) studied fish entrainment by hydraulic dredging (by the hydraulic dredge *R.W. Lofgren*) in the Columbia River. His study found that entrainment only occurred when sturgeon were in the immediate vicinity of the dredge pipe (the dredge did not have a cutterhead). Demersal fish such as sand lance (*Ammodytes hexapterus*) are more vulnerable to entrainment as their avoidance behavior is to burrow into the sand being dredged. Crab entrainment can also occur. A 2006 Corps study observed an entrainment rate for all age classes of Dungeness crab combined was 0.241 crab/cubic yard from Desdemona Shoals in June 2006 (Pearson et al. 2006), a similar overall entrainment rate to that observed in June 2002 (Pearson et al. 2002) of 0.223 crab/cubic yard. In general, the rate of entrainment by a mechanical dredge is lower than that of a hydraulic dredge, which creates a much stronger suction field (Reine and Clarke 1998), it can still occur (Stevens 1981).

While entrainment of some aquatic species will occur during dredging, it is unlikely that this impact will deplete the overall abundance of aquatic species in the area. Conservation measures will be implemented to reduce the amount of time and distance that the dredge draghead or cutterhead is off the sea floor when the pump is operating, and dredging will be completed within the proposed in-water work period. Substantial adverse impacts on salmonid and other fish populations from entrainment are not anticipated.

Burial

The placement of dredged material at the proposed placement sites will result in the burying of benthic and aquatic organisms found below the dredge material dispersal zone.

Loss of benthic invertebrate populations on the bottom of in-bay or ODMDS is not likely to have an effect on food resources for either adult or juvenile salmonids or other fish species. Both adult and juvenile salmon feed principally on pelagic species, which are not associated with bottom habitat. The only exception to this is sand lance, which could be impacted in the placement site areas if individuals are buried in the sand (though normally pelagic, sand lance bury in the sand as a defense mechanism). However, sand lance are very abundant in the coastal inshore area, and it is unlikely that the number of sand lance killed during placement events would have a substantially adverse impact on the size of sand lance populations. Burial of crab is also a concern. A number of studies on crab have been completed to understand the impacts of burial from sediment on survival rate (Vavrinec et al. 2007, Pearson et al., 2006). In general survival from burial increased as burial depth decreased, and survival increased as crab size increased. Behavioral observations and survival results also showed that subadult and adult crabs have the capability to respond to surge currents and burial in ways that substantially reduce exposure to stress and allow high survival (Vavrinec et al. 2007).

The STFATE model (Johnson 1990, Johnson and Fong 1995, Corps 2005a) has been used by the Corps to estimate various parameters that describe dredged material dynamics during placement of the material in open water by a split-hull hopper dredge (Corps 2005a). While burial does impact survivorship for some species, the area of impact is not the entire footprint of the placement site. The thickest area of bottom accumulation for an individual dredge dump activity represents about 10% or less of the overall footprint of coverage for that one dump (Corps 2005b). For a typical event, most of the placement area is composed of a thin apron of dredged material (less than 0.25 feet thick). This is well within the normal seabed elevation fluctuations within the offshore area. Using the Corps' STFATE model, an estimated bottom deposition that would result from 3,000 cy of dredged sand placed using a split–hull hopper dredge about 98% of the placement footprint area would be less than 0.85 feet, around 10 inches. The thickest 2% of the footprint would cover an area of 0.3 acres. The average thickness would be less than 0.25 ft, or 3 inches (Corps 2005a, Corps 2005b).

The STFATE model has also been used to estimate that placement impacts on a 6-inch fish (similar to a juvenile coho). The primary concern would primarily be the drag force or downward force of the placement plume. The fish would sustain this force if it resists being entrained by the plume. If the fish does not resist the force, it would most likely be displaced by the leading edge (boundary layer) of the plume. Boundary layer effects will generally help the fish from being pulled into the plume. However, if the fish was entrained within the plume, the boundary layer established as the plume hits bottom will likely keep the fish from impacting directly on the bottom; the fish would be displaced laterally, parallel to the bottom. Consequently, it is unlikely that pelagic fish, such as coho salmon, would be buried or killed by dredged material placement (Corps 2005a), although sublethal effects could occur.

Impacts to benthic organisms from dump barges or scows (mechanical dredging) may vary slightly from those discussed above for hoppers, but the overall behavior of the placement plume follows the same three general phases: (1) convective descent (plume generally maintains its identity); (2) dynamic collapse (plume impacts the sea floor and diffuses horizontally); and, (3) passive diffusion (diffusion of the material continues by ambient ocean conditions) (Kraus 1991, etc.). Characteristics of plumes are determined by discharge rate, characteristics of the dredged material or slurry, water depth, currents, meteorological conditions, salinity of receiving water, and discharge configuration (Corps and USEPA 1992).

Hydraulic dredges pump sediment as a slurry through a pipeline directly to the placement area. The mixture of dredging site water and finer particles has a higher density than the disposal site water and therefore can descend to the bottom forming a fluid mud mound (Corps and USEPA 1992). Continuing the discharge may cause the mound to spread. Some fine material is stripped during descent and is evident as a plume. The plume created is also a function of discharge rate, slurry characteristics, water depth and ocean conditions. Most hydraulic dredging and placement activities conducted by the Corps are in small placement sites (compared to larger ODMDS) within relatively shallow water. Thus, the size of the discharge field and spatial overlap will be smaller (NMFS 2010).

The effects of burial on aquatic and benthic species at the placement sites will be localized and limited to the area and duration of each event with partial to full recovery (depending on dredging frequency) before the next placement event. Conservation measures proposed in Section 4.4 will support the reduction of potential adverse effects. One of these measures is the requirement for placement activities to be both monitored and managed to avoid mounding at the placement site, minimizing grain size and topographical changes that could adversely impact benthic species.

Disturbance

The disturbance of aquatic organisms within the Project Area could include vibration and noise from dredging or placement operations. Vibrations and noise from these activities may displace aquatic animals (marine mammals, seabirds, fish). Noise, vibration or turbidity from dredging and placement activities may also displace aquatic species for short periods of time (during intermittent dredging and placement operations). However, this impact is not expected to be substantial as many of these animals are very mobile and can move quickly to nearby resources to continue their behaviors, such as foraging, until the activity ceases.

Vessel strikes of marine mammals in the bay or around the ODMDS due to the Project are unlikely as the barge-sized vessels used for dredging and placement activities move slowly throughout the area. Hopper dredges operate at low speed (about one knot) and transit between removal and placement sites at approximately eight knots when loaded and 10 knots empty. Towed barges are slightly slower. Vessel speeds below about 12 knots have been shown to reduce lethal injury to whales, from vessel strikes, to below 50% (Vanderlaan and Taggart 2007, Laist et al. 2001).

During Corps dredging and placement activities, the activities are not constant. For example, with hopper or mechanical dredging, the hopper is filled to near capacity, then dredging stops and the vessel moves to the placement site to empty the hopper. Dredges often only spend about 45% to 49% of the time they are working actually dredging. The remainder of the time (45% to 47%) is spent transiting and maintaining the dredge, and 6% to 8% is spent in placement operations. Based on this, aquatic species in the immediate area are subjected to dredging impacts about 50% of the time and placement impacts about 6% to 8% of the time, which would give fish, marine mammals and birds, time to migrate through the area when the dredge is not working. These species must already avoid similar noise, vibration and turbidity from local vessels throughout the year, which likely reinforces species acclimation to human activity and operations within the Project Area.

Loss or Disturbance of Habitat

The areas proposed for dredging and placement are the same as those used historically, so no existing or additional habitat is expected to be newly converted.

Less than 6% of the existing estuary is located within the footprint of the federally authorized navigation channels. These relatively deeper navigation channels (compared to adjacent waters outside of the boundaries) are dredged regularly and used for vessel traffic. Species within these areas are already exposed to faster flow rates, deeper habitat with less vegetation, and more noise, vibration and turbidity than other surrounding areas. The habitat within these maintained channels is probably used for migration rather than foraging and impacts to any prey species or forage habitat within the channels is expected to be minor and temporary.

Similarly, placement of dredged material at in-bay sites is not anticipated to substantially impact prey species or foraging habitat. Material placement would result in an increase in suspended solids at the sites as it falls to the bottom and/or is carried with the current. This impact should be temporary and localized. Impacts to prey species and foraging habitat are expected to be minor, as the in-bay sites do not provide substantial feeding or rearing habitat. Although dredging may disrupt some migration behavior of fish, this is expected to be temporary as the duration of disturbance is relatively short.

Seafloor habitat at the ODMDS would be impacted when dredged material reaches the bottom and buries any existing surface substrate. However, the ODMDS are located within a dynamic ocean environment and changes to water turbidity and seafloor habitat occur frequently as substrate shifts along the seafloor from currents, winds, and storms. Habitat modification may occur if mounding were to result. This is unlikely because the ODMDS are designed and managed to reduce this impact. It is therefore unlikely that the change any minor and temporary changes in elevation and associated habitat features would substantially alter the benthic community.

Recorded seagrass beds in Coos Bay are located, for the most part, outside of the Project Area (Figure 1-1 and Figure 1-2); the channels and ODMDS generally being deeper with faster flow rates than that preferred by seagrasses.

Based on various sources of existing data (not recently field-verified), approximately 6.7 acres of potential direct impacts to seagrass, important forage and habitat for many fish and bird species, could occur due to maintenance dredging operations (Shafer and Bourne 2012), although dredging usually occurs within areas that shoal and does not occur over the entire Project Area footprint every year. Given the current data, an existing seagrass bed could be growing within the Charleston Access Channel, some of which could be directly impacted by maintenance dredging (although this has not been confirmed with field work). It is important to note that this is based on a variety of data and does not consider annual variability in shoot density, location or function. Additionally, maintenance dredging has been ongoing for decades at this location. If seagrass is present, it has managed to continue to grow regardless of dredging activities. Any risk of increased turbidity on light penetration to nearby seagrass beds from dredging is minimized by turbidity monitoring and the temporary and intermittent nature of the activity.

Given the nature of the dredge material (most is clean sand material; high turbidity and suspended solids or substantially reduced sediment or water quality are not anticipated), potential effects from dredging and placement activities will be limited to the existing federally authorized project footprint and adverse impacts to nearby shorelines, beaches, and off-channel habitats are not anticipated.

Overall, adverse effects on individual aquatic organisms will not occur on a large enough spatial or temporal scale to substantially disrupt area populations. Dredging and placement activities will occur in a high-energy migratory pathway and will not modify off-channel habitat or reduce potential prey resources for protected fish species. Conservation measures (Section 4.4) employed during dredging operations will reduce the risk of fish being exposed to entrainment and being injured or killed.

4.2.1.2 No Action Alternative

The No Action alternative eliminates Corps maintenance dredging within Coos Bay and placement of dredged material at the in-bay sites or ODMDS. Without the removal of accumulating material, channels will shoal and bottom elevations will increase, possibly altering benthic habitats with increased exposure to light.

Over the short-term, adverse biological interactions with infrequent dredging and placement operations would cease and interactions with commercial and recreational marine vessels would change as shoaled non-navigable channels could actually reduce, or at least modify, boating traffic.

Over the long-term, effects from the No Action Alternative are anticipated to be slightly positive for some species as annual disruptions to aquatic resources would decrease. Periodic losses of benthic fauna associated with dredging and placement activities would cease and motile and non-motile species would not be disturbed. Shallow water habitat would increase and areas of seagrass could expand. Species that have adapted to the habitat created by deeper channels maintained by ongoing dredging may benefit less from the No Action Alternative. For example, the influence of saltwater may decrease, thereby decreasing habitat for marine species, but increasing habitat for river and estuarine species.

4.2.2 Shoreline and Terrestrial Plants, Animals and Habitat

4.2.2.1 Preferred Alternative

Short-term effects to shoreline and terrestrial species and habitat in the Project Area are not anticipated as dredging and placement do not occur on coastal, bay or riverine shorelines. Temporary disturbance from noise is negligible as most birds and upland animals are highly mobile and can avoid the area if necessary. Additionally, most of the proposed ongoing maintenance dredging occurs within the urbanized lower bay and river, where animals are often exposed to in-air noise from vessels and shoreline activities. Species that do move out of the area during dredging and placement activities are expected to continue their activities, such as foraging or migrating, in nearby suitable habitat areas returning relatively quickly after activities cease.

Long-term effects to shoreline and terrestrial species and habitat in the area are not anticipated.

4.2.2.2 No Action Alternative

The No Action Alternative would eliminate periodic maintenance dredging and placement by the Corps within Coos Bay. Without the periodic removal of accumulating material, channels will shoal and bottom elevations will increase. Shorelines are not likely to be impacted over the short-term.

Over the long-term, geomorphology of the North Spit could change slightly without the continuation of sand placement into the nearshore to feed the beaches. While this could erode the beach at the head of the North Jetty, adverse impacts to beach habitat are not anticipated. Long-term adverse impacts to in-bay shoreline habitat are not anticipated but could be slightly beneficial to shoreline wildlife.

4.2.3 Threatened and Endangered Species

A Biological Assessment (BA) was prepared for the Preferred Alternative for the blue, finback, sei, sperm, humpback and right whales, Steller sea lion, and loggerhead, green, leatherback, and Pacific ridley sea turtles and provided to NMFS on May 14, 2004 to initiate informal consultation. The NMFS provided their “not likely to adversely affect” concurrence letter on July 16, 2004. A determination of “no effect” was made for the western snowy plover, northern spotted owl, Oregon silverspot butterfly, and bull trout, and a “not likely to adversely affect” determination was made for the marbled murrelet. A concurrence letter was received from USFWS on July 13, 2004. Re-initiation with the USFWS for ESA-listed birds has not been necessary because no additional species or critical habitat, or revisions to existing species and habitat have occurred within the Project Area.

A BA was prepared for the Preferred Alternative for the southern DPS Pacific eulachon, OC and SONCC coho salmon, and the southern DPS green sturgeon and submitted to NMFS on April 7, 2009 to initiate formal consultation and request their Biological Opinion. On May 28, 2010, NMFS concurred with the Corps’ determination that the Preferred Alternative is “not likely to adversely affect” the southern DPS Pacific elauchon and concluded that the Preferred Alternative will not jeopardize the continued existence of the OC and SONCC coho salmon or the southern DPS green sturgeon. NMFS also concurred with the Corps’ determination that the proposed action is “not likely to adversely affect” Southern Resident killer whales or southern DPS of Pacific eulachon and that the critical habitats supporting the OC coho salmon and southern DPS green sturgeon would not be destroyed or adversely modified with the Preferred Alternative (NMFS 2010). Critical habitat for the SONCC coho salmon is not located within the Project Area.

An updated BA has been submitted to the NMFS to analyze effects on newly designated critical habitat for the southern DPS of Pacific eulachon and leatherback sea turtle and for minor changes to the proposed action (Corps 2013b). The Corps concluded that the Preferred Alternative will not destroy or adversely modify critical habitat for the leatherback sea turtle. Critical habitat for Pacific eulachon is not designated within the Project Area.

4.2.3.1 Preferred Alternative

Marine Whales, Marine Turtles and Eastern DPS Steller Sea Lion

Blue, sperm, sei and fin whales are not generally observed in the nearshore. Their presence in the Project Area is unlikely given their preference for offshore waters. Humpback whales and Southern Resident killer whales may occur closer to shore but their presence is infrequent and transitory.

Marine turtles could occur offshore but their occurrence is highly unlikely given their preference for albacore and jellyfish associated with warmer currents offshore (30 to 60 miles offshore). Leatherback sea turtles are more likely to inhabit cold waters compared to other sea turtles but their preferred prey species, brown sea nettle (*Chrysaora fuscescens*) is more closely associated with the Columbia River Plume, Heceta Bank and north of Cape Blanco (all located much farther offshore than the ODMDS off of Coos Bay). Steller sea lion rookeries and haul outs are sufficiently distant from the Project Area (at least five miles away from the dredge locations and at least three miles away from the ODMDS) and effects to breeding or haul out behavior are highly unlikely.

In the event marine mammals and sea turtles are present during dredging and placement activities, dredging operations and dredged material placement procedures associated with the Preferred Alternative may cause temporary movement away from dredging and/or placement activities. The Preferred Alternative may have a minor effect on the quantity and quality of prey available to marine mammals (i.e., salmonid prey of Southern Resident killer whales and Steller sea lions could move away from the activity area) but these highly mobile animals could easily follow their prey to other nearby areas. Vessel strikes on marine mammals or turtles, associated with Corps maintenance dredging and placement activities, are extremely unlikely because the barge-sized vessels are slow moving, follow a predictable course, do not target aquatic animals, and should be easily detected and avoided by marine mammals and turtles.

Critical habitat for the larger whales listed above has not been designated. Although critical habitat for the Southern Resident killer whale is designated, it does not include nearshore ocean areas adjacent to Coos Bay and substantial adverse impacts are not anticipated.

Designated critical habitat for the leatherback sea turtle is located off the coast of Oregon and includes both the North and South ODMDS. However, the two ODMDS are located closer to the shore than that preferred by sea turtles or of their preferred prey species, the one PCE essential for leatherback sea turtle conservation. Additionally, ongoing placement of material at the ODMDS results in intermittent, temporary and localized impacts, which are unlikely to affect critical habitat.

These conclusions reflect previous NMFS concurrence, which agreed that the Preferred Alternative will “not likely to adversely affect” ESA-listed whales, Steller sea lion and turtles (NMFS 2010, 2004). Critical habitat for these species is not located in the Project Area, except for the leatherback sea turtle. An updated BA has been submitted to the NMFS to analyze effects on this newly designated critical habitat (Corps 2013b). The Corps concluded that the Preferred Alternative will not destroy or adversely modify critical habitat for the leatherback sea turtle.

Southern DPS Green Sturgeon

Southern DPS green sturgeon are known to occur in Coos Bay and they may also be present in the vicinity of the ODMDS offshore of the Coos River as they migrate to northern estuaries during summer and early fall.

Annual Corps dredging and placement of sand from the Main Channel is not anticipated to increase water turbidity substantially, but the material from the access channels is finer and, while dredging of these areas occurs less frequently, turbidity during dredging and placement activities of this material could increase. Subadult and adult southern DPS green sturgeon are less susceptible to turbidity and suspended solids than many salmonids, inhabiting areas much more turbid (NMFS 2010). Green sturgeon will be able to move around the areas for the brief period that operations occur. Migrating green sturgeon spend limited time in one area and are more likely to be found offshore than in estuaries. They are less sensitive to turbidity and suspended solids compared to other fish. Juvenile sturgeon would be more likely to be adversely affected but are unlikely to be present, as the southern DPS of green sturgeon are not known to spawn in any Oregon coastal rivers.

Dredging and placement can disrupt benthic prey populations used by the southern DPS green sturgeon if ongoing and repeated dredging in the same location exceeds the recovery rate of the benthic food organisms. This is unlikely as the disturbed areas are surrounded by benthic habitat not regularly impacted by these activities. While southern DPS green sturgeon are known to forage on smaller fish species that could be injured or killed during dredging and placement activities (i.e. sand lance), it is unlikely that the overall abundance of forage fish within the area would markedly decline.

Overall, the effects for ongoing maintenance dredging and placement on the population of the southern DPS green sturgeon or its designated critical habitat will not be substantially adverse to the species.

These conclusions reflect previous NMFS concurrence, which agreed that the Preferred Alternative will not jeopardize the continued existence of the southern DPS green sturgeon or destroy or adversely modify its critical habitat (NMFS 2010).

Oregon Coast Coho Salmon

Over the short-term, disturbance, entrainment, or burial, and reduced water quality and prey species in the Project Area from dredging and placement activities could impact individual OC Coho. Adult and juvenile OC Coho salmon primarily use the Project Area for migration. Upstream migration of adult coho generally occurs in the fall/winter, with a peak in October through December. Juvenile outmigration generally extends from February through June but peaks at about mid-March to mid-May. Because dredging and ocean placement will take place annually between June 15 and October 31 at the Entrance Channel, adult coho may be present in the Project Area but most juveniles will have likely passed through the area before dredging begins. The same is true for dredging and placement at the Charleston Access Channel, which will take place annually between July 1 and November 30[12]. Consequently, impacts from proposed dredging and placement activities for the Preferred Alternative to the migration of OC coho salmon are expected to be minor. The dredging and placement activities would be intermittent and of short duration, and occur in areas that are not considered valuable habitat for coho. Adult coho would most likely move from the dredging activity into more suitable shallow areas adjacent to the navigation channels. Coho should be able to move away from the Flow-lane Placement Site for the brief period of time that it is used, and would not be adversely impacted by placement operations. Ocean placement usually occurs at a depth below that in which coho salmon feed and it is unlikely that any coho or coho feeding areas will be impacted by ocean placement.

[12] The in-water work period for dredging within the Charleston Access Channel has changed from July 1 through October 31 to July 1 through November 30. This modification was approved by the NMFS in 2011 (K. Phippen personal communications, September 27, 2011).

Reduced primary production in the Project Area is unlikely to be substantial given the localized nature of disturbance, turbidity and suspended solids from dredging and placement. The removal of sediment from the channel areas can cause mortality of polychaetes, oligochaetes, clams, and amphipods. However, the area is a high-energy environment. Recovery of shorter-lived benthic invertebrates (amphipods) will likely occur in several months in comparison with the larger benthic macroinvertebrates (mollusks and larger polychaetes), which may take a longer. Burial of some benthic prey populations at the placement sites will also occur but these prey species live in a very dynamic water and benthic environment and recolonization rates in these types of systems tends to be quite rapid (Pemberton and MacEachern 1997). Some of the areas of the authorized channel where shoaling and dredging occurs frequently (i.e. annually), may never fully have time to recolonize. The importance of the dredged channel and placement areas as a rearing area for juvenile salmonids is limited, and the disturbance to the benthic community within these areas likely will not alter feeding opportunities for salmonids moving to and from the ocean. Undisturbed benthic habitat is available nearby and yearlings will likely forage within the estuary, but pass quickly through the area en-route to the ocean as there is little of the preferred complex, off-channel habitat elements within either the dredged channel areas.

Removal of any existing seagrass beds could temporarily result in a slight reduction in primary production in the area where dredging occurs and potentially slightly reduce prey availability to OC coho salmon. Most of the known and recorded seagrass beds within the Project Area are located outside of the deeper authorized channels. Effects to prey availability from any seagrass beds located within the Project Area (that have not been recorded) compared to the amount of seagrass habitat available in the rest of the estuary, would be minimal.

Based upon the assessment of impacts, as well as implementation of the proposed conservation measures, including the in-water work periods, the Preferred Alternative is not likely to have substantial adverse impacts to OC coho salmon, nor will the activities result in destruction or adverse modification of designated critical habitat for the species.

These conclusions reflect previous NMFS concurrence which agreed that the Preferred Alternative will not jeopardize the continued existence of the OC coho salmon NMFS 2010) or destroy or adversely modify its critical habitat (NMFS 2010).

Other ESA-listed Salmon

Other ESA-listed salmon species could be migrating offshore during dredging and placement activities and be passing through the ODMDS located within the Project Area. These salmon will most likely be adults and can easily avoid burial by placement activities or any associated areas of water turbidity. The availability of food resources around the immediate placement sites at the two ODMDS will decline slightly over the short-term but abundant habitat and prey is available nearby. If these fish moved into the bay where dredging and placement activities were to occur, food resources are still readily available nearby.

These conclusions reflect previous NMFS concurrence which agreed that the Preferred Alternative will not jeopardize the continued existence of the SONCC coho salmon (NMFS 2010). Critical habitat for the SONCC coho salmon is not located within the Project Area.

Southern DPS Pacific Eulachon

According to the NMFS analysis supporting the listing of the southern DPS of Pacific eulachon, the most significant threat to eulachon and their habitats are changes in ocean conditions due to climate change (74 FR 10870). Dredging is identified as a low to moderate threat to eulachon primarily due to spawning related impacts.

Adult eulachon are found widely distributed within marine coastal waters and the specifics of their range are not yet completely understood, however, the presence of eulachon in the Project Area is unlikely based on available information. Further, dredging and placement activities in Coos Bay occur mostly between June and October (only the Charleston Access Channel is dredged into November), outside of the spawning period when eulachon may be present in the Project Area (between late winter through early summer). Additionally, the action is temporary in nature, also reducing the probability for adverse impacts due to the lack of spatial and temporal overlap. Dredging and placement occurs for only short periods each year and individual fish range widely with little known about their ocean movements.

Dredging and placement activities within the lower bay and ODMDS would have extremely small incremental climate related impacts (see Section 4.1.7.2), no effect on spawning areas for eulachon, and is not expected to result in modifications to migratory pathways. Substantially adverse impacts to southern DPS Pacific eulachon are not anticipated.

These conclusions reflect previous NMFS concurrence, which agreed that the Preferred Alternative will "not likely to adversely affect" southern DPS eulachon (NMFS 2010, 2004). Critical habitat for Pacific eulachon is not designated within the Project Area.

USFWS Jurisdictional Species

ESA-listed birds are anticipated to avoid the area during maintenance dredging, moving to nearby suitable habitat until the Project is completed. Marbled murrelets could forage within the Project Area and western snowy plovers could forage along offshore beaches on either side of the jetties, but it is unlikely that they will be substantially disturbed by dredging or placement activities. The likelihood of a short-tailed albatross entering the Project Area is extremely low. Further, vessels are common in Coos Bay and these birds are highly mobile and can fly around the activities to other nearby resources until the activity ceases. The North Spit, important for wintering and breeding western snowy plovers, will not be affected by dredging and placement activities.

Based upon the assessment of impacts, the Preferred Alternative is not likely to have substantial adverse impacts to ESA-listed birds. Designated critical habitat for snowy plovers is not located in the Project Area although critical habitat is located upland of the ODMDS, Site F. Placement of dredged material within the Nearshore of Site F is managed (to reduce mounding) and ensures beach nourishment (a slight benefit) to the North Spit, where designated habitat is located.

These conclusions reflect previous USFWS concurrence, which agreed that the Preferred Alternative will "not likely adversely affect" the marbled murrelet and would have "no effect" on the western snowy plover (USFWS 2004). Critical habitat for these species is not located within the Project Area.

4.2.3.2 No Action Alternative

The No Action Alternative eliminates maintenance dredging within Coos Bay and placement of dredged material at the in-bay sites or ODMDS. Without the removal of accumulating material, channels will shoal and bottom elevations will increase, possibly altering benthic habitats with increased exposure to light.

Over the short-term, adverse biological interactions with infrequent dredging and placement operations would cease and interactions with commercial and recreational marine vessels would change as shoaled non-navigable channels could actually reduce, or at least modify, boating traffic.

Over the long-term, effects from the No Action Alternative are anticipated to be slightly positive as annual disruptions to aquatic resources would decrease. Periodic losses of benthic fauna associated with dredging and placement activities would cease and motile and non-motile species would not be disturbed. Shallow water habitat would increase and areas of seagrass could expand. These long-term changes may slightly improve habitat conditions for ESA-listed salmonids and fish within the navigation channel and placement site areas.

Marine Whales, Marine Turtles, and Eastern DPS Steller Sea Lion

Similar to the Preferred Alternative, blue, sperm, sei and fin whales along with sea turtles are not generally observed in the nearshore. Their presence in the Project Area is unlikely given their preference for offshore waters. Humpback whales and Southern Resident killer whales may occur closer to shore but their presence is likely to be infrequent and transitory. Steller sea lion rookeries and haul outs are located at least five miles away from the Project Area. Without ongoing maintenance dredging and placement activities, substantial impacts are not anticipated on these ESA-listed species over the short-term.

Over the long-term, a reduction in waterfront development within the area, caused by a loss of access and navigable channels, could result in slightly positive habitat improvements.

Southern DPS Green Sturgeon

Migrating southern DPS green sturgeon spend limited time in one area and are more likely to be found offshore compared to estuaries. Similar to the Preferred Alternative, while southern DPS green sturgeon do not spawn in the Coos Bay rivers, they are known to occur in Coos Bay and may also be present in the vicinity of the ODMDS as they migrate to northern estuaries during summer and early fall. Without ongoing maintenance dredging and placement activities, impacts on the southern DPS green sturgeon are not anticipated.

Oregon Coast Coho Salmon

Minor short-term adverse impacts to OC coho salmon would cease without ongoing Corps maintenance dredging and placement activities.

Over the long-term, a reduction in waterfront development within the area, caused by a loss of access and navigable channels, could result in slightly positive habitat improvements. Migrating juvenile OC coho salmon would find additional prey resources within increased shallow water habitat within the Project Area.

Other ESA-listed Salmon

Without ongoing maintenance dredging and placement activities, the potential for minor and temporary adverse impacts on other ESA-listed salmon species migrating offshore and passing the ODMDS would cease. Substantial long-term improvements to habitat used by other migrating ESA-listed salmon are not anticipated.

Sothern DPS Pacific Eulachon

No impacts to southern DPS Pacific eulachon would occur should ongoing maintenance dredging and placement activities cease.

Over the long-term, a reduction in waterfront development within the area, caused by a loss of access and navigable channels, could result in overall slightly positive habitat improvements.

USFWS Jurisdictional Species

Similar to the Preferred Alternative, short-term adverse impacts to ESA-listed birds are not anticipated for the No Action Alternative. Over the long-term, slight improvements to in-water habitat from ceased dredging and placement activities, and an eventual reduction in waterfront development, could result in a slight increase in foraging habitat within the Project Area.

4.3 OTHER RESOURCES

4.3.1 Cultural and Historic

4.3.1.1 Preferred Alternative

There are no known sites of historical or archeological significance in the Coos Bay Project Area. The area has been dredged to the authorized dimensions previously and the placement sites used for many years. Adverse effects to cultural and historic resources from either the dredging or placement activities are not anticipated. Past coordination with SHPO has concurred with these conclusions (SHPO 1982, OAS 1976). The Corps also coordinated recently with both Oregon coastal tribal governments and SHPO. Letters to a number of coastal tribal governments (refer to Section 5 for a list) were mailed out on February 28, 2013. No comments were received by the tribal governments. A letter from the Corps to SHPO was mailed out on March 4, 2014 and a letter of concurrence was received on March 21, 2014.

Previous cultural and historical resource surveys have been completed and the results provided to SHPO for concurrence with the conclusion that adverse impacts to cultural and historical resources are unlikely.

4.3.1.2 No Action Alternative

Similar to the Preferred Alternative, short-term and long-term effects to cultural and historic resources for the No Action Alternative are not anticipated, as there are no known sites of historical or archeological significance in the Project Area.

4.3.2 Socioeconomic

4.3.2.1 Navigation

Preferred Alternative

The Preferred Alternative has both short- and long-term positive impacts on navigation in Coos Bay. Shoaling of the navigation channels would not provide adequate depth for efficient passage of vessels. Consequently, maintaining the Entrance Channel and Boat Basin Access Channel to authorized depths is critical to keeping the river and harbor open and to sustaining important navigation components of the local and state economy.

A possible short-term benefit to navigation could include a slight reduction in wave height within the entrance channel, which improves the navigability of the area.

Maintained navigation throughout the authorized channels allows for waterfront industries and businesses to continue to operate within the area and for Coos Bay to continue to be used as a USCG “critical harbor of refuge”, ultimately reducing the hazard to navigation and protecting human life and the environment. The Preferred Alternative also supports the area‘s search and rescue station with rescue vessels and helicopter support based in Charleston.

No Action Alternative

If the Entrance Channel, inner channel, turning basins, and other navigational access corridors are no longer maintained with periodic dredging by the Corps, the channels will shoal until they reach a quasi-equilibrium state. Over the short-term, commercial, recreational, and rescue vessels would navigate a less reliable channel to enter or exit the bay. Additionally, the lack of reliable and defined channels would increase the risk of groundings for vessels.

Over the long-term, local economies reliant on marine vessel traffic will likely suffer. Impacts could be in the form of loss of maritime jobs, commercial port leases and those industries that rely on the export of goods via maritime means (i.e. lumber). These impacts would translate to a reduction in revenue to the cities and counties in the region as well as at the federal level.

Further, the site may no longer serve as a “critical harbor of refuge” or as a station for USCG vessels to perform existing site missions such as rough water rescues, maritime environmental protection and maritime law enforcement.

4.3.2.2 Commerce

Preferred Alternative

Navigation within this estuary allows for access to the International Port of Coos Bay and a number of cities and for increased economic return due to commercial and recreational interests over both the short- and long-term.

Dredging and placement operations could cause minor time delays for commercial boaters and fishing activities due to congested maritime navigation. However, collisions between boaters and dredge traffic are unlikely due to the slow speed at which the dredges move. Prior to dredging and placement operations, the Corps coordinates with the local port, the USCG and the Crab Commission to minimize unexpected temporary disturbances.

The Preferred Alternative will not change the type or quantity of goods shipped, or the type or size of vessels transiting the area. Navigation access is crucial for maintaining the existing economy in the local area and the state of Oregon. Some short-term interference to vessel traffic could occur during the proposed maintenance activities, but these conflicts are expected to be an inconvenience rather than a direct impact. The Preferred Alternative will not cause substantial changes in population, economics, or other indicators of social well-being, and will not result in a disproportionately high or adverse effect on minority populations or low-income populations.

The Preferred Alternative has a positive effect on the local fishing industry and other waterfront-based economies (i.e. import and export, water-based tourism, ship and boat yards, etc.) of the local area and state of Oregon.

No Action Alternative

If Corps maintenance dredging of the channels ceased, shoaling will create unreliable navigation conditions. Shipping and fishing traffic would have to be directed through other ports, which would detrimentally affect the local fishing and waterfront-based commerce over the short-term. Business generated by recreational boating will also diminish over the long-term.

4.3.3 Recreation

4.3.3.1 Preferred Alternative

Short-term and long-term adverse impacts to recreational activities and sites are not expected. In-water work will not affect shoreline or beach accessibility. Placement sites are located outside of any major recreational use areas.

Dredging and placement operations could cause minor time delays for recreational boaters and fishing activities due to congested maritime navigation. However, collisions between boaters and dredge traffic are unlikely due to the slow speed at which the dredges move. Crab fishermen may crab in Coos Bay and adjacent areas during dredging and placement activities and some intermittent and temporary disturbances to crab fishing may occur. Prior to dredging and placement operations, the Corps coordinates with the local port, the USCG and the Crab Commission to minimize unexpected temporary disturbances.

4.3.3.2 No Action Alternative

With the elimination of periodic maintenance dredging of the entrance channel and other required access channels by the Corps, recreational boating and sport fishing could change or diminish over both the short- and long-term. The No Action Alternative will result in shoaling in the channels, which will reduce the available draft and size of boats that could use the area. Only smaller vessels would be able to continue recreational activities. The loss of navigability for larger vessels will reduce offshore recreation opportunities as boats would need to travel further from other ports or harbors. Additionally, the lack of reliable and defined channels could increase the risk of groundings for larger recreational vessels.

4.4 CONSERVATION MEASURES

Conservation measures and BMPs for the Preferred Alternative are proposed to avoid and minimize the potential for adverse impacts to physical and biological resources:

- Dredging within the Project Area will continue to occur between June 15 and October 31 (or through November 30 for the Charleston Access Channel) of any given year (with about six days of dredging in April or May), avoiding key migration periods for a number of protected fish species when possible. Dredging in shallow water areas (less than 20 feet) will be performed, to the extent possible, at times that will avoid the peak out-migration periods for ESA-listed salmon species within the Project Area (Table 2-1).
- Maintenance dredging and placement activities will continue in areas that are dredged/used for placement on a regular basis and generally have a lower biological productivity than other areas.
- Prior to dredging and placement operations, the Corps will coordinate the work schedule with the local port(s), the USCG and the Crab Commission. The USCG will issue a Notice to Mariners.
- Prior to, and during dredging and placement operations, dredge operators will communicate with the nearby USCG, pilots and local vessels.
- To minimize water turbidity and the potential for entrainment of organisms, the draghead of the hopper dredge or the cutterhead of the hydraulic cutterhead dredge will remain on the bottom to the greatest extent possible and only be raised three feet off the bottom when necessary for dredge operations.
- If the Captain or crew operating the dredges observes any kind of sheen or other indication of contaminants, they will immediately stop dredging/placement activities and notify the USCG and the Corps' environmental staff to determine the appropriate action.
- Contractors will not release any trash, garbage, oil, grease, chemicals, or other contaminants into the waterway.
- If routine or other sediment sampling determines that dredged material is not acceptable for unconfined, in-water placement, then a suitable alternative placement plan will be developed in

cooperation with the NMFS, USEPA, ODEQ, and other applicable agencies. The local sponsor is responsible for providing and permitting any proposed beneficial use upland site.

- The Corps works to meet state water quality standards as set forth in the ODEQ WQC (ODEQ 2004). Water turbidity is required to not exceed 10% above natural stream turbidities except where allowed by Oregon Administrative Rules (OAR) 340-041-0205(2)(c). For the Coos Bay Project in areas with course-grained sediments, turbidity levels will be monitored via visual observations to identify any adverse detectable change in water quality. In areas where fine-grained sediments are present in levels equal to or greater than 20% silts/clays (usually between RM 12 to 15), a turbidimeter is used to quantify change as NTUs.
- Placement activities at the ODMDS are performed in accordance with the Site Management and Monitoring Plan developed under 40 CFR 228.9 and with use restrictions specified as part of the USEPA designation for these sites. Material is dispersed as thinly and evenly as possible to prevent mounding and reduce impacts to marine organisms.
- When using a hydraulic cutterhead (pipeline) dredge, with material placed in an in-bay placement site, work is restricted to the ebb tide, so material dispersed to the maximum extent possible and turbidity is reduced.

4.5 DIRECT AND INDIRECT EFFECTS SUMMARY

A summary of direct and indirect effects on resources for the Preferred Alternative compared to the No Action Alternative are provided in Table 4-2. Effects can be direct (D), indirect (I), or have no effect (NE) and be short-term/temporary or long-term/continuous in nature. Based on this EA, the Preferred Alternative would not substantially affect the quality of the human environment. While the No Action Alternative would result in a number of overall slight habitat improvements to the Project Area, there would be substantial adverse impacts to navigation, socioeconomics, and recreational resources.

Table 4-2. Coos Bay Summary of Effects

		Preferred Alternative		No Action	
Resource	**Effect Duration**	**Effect Type** Direct (D) Indirect (I) No Effect (NE)	**Description**	**Effect Type** Direct (D) Indirect (I) No Effect (NE)	**Description**
Physical Environment					
GEOLOGY	Short-term	NE	No temporary direct or indirect impacts are anticipated to occur.	NE	No temporary direct or indirect impacts are anticipated to occur.
	Long-term	NE	No long-term direct or indirect impacts are anticipated to occur.	NE	No long-term direct or indirect impacts are anticipated to occur.
COASTAL PROCESSES					
Coastal Circulation and Sediment Transport	Short-term	D	Direct: Minor, temporary mounding is possible at the ODMDS that may result in localized changes in nearshore currents and beach erosion from wave refraction and focusing along some portions of beach. The SMMP requires monitoring and management of ODMDS to reduce long-term mounding. Compliance with the SMMP (i.e. staggered drop zones and incremental placement volumes) minimizes the potential for minor and temporary mounding. Placement of dredge material in nearshore portions of Site F or at flow-lane Site G would provide sediment to the littoral cell, thereby providing a benefit to the Coos Littoral Cell sediment budget. Sediment would have a beneficial effect on Project Area beaches. Placement of material of marine origin outside of the littoral cell (ODMDS E, H and offshore portions of Site F) could result in neutral impacts to the sediment budget.	D	Direct: Coos Bay would remain a sediment sink, although more emphasized, which could result in shoreline recession on beaches to the north. Direct: Shoaling would occur within the Entrance Channel toward a new quasi-equilibrium condition (likely narrower and shallower channel with higher current velocities).
	Long-term	D	Direct: Placement of a portion of dredged sediment within the littoral cell would continue to benefit beaches in the Project Area.	D	Direct: Coos Bay would continue to trap littoral sediment, which may result in erosion of adjacent beaches.
Sea-Level Rise	Short-term	NE	SLR occurs over long temporal scales in response to changing global temperatures and other factors. Therefore, no short-term effects to SLR are anticipated as a result of the Project.	NE	No short-term effects to SLR are anticipated.
	Long-term	I	Indirect: Could indirectly contribute to SLR through the release of GHG emissions during construction. Equipment compliance with stringent air quality standards would minimize these impacts.	I	Indirect: A slight reduction in GHG emissions could indirectly benefit the potential for effecting SLR, although the effect is more likely to be neutral.
HYDROLOGY	Short-term	NE	No temporary direct or indirect impacts are anticipated to occur as the channels would be retained in their existing condition.	D	Direct: Shoaling may modify the current hydrodynamics of the bay, possibly modifying flow and residence time in different areas.
	Long-term	NE	No long-term direct or indirect impacts are anticipated to occur.	D	Direct: Modified hydrodynamics would result in a new hydrological equilibrium.
SEDIMENT QUALITY	Short-term	D	Direct: Redistribution of sediment as in-bay sediment would be transported to the ODMDS. Dredged sediment is of slightly different character than native ocean sediment at these placement locations; however, dredge sediments are subject to SEF standards and SMMP placement and monitoring requirements that ensure only clean, compatible dredge material is placed at these sites. Compliance with SEF standards would result in no substantial effects to sediment quality.	D, I	Direct: No redistribution of sediments within the Project Area. Indirect: Potential increase in vessel groundings and possible spills.
	Long-term	D	Direct: Redistribution of sediment would continue, however, continued compliance with SEF standards and the SMMP would minimize effects.	I	Indirect: If shoaling of the channels leads to less vessel traffic and commercial use of the bay, sediment contamination from anthropogenic sources (i.e. petroleum leaks and spills from vessels, commercial and industrial waterfront industries) may be slightly reduced.
WATER QUALITY	Short-term	D	Direct: Localized, temporary increases in turbidity are anticipated primarily at placement sites, although some temporary increases in turbidity may be associated with dredging depending on the method. These impacts are minimized through implementation of Corps dredge conservation measures (i.e. turbidity monitoring).	D, I	Direct: Fewer localized temporary periods of reduced water quality due to no maintenance dredging and placement operations. Indirect: Potential increase in vessel groundings and possible spills.
	Long-term	I	Indirect: Sustained vessel traffic and commercial use of the bay could result in reductions in water quality from anthropogenic sources.	I	Indirect: If shoaling of the channels leads to less vessel traffic and commercial use of the bay, reductions in water quality from anthropogenic sources (i.e. petroleum leaks and spills from vessels, commercial and industrial waterfront industries) may be reduced.

Table 4-2. Coos Bay Summary of Effects (cont'd)

		Preferred Alternative		No Action	
Resource	**Effect Duration**	**Effect Type**	**Description**	**Effect Type**	**Description**
SOUND	Short-term	D, I	Direct: Intermittent periods of increased in-air noise from dredge activities are anticipated, but not expected to rise above background levels for very long. Indirect: Temporary increases to in-air and in-water sound levels could result in minor impacts to aquatic organisms. However, these impacts are unlikely as most species of concern (e.g. anadromous salmonids) are not typically present during operations (i.e. in-water work periods).	D	Direct: Discontinuation of Corps dredging and placement activities would not generate in-air or in-water sounds.
	Long-term	NE	Sound impacts are temporary in nature and no long-term direct or indirect impacts are anticipated because these increases are unlikely to rise above ambient background levels from existing maritime traffic.	I	Indirect: Shoaling of the navigation channels could result in decreased maritime commerce traffic in the bay. With reduced navigability and vessels, noise from vessels and related waterfront activities (both in-air and in-water) could decline.
AIR QUALITY					
Air Quality Standards	Short-term	D	Direct: Nominal increases in emissions of criteria pollutants are not anticipated to result in exceedances of NAAQS. The Project Area has not been identified as a Non-Attainment or Maintenance Area by the ODEQ and Corps dredge equipment recently underwent engine upgrades to meet more stringent California air quality standards. These engine modifications, along with necessary compliance with ODEQ air quality standards, would minimize any impacts.	D	Direct: Air quality would be slightly improved from reduced emissions associated with channel maintenance dredging.
	Long-term	D	Direct: Would annually add a very small increment of criteria pollutants to the NAAQS monitoring area. This increment is not anticipated to result in potential air quality exceedances. The Project Area has not been identified as a Non-Attainment or Maintenance Area by the ODEQ and Corps dredge equipment recently underwent engine upgrades to meet more stringent California air quality standards. These engine modifications, along with necessary compliance with ODEQ air quality standards, would minimize any impacts.	I	Indirect: Shoaling of the navigation channels could result in decreased maritime commerce traffic in the bay. Reduction in traffic and associated waterfront activities could reduce air emissions from these activities that would slightly improve the air quality in the area.
Climate Change	Short-term	I	Indirect: Emissions from dredge and placement activities could contribute indirectly to climate change through the release of GHGs. Corps dredge equipment recently underwent engine upgrades to meet more stringent California air quality standards. These engine modifications, along with necessary compliance with ODEQ air quality standards, would minimize these impacts.	I	Indirect: The discontinuation of dredging and placement activities would not contribute intermittently to modest increases in GHG emissions, which contribute to climate change. A very small reduction in GHG could result.
	Long-term	I	Indirect: Emissions from dredge and placement activities could continue to contribute incrementally and indirectly to climate change through the annual release of GHGs. Corps dredge equipment recently underwent engine upgrades to meet more stringent California air quality standards. These engine modifications, along with necessary compliance with ODEQ air quality standards, would minimize these impacts	I	Indirect: The discontinuation of dredging and placement activities would not contribute intermittently to modest increases in GHG emissions, which contribute to climate change. A very small reduction in GHG could result.

Table 4-2. Coos Bay Summary of Effects (cont'd)

		Preferred Alternative		No Action	
Resource	**Effect Duration**	**Effect Type**	**Description**	**Effect Type**	**Description**
BIOLOGICAL ENVIRONMENT					
Aquatic Plants, Animals, Habitat	Short-term	D, I	Direct: Injury and mortality of benthic organisms and crustaceans; entrainment of small fish and aquatic organisms (sand lance); avoidance of area from construction noise and increased water turbidity; and burial of benthic organisms and crustaceans would occur within dredge and placement areas. These impacts are minimized through implementation of Corps dredge conservation measures (i.e. in-water work periods, placement of dragheads on channel bottom, dredging of only those areas necessary to maintain authorized channel dimensions, water quality monitoring, slow speed of dredges, etc.). Direct: Loss or disturbance of habitat will be temporary and limited to only the areas immediately surrounding dredge and placement operations. These impacts are minimized through implementation of Corps dredge conservation measures (i.e. in-water work periods, dredging of only those areas necessary to maintain authorized channel dimensions). Indirect: Water turbidity increases could result in indirect impacts to submerged aquatic vegetation near the Project Area; although hopper dredging does not typically generate high levels of turbidity. These impacts are minimized through implementation of Corps dredge conservation measures (i.e. placement of dragheads on channel bottom, dredging of only those areas necessary to maintain authorized channel dimensions, water quality monitoring). Indirect: Placement of dredged sediments at the ODMDS may result in temporary, localized changes in the character (grain size and chemistry) of offshore sediments in these areas. These localized impacts to bottom-dwelling or benthic organisms would be short-term and, in combination with the Corps' conservation measures (including compliance with the ODMDS SMMP), not result in substantial adverse impacts.	D	Direct: Reduced injury, mortality, entrainment, avoidance of dredging or placement areas, water quality impacts, burial of aquatic species would reduce temporary and localized disturbances to biological populations. Direct: Elevations in the navigation channels would increase in some areas. The shallower habitat would allow more light to penetrate the channel bottom encouraging benthic algal growth. Direct: Loss of habitat for those species that have adapted to the deeper navigation channels maintained by ongoing dredging over the past century (i.e. in some areas the influence of saltwater may decrease, thereby decreasing habitat for marine species, but increasing habitat for river and estuarine species).
	Long-term	D	Direct: Loss or disturbance of habitat. Dredging within channels would continue to temporarily disturb habitat within the dredged areas of the channels. This impact is minimized through implementation of Corps dredge conservation measures (i.e. dredging of only those areas necessary to maintain authorized channel dimensions).	I	Indirect: Shoaling channels would increase areas within the channels back to pre-dredging levels (in some areas up to -10 feet MLLW). With increased light penetrating the channel floor, increases in aquatic vegetation (algae and seagrass) would occur providing more areas of food and shelter for aquatic organisms.
Shoreline and Terrestrial Plants, Animals, Habitat	Short-term	D	Direct: Temporary increases in in-air sound could result in minor impacts to foraging shorebirds. This impact will have no substantial adverse effects.	N	Direct: Shoreline habitats are unlikely to be directly affected.
	Long-term	NE	No long-term direct or indirect impacts are anticipated to occur.	I	Indirect: If shoaling of the navigation channels reduces maritime commerce activities in the bay, shoreline habitat may improve from fewer impacts from these commercial activities.
Endangered Species	Short-term	D	Direct: Temporary and localized avoidance by southern DPS green sturgeon, adult OC coho salmon, other ESA-listed salmon, and southern DPS Pacific eulachon from dredging and placement operations (i.e. in-water noise) will occur. Reduced water quality, potential entrainment and fewer prey species in the dredged channels and ODMDS will be minimized through implementation of Corps dredge conservation measures (i.e. placement of dragheads on channel bottom, dredging of only those areas necessary to maintain authorized channel dimensions, water quality monitoring, and in-water work periods). Direct: Modification of habitat will be temporary and limited only to areas immediately surrounding dredge and placement operations. These impacts are minimized through implementation of Corps dredge conservation measures (i.e. in-water work periods, dredging of only those areas necessary to maintain authorized channel dimensions).	D	Direct: Reduced injury, mortality, entrainment, avoidance of dredging or placement areas, water quality impacts, burial of aquatic species would reduce temporary and localized disturbances for all ESA-listed species.
	Long-term	I	Indirect: Modification of habitat for OC coho salmon will be temporary and limited. Seagrass near channels may be affected, although this is unlikely given typical dredging methods (i.e. hoppers). This impact is further minimized through implementation of Corps dredge conservation measures (i.e. dredging of only those areas necessary to maintain authorized channel dimensions).	I	Indirect: Increased levels of aquatic vegetation within the channels may provide more shelter and food to aquatic organisms including ESA-listed species, although this increase would be minor given the relatively small area in which this would occur given the size of the estuary.

Table 4-2. Coos Bay Summary of Effects (cont'd)

		Preferred Alternative		No Action	
Resource	**Effect Duration**	**Effect Type**	**Description**	**Effect Type**	**Description**
OTHER RESOURCES					
CULTURAL AND HISTORIC	Short-term	NE	No temporary direct or indirect impacts to cultural resources are anticipated to occur as the Project Areas have been previously disturbed.	NE	No temporary direct or indirect impacts are anticipated to occur.
	Long-term	NE	No long-term direct or indirect impacts to cultural resources are anticipated to occur as the Project Areas have been previously disturbed.	NE	No long-term direct or indirect impacts are anticipated to occur.
SOCIOECONOMICS					
Navigation	Short-term	D	Direct: Minor vessel traffic delays within the channels are possible during dredge activities. Adverse impacts minimized by communications between dredge, the USCG, and other vessels using the area. Direct: Maintained vessel access and navigability of federal channels would continue to support access to Port facilities, private marinas and waterfront industry. Direct: Maintained navigation throughout the authorized channels allows for the continued USCG "critical harbor of refuge" status, ultimately reducing the hazard to navigation and protecting human life and the environment. Direct: A slight reduction in wave height within the entrance channel, which improves the navigability of the area.	D	Direct: Reduced reliability of access and navigability of federal channels. Increased risks to vessels (i.e. groundings).
	Long-term	D	Direct: Maintained vessel access and navigability of federal channels would directly benefit access to Port facilities, private marinas and waterfront industry.	I	Indirect: Shipping and vessel traffic would change to favor alternative deeper draft ports.
Commerce	Short-term	D	Direct: Navigation channel maintenance would sustain access for maritime commerce, which is important to the local and state economy (e.g. fishing, crabbing, clamming, lumber products, tourism, boatyard repair, etc.).	D	Direct: Reduced reliability of access and navigability of channels would adversely affect maritime commerce and development, which is important to the local and state economy (e.g. fishing, crabbing, clamming, lumber products, tourism, boatyard repair, etc.).
	Long-term	D	Direct: Navigation channel maintenance would sustain access for maritime commerce, important to local and state economy (e.g. fishing, crabbing, clamming, lumber products, tourism, boatyard repair, etc.).	D	Direct: Reduced reliability of access and navigability of channels would adversely affect maritime commerce, which is important to local and state economy (e.g. fishing, crabbing, clamming, lumber products, tourism, boatyard repair, etc.).
RECREATION	Short-term	D	Direct: Removal of shoals will maintain channel conditions for the passage of recreational vessels (i.e. smaller waves in the Entrance Channel).	D	Direct: Shoaling of the Entrance Channel would make passage more dangerous for recreational vessels at times.
	Long-term	D	Direct: Removal of shoals will maintain channel conditions for the passage of recreational vessels.	D, I	Direct: Shoaling of the Entrance Channel may make passage dangerous for recreational vessels at times. Indirect: Shoaling of the Entrance Channel, minor reduction of biological impacts from halting maintenance dredging, and reduced overall maritime commerce in the bay may result in increased recreational opportunities (i.e. improvements in clamming, crabbing, fishing). Indirect: Fewer waterfront businesses may be able to remain viable in the area with reduced access and navigability making it more difficult for recreational vessels to operate or be maintained (i.e. fewer viable boatyards, marinas for moorage and launch capabilities).

4.6 CUMULATIVE EFFECTS

A cumulative impact is defined in CEQ NEPA regulations as the "impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (CFR Title 40, Section 1508.7). CEQ interprets this regulation as referring only to the cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present and reasonably foreseeable future actions.

In contrast to the potential direct and indirect effects of the build alternatives or the No Action Alternative, cumulative effects are those that could result from the combination of individual effects of multiple actions over time. Cumulative and incremental effects can result in unintended and undesirable environmental changes despite efforts to minimize or mitigate the project-specific direct and indirect effects of the proposed action and the previously completed or reasonably foreseeable future actions (RFFAs).

Assessing cumulative impacts may involve assumptions and uncertainties because data on the environmental effects of other past, present and RFFAs are often incomplete or unavailable and expressing impacts must often be done in qualitative terms or as a relative change. Cumulative impacts were assessed for each resource, consistent with CEQ guidance (CEQ 2005, 1997) and that of USEPA (USEPA 1999).

4.6.1 History of the Coos Bay Project Area

This section identifies past, present and RFFA projects that could incrementally contribute to resources affected by the Preferred Alternative and No Action Alternative.

4.6.1.1 Past Actions

The Coos Bay estuary has been substantially altered from the 1800's through commercial/industrial uses and residential development. These activities resulted in the introduction of non-native species and alteration of rivers and streams. Changes in public expectations concerning how resources are managed began in the 1970's, and today the protection of unique ecosystems, such as coastal estuaries, has increased with the support of stricter environmental regulation.

Past actions relevant to the cumulative analysis in this EA are those that have previously taken place and are largely complete, but that have lasting effects on one or more resources that could also be affected by the Preferred Alternative. For these past actions, CEQ guidance states that consideration of past actions is only necessary to better inform agency decision-making. Past actions considered in this analysis are summarized below and their effects, which have resulted in the existing conditions, as described in Section 3.

- Early Euro-American settlement of the Coos Bay area during the late 1800's and early 1900's.

- Authorization of the Coos Bay and Coos and Millicoma River Federal Navigation Projects by the RHA of 1880, 1892, 1910, 1919, 1930, 1935, 1945, etc., which included construction, maintenance and periodic reconstruction of the North and South Jetties by the Corps.
- Corp's maintenance dredging and placement activities.
- Continued human use and modification of the Coos River estuary, the surrounding area, and tributaries feeding into the bay up until the passing of the Clean Water Act. This included clearing for timber harvest and agricultural development, urban development of small towns and cities near the shoreline, highways and railroads, and power and utility lines.
- Navigation and waterfront facilities constructed and maintained by local sponsors (i.e. the Port and local waterfront businesses).
- Facilities constructed and maintained by the Southwest Oregon Regional Airport.
- Recreational facilities established by federal, state, and local agencies.
- Commercial and residential development that has occurred in the area.

4.6.2 Present and Reasonably Foreseeable Future Actions

Present actions identified in this analysis are those that are currently occurring and also result in impacts to the same resources as would be affected by the Preferred Alternative. Present actions generally include on-going use activities (waterfront activities) and recently completed development (new or replaced docks, dredging, and waterfront development).

Reasonably foreseeable future actions identified in this analysis are those that are likely to occur and affect the same resources as the Preferred Alternative. For a future action to be considered reasonably foreseeable, there must be a level of certainty that it would occur. This level of certainty is considered met with the submission of a formal project proposal or application to the appropriate jurisdiction, approval of such a proposal or application, inclusion of the future action in a formal planning document, or other similar evidence. For future actions in the proposal stage, the action also must be sufficiently defined in terms of location, size, design, and other relevant features to allow for meaningful consideration in the cumulative analysis.

Present and RFFAs include many of the same operational and maintenance activities described in the above list. To determine whether there are other present and/or future actions reasonably certain to occur in the Project Area, Corps studies of the area were reviewed, local government websites were reviewed and local entities queried.

The following actions were also identified as being reasonably certain to occur over the next ten years (locations for some of these projects can be found in Figure 4-1 and Figure 4-2):

- **Coos Bay Jetties Rehabilitation Project:** A preliminary Major Maintenance Report (MMR) was prepared for the Corps in 2012 by Moffatt & Nichol in order to investigate several repair design alternatives with the primary goal of extending the functional life of the north and south jetties and maintaining deep-draft navigation through the entrance. The project still requires environmental review, final design and funding. However, it is anticipated that maintenance and/or rehabilitation of the existing jetties would be needed within the next 10 years.

- **Oregon International Port of Coos Bay Slip and Access Channel:** The Port is pursuing multiple marine terminal development projects on the North Spit of Coos Bay, referred to collectively as the Oregon International Port of Coos Bay Slip and Access Channel. The proposed multi-purpose cargo slip would accommodate two berthing areas, one for the proposed Jordan Cove Energy Project liquefied natural gas (LNG) terminal and a second for inbound and/or outbound bulk and/or breakbulk commodities. Jordan Cove continues to pursue permitting for its LNG project, while the Port of Coos Bay continues to have discussions with entities investigating marine industrial property opportunities. The slip and adjoining vessel berths are proposed to be constructed at -45 feet North American Vertical Datum of 1988 (NAVD88), and be connected to the Coos Bay Federal Navigation Channel by a new dedicated access channel also dredged at -45 feet. These projects are closely related to the Coos Bay Channel Deepening Project but could also occur if the deepening project does not move forward.
    - **Jordan Cove LNG Terminal Project:** Energy Projects Development LLC has begun seeking approvals from state and federal regulators to construct and operate a LNG export terminal on the North Spit within the Oregon Gateway Marine Terminal (OGMT) complex. The facility is being designed to accommodate about six to seven vessels a month. In order to accommodate the LNG tankers, 5.67 MCY of material would need to be removed (includes both in-water dredging and upland excavation) from a 53-acre site along the North Spit (includes portions of Henderson March). In 2012, the Federal Energy Commission (FERC) notified Jordan Cove that revised project analysis and permit applications would be required before they could review the application. Revisions to analysis and documentation would be complete in 2013. With approval, construction would start within the within next five years. In-water work necessary to construct the terminal would include about 45 acres of new dredging between the shoreline and existing federal navigation channel boundary at about RM 7.5.
    - **General Purpose Cargo Terminal Project:** The Port is considering developing a General Purpose Cargo Terminal that could be served channelside or by an existing berth.
- **Charleston Marina Master Plan:** The Port is updating the Charleston Marina Master Plan. The Port is currently seeking community involvement from users of the facilities, local area residents, other public agencies and various advocacy and community support groups in the Charleston area to develop a comprehensive and flexible plan that would produce the greatest benefit for Charleston and Oregon's Bay Area.
- **North Spit Barge Slip Project:** In 2004, the Port sold 32 acres of industrial land and the barge slip to Southport Forest Products for the construction of a modern small-log sawmill. Prior to the opening of the mill, the Port also developed the North Spit Rail Spur to serve the mill and other

industrial lands in the TransPacific Parkway corridor. The ConnectOregon multimodal transportation system funding program presented an opportunity for the Port and Southport to partner on development of a multimodal barge facility with access to rail and road. The barge slip is now reconfigured to handle ocean going cargo barges able to move inbound logs, outbound woodchips and a variety of breakbulk general cargo. The Southport facilities were completed December 2007 and dredging was completed in 2012. The privately-owned barge slip is now suitable for intermodal cargo movements. Additional upgrades at this site over the next ten years could include additional new dredging, most likely in the area of about 5 acres of previously un-dredged shallow water.

- **Southwest Oregon Regional Airport Runway Expansion:** The Southwest Oregon Regional Airport (SORA) is located within the city of North Bend. The SORA is planning to extend its runway to accommodate larger planes. To do this may require approximately 4 acres of fill at the end of their existing runway into the shoreline (extension equates to about 400 linear feet) at about RM 8.

Three actions identified as still being within the project planning and feasibility stage are listed below. It is not clear what would be required to support such projects or when/if they would move forward. Therefore, these projects were not included in the cumulative effects analysis.

- **Coos Bay Channel Deepening Project:** The Port is currently conducting a Corps of Engineers Feasibility Study (FS) and NEPA Environmental Impact Statement (EIS) under the authority granted by Section 203 of the Water Resources Development Act (WRDA), 1986, with the Portland District having oversight of this project. The project proposes modifications to the existing Federally authorized Coos Bay Navigation Channel to accommodate larger deep draft vessels while providing a net positive local, state, and Federal economic and environmental benefit. Also included in the project is ecosystem restoration, maintenance dredging and minor jetty modifications. The project is currently within the Feasibility Study stage and it is still unclear as to if this project would move forward and how much deepening or widening of the channel would actually occur if it did.
- **Roseburg Forest Products:** The Roseburg Forest Products Chip Terminal is located on the North Spit at about RM 8. Roseburg is considering additional terminal upgrades to their facilities, which could result in new dredging at their terminal. However, these plans are preliminary in nature.
- **Possible Bulk Terminal (previously called Project Mainstay):** Project Mainstay was a proposed dry bulk coal terminal to be located on the North Spit (at about RM 6). The initial proposal called for channel deepening and construction of a new terminal that would result in the export of 6 to 10 million metric tons of coal a year. In-water work necessary to construct the terminal was to include about 15 acres of new dredging between the shoreline and existing federal navigation channel boundary at about RM 7.5. Mitigation was to be proposed as part of this project to offset adverse impacts on biological resources. In April of 2013, negotiations between the Port

and Project Mainstay partners ended. At this time there are no definite plans, or development partners, to support a bulk terminal at this site.

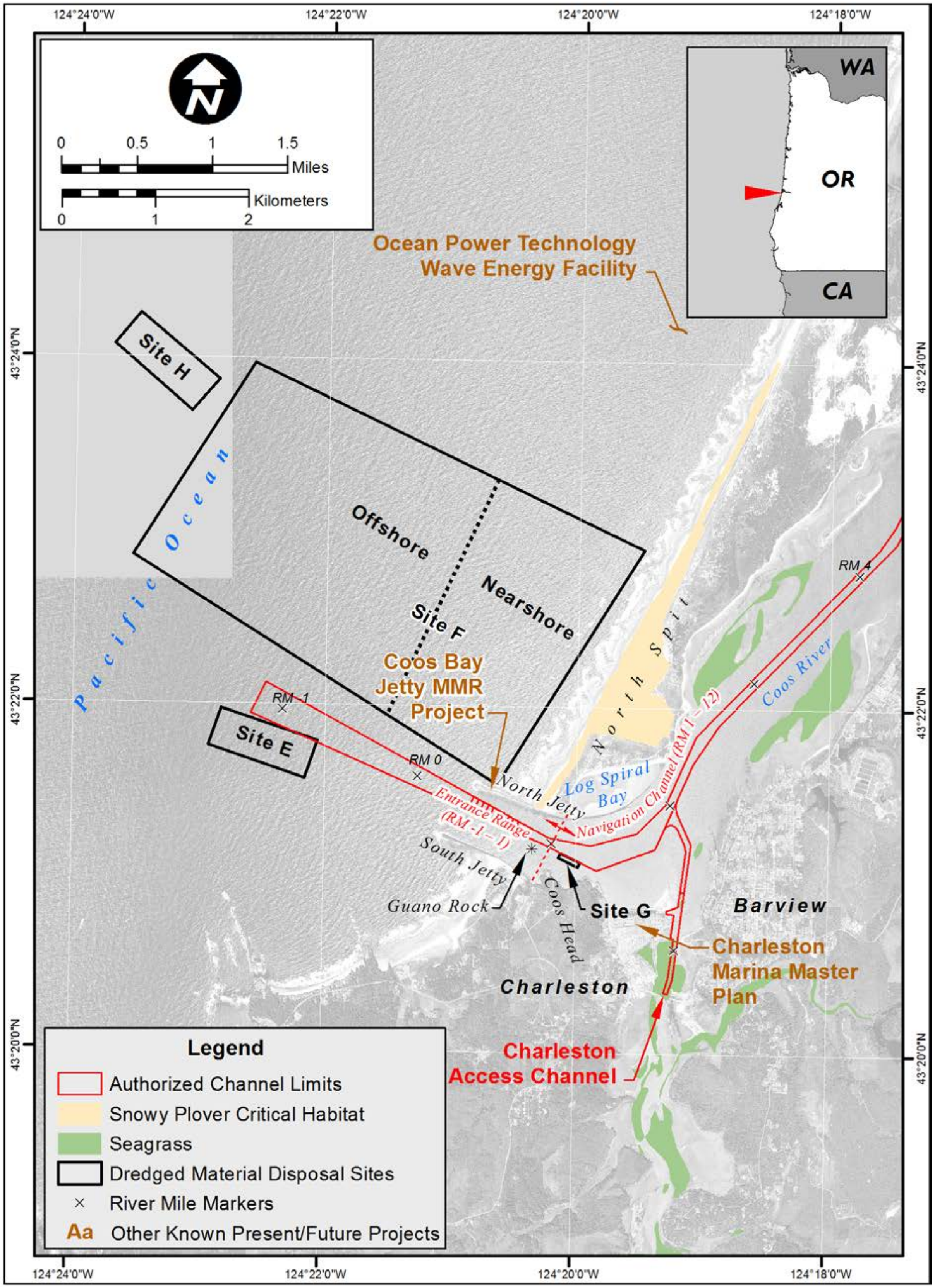

Figure 4-1. Cumulative Project Locations – Lower Coos Bay

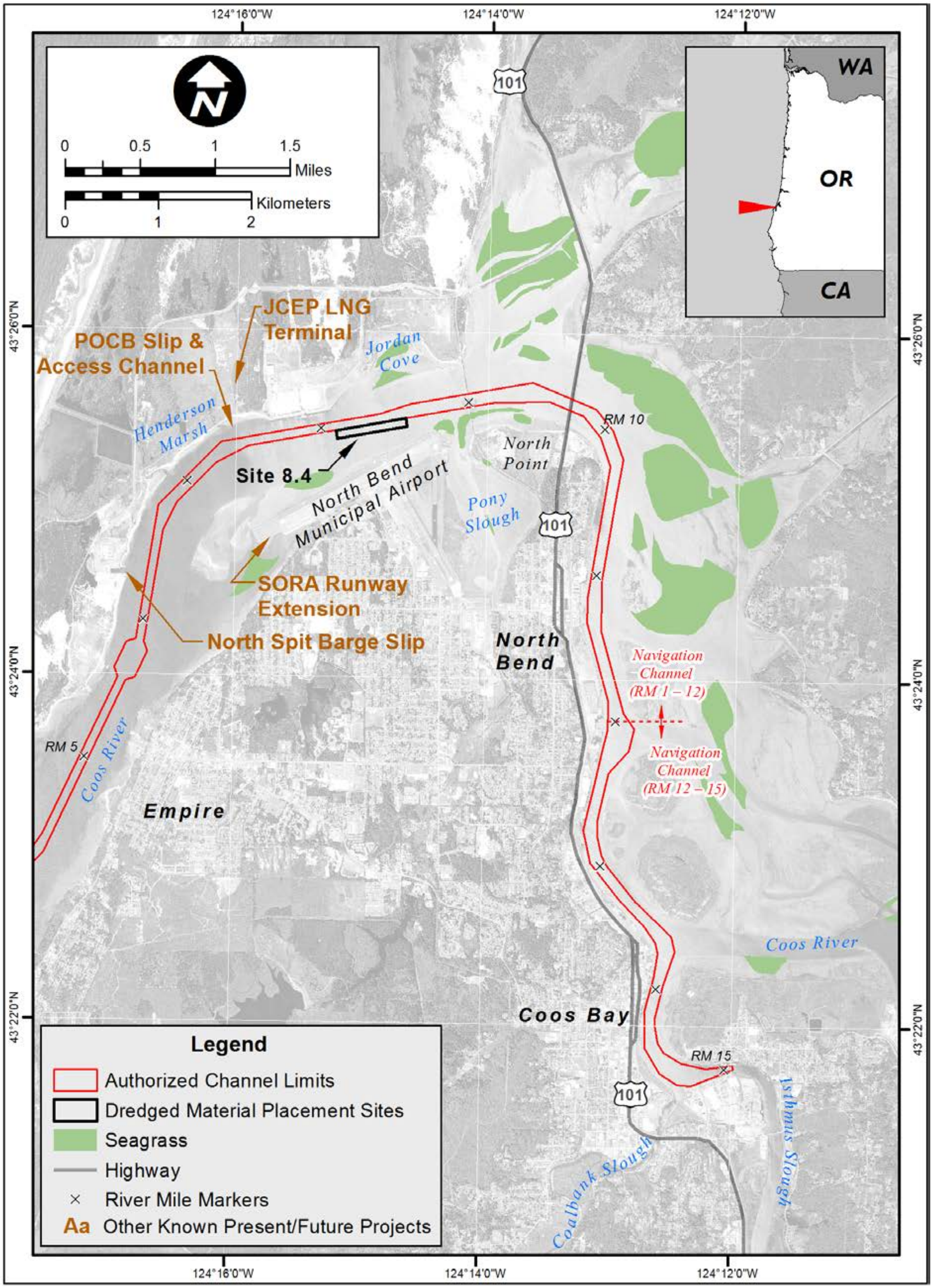

Figure 4-2. Cumulative Project Locations – Upper Coos Bay

4.6.3 Effects

In order to determine the potential cumulative effects of the Project, the analysis considered the relationships between the direct and indirect effects of the Project alternatives, past and present actions and other RFFAs on the resources of concern. The expected cumulative effects for the Project were identified according to a process recommended by the CEQ (CEQ 1997) where it was considered how past and present actions have already affected the geographic area. Those past and present actions (developments) have changed several of the environmental elements discussed in this EA relative to their original conditions and continue to influence current trends.

The past temporal boundary, or environmental reference point, for the cumulative effects analysis was determined on the basis of the unique history of each resource. Lasting effects due to past actions have accumulated in the project vicinity since the early nineteenth century and have continued to shape the developments that have occurred in the area. In order to understand the contribution of past actions to the cumulative effects of the alternatives, this analysis relies on current environmental conditions to understand the impacts of past actions. The existing conditions reflect the aggregate impact of all prior actions that have affected the environment and might contribute to cumulative effects. CEQ issued a memorandum regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions” (CEQ 2005).

Like the past temporal boundaries, the geographic boundaries used for the cumulative effects analysis vary by resource. These boundaries may be natural ecological boundaries or sociocultural boundaries selected to ensure that all the potential effects are included. They also may take into account the distance at which an effect can influence a particular resource.

In accordance with CEQ, cumulative impacts of direct and indirect effects of the Preferred and No Action Alternatives are analyzed in this section (CEQ 2005). Resource categories that were not determined to result in direct or indirect effects were not included in this analysis (CEQ 2005). Resources subject to this provision include Geology and Cultural/Historic. Justification for determinations of “no effect” for these resources can be found in sections 4.1 and 4.3, respectively.

4.6.3.1 Coastal Processes and SLR

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for past and present development related to coastal processes and SLR. The construction of the entrance channel jetties resulted in an ongoing cumulative effect on coastal processes by modifying currents and sediment transport in Coos Bay.

The geographical boundary for this resource includes the Coos Bay Project Area, including the ODMDS, along with the Coos Littoral Cell.

Past, Present and Reasonably Foreseeable Future Actions

Prior to development of Coos Bay, the river outlet naturally migrated along a shifting sand spit. The meandering channels in the bay were likely shallower with higher current velocities. Stabilization of the

Entrance Channel with jetties and deepening of interior navigation channels resulted in a modification to the coastal system. Post-construction of these features, sediment accumulated along both the south and north jetties and beaches.

The Coos Bay Jetties Rehabilitation Project was the one RFFA identified that may also result in incremental effects to currents and sediment transport in the Project Area. The project would restore the prior function of the jetties, therefore, is not considered to result in a substantial effect to the existing coastal system.

In 1891 sea levels may have been approximately three inches below the present day condition. GHG concentrations in the atmosphere and global temperatures were also lower than present day. Many of the past, present and RFFAs may have contributed incrementally to SLR through the release of GHG emissions during construction and operation of these projects. These contributions are not considered substantial given the nature of these projects relative to the global context of these systems.

Preferred Alternative

The Preferred Alternative maintains the existing configuration of the navigational channels that have been in place at Coos Bay for over a century and dredging and placement practices, which began in the early 1900's. Ongoing maintenance dredging in combination with the repair/replacement of the existing jetties would not change the currents or sediment transport system. Implementation of the Preferred Alternative, in combination with past, present and RFFAs, would not incrementally impact coastal processes in Coos Bay.

The Preferred Alternative could indirectly contribute to very slight and incremental SLR through the periodic release of small amounts of GHG emissions to the atmosphere, which then acts to warm the climate. The proposed contributions in combination with past, present and RFFAs are not considered substantial given the magnitude of the contribution relative to the global nature of the system.

No Action Alternative

The No Action Alternative, in combination with past, present and RFFAs, would result in shoaling of the federal navigation channels, which would likely modify currents and sediment transport in the Project Area. These modifications to currents would not be a substantial impact to the coastal system; however, may result in indirect impacts to other resources such as navigation and biology. Discontinuation of sediment placement activities in the littoral cell could adversely affect beaches in the Coos Littoral Cell.

The No Action Alternative would halt any GHG emissions to the atmosphere from periodic dredging and placement activities and would therefore not contribute to SLR when in combination with past, present and RFFAs. Indirectly and over the long-term, navigational usage of the area would be impaired without ongoing maintenance dredging. This could result in reduced emissions from large vessels locally; however, this would not necessarily reduce global GHG emissions released from maritime commerce as this industry would likely continue and use a different port. The No Action Alternative is anticipated to have a neutral impact on SLR.

4.6.3.2 Hydrology

The year federal channel maintenance commenced (1910) was used as the environmental reference point for past and present development related to hydrology. Further deepening and widening of the navigation channels has occurred over the past century, the last time was in 1998. These activities indirectly promoted the commercial and industrial development of the Coos Bay waterfront to support the maritime industry.

In a pre-development state, the hydrology of Coos Bay differed from the present condition in terms of water volume and flow rates. The amount of water retained in the bay increased as projects increased channel and basin depths to allow for maritime commerce. Flow rates in the channels were subsequently altered and likely reduced in many areas.

The geographical boundary considered for the cumulative effects of this resource includes the Coos Bay estuarine system up to RM 15.

Past, Present and Reasonably Foreseeable Future Actions

Past maintenance dredging, channel deepening and waterfront development projects incrementally modified the hydrology of Coos Bay by modifying the interior shoreline and navigation channels. The volume, residence time and drainage area of the bay changed slightly because of these activities.

Identified RFFAs, such as the Oregon International Port of Coos Bay Slip and Access Channel, North Spit Barge Slip Project and the Southwest Oregon Regional Airport Runway Expansion, may also result in incremental effects to hydrology by deepening or modifying the tidal prism of the bay. These effects are not considered substantial given the scale of the projects relative to the bay system.

Preferred Alternative

The Preferred Alternative, in combination with past, present and RFFAs, could contribute incrementally to changes in volume, flow rates, residence time and drainage area of Coos Bay. However, the Project would maintain, instead of modify, the existing configuration of the navigation channels. Therefore, substantial cumulative impacts are not anticipated.

No Action Alternative

The No Action Alternative, in combination with past, present and RFFAs, may indirectly result in incremental modifications in hydrology through navigational channel shoaling. Shoaling of the navigation channels may result in decreased water volume, residence time and current velocities in the bay. The system would begin to slowly revert to a pre-development condition.

4.6.3.3 Sediment Quality

The year federal channel maintenance commenced (1910) was used as the environmental reference point for past and present development related to sediment quality. Maintenance dredging resulted in redistribution of marine and fluvial sediment from the bay to upland, in-bay and ocean placement sites. These activities did not likely directly affect the sediment quality; however, maintenance dredging activities indirectly promoted the commercial and industrial development of the Coos Bay waterfront to support the maritime industry.

The geographical boundary considered for the cumulative effects of this resource includes Coos Bay as well as nearshore ODMDS.

Past, Present and Reasonably Foreseeable Future Actions

Development of the Port for maritime commerce and recreational uses has affected sediment quality in the study area through the introduction of point and non-point sources of pollution to the bay. Present actions and RFFAs will likely continue to develop the waterfront in the study area to support increased maritime commerce uses.

Preferred Alternative

The Preferred Alternative entails the redistribution of sediments within the Project Area and could potentially affect sediment quality should a spill take place during dredging. Redistribution of sediment within the Project Area is not considered a substantial effect to sediment quality. Potential contamination of sediment during dredging is unlikely given the Corps' conservation measures employed during construction.

For any recent, present actions or RFFAs that involve dredging and placing sediments, the material is required to meet open-water placement standards outlined in the SEF. Smaller waterfront sites that may contain contaminated sediments need to have their dredging and placement methods approved by the regulatory agencies to avoid reducing sediment quality in other areas. Any material that does not meet sediment quality standards are required to be disposed of at an approved upland facility. Ongoing waterfront development can remove sediments contaminated from past practices over the last 100 years that have resulted in sediment contamination. Current environmental regulations are in place to reduce and minimize further sediment contamination from ongoing waterfront operations. In this way, activities associated with the Preferred Alternative, in combination with past, present and RFFAs, would not likely contribute to reductions in sediment quality. BMPs are also required during in-water dredging, placement and construction activities to minimize petroleum spills and any debris from entering marine waters. The redistribution of sediment from in-bay to nearshore sites is not considered a substantial adverse impact.

No Action Alternative

The No Action Alternative may indirectly result in small incremental improvements in sediment quality in the study area if maritime uses diminish because of unreliable and/or unnavigable channel configurations.

Substantial cumulative impacts on sediment quality for the No Action Alternative, in combination with past, present and RFFAs are not anticipated. In general, any minor short-term shifts in grain size caused by maintenance dredging and placement would be eliminated. Over the long-term, shoaling would continue bringing in sand (riverine and marine), which could lead to both positive and adverse indirect effects. Without maintenance dredging, reduced navigability could result in an increase in vessel accidents and possible petroleum spills, which could affect sediment quality. Eventually, navigation for larger vessels in the channel would be reduced affecting the waterfront-dependent industry in the area. With less industry comes the potential for less risk of sediment contamination from point sources (boatyards, outfalls, etc.). Sediment quality at the ODMDS and in-bay placement sites would most likely improve slightly, with reduced short-term changes in grain size.

4.6.3.4 Water Quality

The year federal channel maintenance commenced (1910) was used as the environmental reference point for past and present development related to water quality. Maintenance dredging resulted in redistribution of marine and fluvial sediment from the bay to upland, in-bay and ocean placement sites. These activities did not likely affect water quality; however, maintenance dredging and channel deepening activities indirectly promoted the commercial and industrial development of the Coos Bay waterfront to support the maritime industry.

The geographical boundary for this resource includes the Coos Bay watershed as well as offshore waters in the Project vicinity.

Past, Present and Reasonably Foreseeable Future Actions

Maintenance dredging supported the development of the port for maritime commerce. This resulted in commercial and industrial uses along the waterfront. These uses have adversely affected water quality in the study area through introduction of point and non-point sources of pollution to the bay.

RFFAs, such as the Jordan Marine Terminal Project, continue development of the waterfront and support existing and new maritime commerce uses. All RFFAs are subject to federal, state and local water quality regulations and standards. Water quality and estuary protection and restoration efforts are also underway, which further protect water resources.

Preferred Alternative

The Preferred Alternative would cause temporary turbidity plumes (direct impact) and would maintain channel depths to allow for continued use and growth of the waterfront (indirect impact to water quality).

The identified past, present and RFFAs, when combined with the effects of the Preferred Alternative, have and will continue to incrementally increase water turbidity and suspended sediments temporarily, and increase the risk of petroleum spills during dredging activities within Coos Bay and placement activities at the in-bay sites and ODMDS. New development projects (upland facilities as well as overwater docks and new vessel berths) would also result in long-term increases in impervious surfaces and associated runoff into the watershed. However, state, and federal water quality control regulations, and BMPs, are designed to limit substantial adverse impacts from both construction and ongoing operations.

No Action Alternative

Substantial cumulative impacts on water quality for the No Action Alternative, in combination with past, present and RFFAs are not anticipated. Without ongoing maintenance dredging, some of the present and RFFAs may not be able to continue or occur (i.e. without maintained dimensions of the authorized channels, navigation access and maintenance is jeopardized and some of the identified Port and marina projects, and other general waterfront activities, may not be feasible or justifiable). Over the short-term, increased shoaling and undefined channel dimensions could lead to increased risk of vessel groundings, which could indirectly jeopardize water quality to some extent (increased risk of spills and debris). However, over the long-term, water quality may improve slightly as development of the waterfront would decrease without ongoing maintenance dredging as fewer users would be able to navigate the bay.

4.6.3.5 Sound

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for past and present development related to sound. The construction of the entrance channel jetties and deepening of the channel resulted in an ongoing increase in anthropogenic sounds in Coos Bay as waterfront commerce and use increased.

The geographical boundary for this resource includes the Project Area (in-air and in-water) along with the waterfront communities from about RM -1 to RM 15.

Past, Present and Reasonably Foreseeable Future Actions

Sound levels in the pre-development condition of Coos Bay were much lower than present day. Maintenance dredging supported the development of the port for maritime commerce. This resulted in commercial and industrial uses along the waterfront. These uses have incrementally affected sound in the area through the introduction of commercial and industrial sounds, urban sounds from growing towns, and increased in-water sound from vessel access and use. RFFAs will likely continue to result in maintaining or slight increases in both in-air and in-water sounds.

Preferred Alternative

The identified past, present and RFFAs, when combined with the effects of the Preferred Alternative, have and will continue to incrementally increase in-air and in-water noise levels within Coos Bay but will not result in substantial cumulative effects. Maintenance dredging of the navigation channels allows for maritime commerce activities in the bay to continue as well as potentially grow in the future. However, these noises are temporary in nature (reaching highest levels during construction).

Future projects that could impact nearby residences often need to comply with local noise ordinances. While ongoing maintenance dredging takes place throughout the Coos Bay channels, these temporary and intermittent additive increases in noise are unlikely to impact nearby residents substantially above current conditions as most of the RFFAs are not located immediately adjacent to residential areas. In-water sound from maintenance dredging is increased, but not substantially above those levels found in the high-energy, high-wave and wind environment of the Oregon coast.

The implementation of the Preferred Alternative, in combination with past, present and RFFAs, would result in incremental increases in in-air and in-water sound in Coos Bay, but substantial cumulative impacts are not anticipated.

No Action Alternative

Substantial cumulative impacts on sound for the No Action Alternative, in combination with past, present and RFFAs, are not anticipated. Without ongoing maintenance dredging, some of the present and RFFAs may not be able to continue or occur (i.e. without maintained dimensions of the authorized channels, navigation access is jeopardized and some of the identified Port and marina projects, and other general waterfront activities, may not be feasible or justifiable).

Without ongoing maintenance dredging, present and RFFAs, anthropogenic in-air and in-water sound would be reduced. Over the short-term, surrounding shoreline and in-water activities (industry, boating, etc.) would continue. Over the long-term, a slight reduction in in-air and in-water sound could result due to reduced navigational access within the federally authorized channels and less in-water access to the Port, Charleston marina and the surrounding docks.

4.6.3.6 Air Quality and Climate Change

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for past and present development related to air quality and climate change resources. The construction of the entrance channel jetties and dredging of the federal channels resulted in an ongoing, incremental increase in air pollutants from construction, increased vessel use, waterfront industry, and general urban development of the area.

The geographical boundary for cumulative air quality effects is the NAAQS Air Quality monitoring area.

Past, Present and Reasonably Foreseeable Future Actions

Development of Coos Bay waterfront has contributed on a slight and incremental level to reductions in air quality on local and global climate scales.

Preferred Alternative

The identified past, present and RFFAs, when combined with the effects of the Preferred Alternative, could incrementally decrease air quality within the area but would not result in substantial cumulative effects. Past activities have resulted in incremental release of air pollutants. All present actions and RFFAs must comply with USEPA standards and the ODEQ Air Quality Program.

No Action Alternative

Substantial cumulative impacts on air quality and climate change for the No Action Alternative, in combination with past, present and RFFAs, are not anticipated. Small reductions in GHG emissions over both the short-term (no dredges being used in the area) and long-term (with reduced navigation would come reduced vessel use of the Project Area), could result in small improvements to air quality in the area.

4.6.3.7 Biological (Aquatic, Shoreline and ESA Species)

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for biological resources. Past maintenance dredging and increased waterfront development within the estuary have resulted in losses of aquatic and shoreline habitats, which have caused adverse impacts to fish and wildlife resources. Offshore biological resources have been impacted by commercial and recreational fishing activities. These actions occurred in a regulatory landscape very different from what exists today where federal, state and local resource agencies work to protect and restore estuaries that support biological resources. Restoration and protection efforts of the nation's estuaries began in the 1970s and continue today and more stringent federal and state laws require increased effort to avoid dramatic impacts on resources and mitigation of impacts when necessary.

The geographical boundary for this resource is the Coos Bay estuary and adjacent offshore ODMDS.

Past, Present and Reasonably Foreseeable Future Actions

Maintenance dredging and other improvements in the area (e.g. jetty construction) supported the development of the Port for maritime commerce. This resulted in commercial and industrial uses along the waterfront and recreational and commercial fishing (including shellfish harvesting) within and offshore of Coos Bay. These uses have adversely affected biological resources. RFFAs will likely continue to develop the waterfront in the study area to support increased maritime commerce uses.

Over the past three decades protection and restoration activities within the estuary have also begun. Along the southern arm of the Coos Bay estuary is the South Slough, which has been designated the South Slough National Estuarine Research Reserve, one of only 27 such reserves in the country (NERRS 2013). The effort was spearheaded by the Citizens of Charleston (Oregon) and the Barview/Charleston Citizens Committee in 1971. The 4,771-acre reserve includes 3,855 acres of upland forest, 115 acres of riparian habitat and 800 acres of tidelands. The estuary is connected to Coos Bay near Charleston and is one of seven tidal inlets that collectively form the Coos estuary.

The timber industry, once heavy in the Coos Bay area, has subsided and stabilized over the past few decades. Timber harvesting practices have improved as have waterfront shoreline development methods (the use of fill within shoreline salt marshes and fresh water wetlands) is no longer a preferred method of waterfront development.

New marine reserves are also being proposed and developed along the Oregon coast. In 2009, the Oregon State Legislature passed House Bill 3013 that establishes a process for evaluation and implementation of marine reserves within Oregon's Territorial Sea (ODFW 2013). ODFW is currently implementing the marine reserves process. To date, two pilot marine reserves sites have been established (Redfish Rocks and Otter Rock near Port Orford and Depoe Bay) and three new areas have recently been approved (Cape Falcon, Cascade Head and Cape Perpetua between Florence and Newport). Marine reserves are areas within Oregon's Territorial Sea or adjacent rocky intertidal area that are protected from all extractive and development activities, except as necessary for monitoring or research to aid in the research and management of ocean habitats and marine plants and animals.

Coos Bay remains one of the largest and most important estuaries in the nation for natural resources along with commercial and recreational fishing. Restoration priorities are still critical to improving the health of the system, which includes aquatic species such as shellfish and ESA-listed anadromous salmonids. However, development now occurs alongside protection and restoration activities.

Preferred Alternative

Completion of past, present and RFFAs, in combination with the Preferred Alternative, have the potential to cumulatively affect biological resources in the estuary and the nearshore ocean. Direct impacts include the physical removal of habitat through dredging, burial of habitat or conversion of a habitat. Indirect cumulative impacts to biological resources are a result of temporary increases in turbidity, in-air noise and in-water noise. For example, dredging or filling in areas previously undisturbed could fragment shallow water habitat, specifically between RM 5 and RM 9, used for feeding, shelter and migration by ESA-listed OC coho salmon and other migrating salmonids. Dredging for new development will result in more deep water habitat (berths) and overwater facilities (docks). A conservative estimate of dredging/fill for all projects could result in up to 69 acres (0.5% of the Coos Bay estuary) of disturbed/converted shallow water habitat outside of the federally authorized navigation channel. However, many of the RFFA sponsors are already working with federal, state and local resource agencies to adhere to conservation measures and BMPs (in-water work periods to avoid key migration times for salmonids, compliance with the SMMP to monitor and manage the ODMDS, etc.); and are developing mitigation plans to offset adverse impacts on biological resources (i.e. to mitigate for loss of shallow water habitat). Future land uses are required to comply with local land use and shoreline plans and even more specific local area plans (i.e. the Coos Estuary Plan is a component of the Coos County Comprehensive Land Use Plan that provides policies to guide management and planning of land activities that may affect the estuary). Compliance of future development with this plan, the SMMP and applicable BMPs and conservation measures, mitigation required to complete these projects and ongoing protection and restoration of estuary habitat minimize the potential for these cumulative impacts to be substantial.

No Action Alternative

Cumulative impacts on biological resources for the No Action Alternative, in combination with past, present and RFFAs would be generally slightly beneficial to natural resources. Without ongoing maintenance dredging, some of the present and RFFAs may not be able to continue or occur (i.e. without maintained dimensions of the authorized channels, navigation access and maintenance is jeopardized and some of the identified Port and marina projects, and other general waterfront activities, may not be feasible or justifiable).

Without the removal of accumulating material and further waterfront maintenance and development, channels will shoal and bottom elevations will increase, possibly altering benthic habitats with increased exposure to light. Over the short-term, adverse biological interactions from dredging and placement operations, along with other waterfront development projects, would cease and interactions with commercial and recreational marine vessels would change as shoaled non-navigable channels could actually reduce, or at least modify, boating traffic. Shorelines are not likely to be impacted over the short-term.

Over the long-term, effects are anticipated to be slightly positive for some species as annual disruptions to aquatic resources would decrease. Periodic losses of benthic fauna associated with dredging and placement activities would cease and motile and non-motile species would not be disturbed. Shallow water habitat would increase and areas of seagrass may expand. Species that have adapted to the habitat created by deeper channels maintained by ongoing dredging may benefit less from the No Action Alternative. For example, the influence of saltwater may decrease, thereby decreasing habitat for marine species, but increasing habitat for river and estuarine species. These long-term changes, combined with other beneficial actions (i.e. habitat restoration in the estuary), may improve habitat conditions for ESA-listed fish.

4.6.3.8 Socioeconomic (Navigation and Commerce)

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for socioeconomic resources. The construction of the entrance channel jetties resulted in a protected bay with a more reliable entrance channel while channel deepening and maintenance dredging improved vessel access and navigability.

The geographical boundary for this resource extends from the Project Area and surrounding beaches to the cities of Charleston, Barview, Coos Bay, North Bend, and Empire to the entire state of Oregon.

Past, Present and Reasonably Foreseeable Future Actions

Past actions have resulted in a deeper navigation channel and a more commercially developed shoreline within Coos Bay.

Maintenance dredging supported the development of maritime commerce for the surrounding communities and the Port. This resulted in further commercial and industrial growth along the waterfront in and offshore of Coos Bay. Present actions and RFFAs will likely continue to maintain and develop the waterfront in the study area to support increased maritime commerce uses.

Identified RFFAs, such as the Oregon International Port of Coos Bay Slip and Access Channel, North Spit Barge Slip Project, Coos Bay Jetties Rehabilitation Project, and the Southwest Oregon Regional Airport Runway Expansion, will maintain and improve navigation to and within Coos Bay, and will support continued maritime commerce.

Preferred Alternative

Cumulative impacts on socioeconomic resources for the Preferred Action, in combination with past, present and RFFAs would be anticipated to be generally beneficial. Ongoing navigation has and will continue to allow maritime commerce to support the community and state.

No Action Alternative

Impacts on socioeconomic resources for the No Action Alternative, in combination with past, present and RFFAs could be substantial. If the entrance channel, inner channel, turning basins, and other navigational access corridors are no longer maintained with periodic dredging, the channels will shoal until they reach a quasi-equilibrium state. Commercial, recreational, and rescue vessels will no longer have reliable navigational access to the Port and bay. Local economies reliant on marine vessel traffic would suffer as future marine-dependent development would most likely decrease resulting in lost regional jobs and revenue. Further, the site could no longer serve as a harbor of safe refuge or as a station for USCG vessels.

4.6.3.9 Recreation

The year federal authorization for navigational improvements began (1891) was used as the environmental reference point for recreational resources. The construction of the entrance channel jetties resulted in a protected and more reliable entrance channel while channel deepening and maintenance dredging improved vessel access and navigability.

The geographical boundary for this resource extends from the Project Area and surrounding beaches to the cities of Charleston, Barview, Coos Bay, North Bend, and Empire to the entire state of Oregon.

Past, Present and Reasonably Foreseeable Future Actions

Past actions have resulted in a deeper navigation channel and a more commercially and recreationally developed shoreline within Coos Bay.

Maintenance dredging supported the development of the communities and the port for recreational activities in Coos Bay, which include marine tourism, fishing and shellfish harvesting. Present actions and RFFAs will likely continue to maintain and develop the waterfront to support increased maritime recreational uses.

Identified RFFAs, such as the Coos Bay Jetties Rehabilitation Project and the Southwest Oregon Regional Airport Runway Expansion, will maintain and improve navigation to and within Coos Bay, and will support continued maritime recreation.

Preferred Alternative

Cumulative impacts on recreational resources for the Preferred Action, in combination with past, present and RFFAs would be anticipated to be generally beneficial by providing continued reliable navigational access within Coos Bay. Adverse impacts to recreational activities are not expected, as in-water work should not affect beach accessibility. Temporary dredging operations could cause minor time delays for recreational boaters due to congested navigation. Collisions between recreational boaters and dredge traffic are unlikely due to the slow speed at which the dredge moves and the coordination and communication BMPs in place. Reliable access would allow existing maritime recreation to continue and would not prohibit growth of new or improved facilities to expand the maritime industry in the region. The ODMDS are located outside of any major recreational use area. As a result, few impacts to recreation are expected to occur. Sediment placement at Site G will not affect beach activities, since it is not placed directly on nearby beach but in the water.

No Action Alternative

Cumulative impacts on recreational resources for the No Action Alternative, in combination with past, present and RFFAs, particularly for those activities, which require transit through the navigation channels, could be substantial. With the elimination of periodic maintenance dredging of the entrance channel and other required access channels, other present actions and RFFAs may decrease and recreational boating and sport fishing could change or diminish. The No Action Alternative will result in shoaling in the channels, which will reduce the available draft and size of boats that could use the area. Only smaller vessels would be able to continue recreational activities. The loss of navigability for larger vessels will reduce offshore recreation opportunities, as boats would need to travel further from other ports or harbors. Additionally, the lack of reliable and defined channels would increase the risk of groundings for recreational vessels. Further, the site could no longer serve as a harbor of safe refuge or as a station for USCG vessels.

4.6.4 Cumulative Effects Summary

This cumulative effects analysis considered the effects of implementing the Preferred Alternative against the No Action Alternative in association with past, present and RFFAs by the Corps and other parties in and adjacent to the Project Area.

Cumulative effects from the Preferred Alternative do not reach a level of substantial environmental impact. A summary of the cumulative effects analysis is provided in Table 4-3.

Table 4-3. Summary of Cumulative Effects

Resource	Effect Type Direct (D) Indirect (I)	Preferred Alternative	Effect Type Direct (D) Indirect (I)	No Action Alternative
		Effect Description		Effect Description
Coastal Processes and SLR	D, I	Direct: Incremental contributions to a modified coastal configuration. The existing configuration has been in place since the 1890's and changes to existing currents and sediment transport are not anticipated. Indirect: Episodic release of GHG emissions during construction activities could incrementally affect SLR, but the incremental contribution is not substantial.	D, I	Direct: Shoaling of the navigation channels could result in changes to the existing currents and sediment transport. Indirect: Episodic release of GHG emissions during construction activities would not incrementally affect SLR.
Hydrology	D	Direct: Contributes incrementally to a modified hydrologic condition. The existing hydrology has been relatively stable since the 1980's and substantial changes to hydrology are not anticipated.	D	Direct: Shoaling of the navigation channels could result in changes to the existing hydrologic condition of the bay.
Sediment Quality	D, I	Direct and indirect: Incremental reductions in sediment quality (grain size); however, could indirectly allow growth of waterfront development that could contribute to non-point reductions in sediment quality.	D	Direct: Short-term changes in sediment quality (grain size) would cease.
Water Quality	D	Direct: Incremental contributions to reductions in water quality. A TMDL has been initiated by the ODEQ for the Coos Subbasin. Implementation of this program will attain water quality standards for the watershed, thus, minimizing the potential for substantial adverse cumulative impacts.	D, I	Direct and indirect: Overall improvements in water quality. However, over the short-term increased vessel groundings from reduced navigation could also reduce water quality. Over the long-term, slight improvements in water quality are anticipated with a reduction in waterfront development and vessel access and use.

Resource	Effect Type Direct (D) Indirect (I)	Preferred Alternative Effect Description	Effect Type Direct (D) Indirect (I)	No Action Alternative Effect Description
Sound	D	Direct: Would contribute incrementally to sound levels during construction.	D	Direct: Would incrementally contribute to sound level reductions.
Air Quality and Climate Change	D	Direct: Would incrementally contribute to reductions in air quality. Compliance with the ODEQ's Air Quality Monitoring Program and USEPA's air quality standards would minimize the potential for substantial cumulative impacts. Direct: Ongoing GHG emissions would continue to incrementally affect climate change.	D	Direct: Would incrementally contribute to air contaminant and GHG emission reductions.
Biological (Aquatic, Shoreline, ESA)	D, I	Direct and indirect: Would incrementally contribute to reductions in prey species and habitat. Conservation measures, BMPs and compliance with existing development plans would minimize the potential for substantial adverse cumulative impacts.	D, I	Direct and indirect: Would contribute to slight improvements in prey species and habitat.
Socio-economic (Navigation and Commerce)	I	Indirect: Would provide an incremental benefit to local cities and the state by providing efficient navigational access for maritime commerce.	D, I	Direct and indirect: Would reduce access and navigation, thereby indirectly limiting maritime commerce, which would adversely affect the local and state economy.
Recreation	D	Direct: Would incrementally result in impacts to recreation during construction. Impacts would be minimized with conservation measures.	D, I	Direct and indirect: Would directly reduce access and navigation, thereby indirectly limiting waterfront recreational opportunities.

5. COORDINATION

A Public Notice will be issued by the Corps summarizing the completion of this updated EA. The Notice will also be sent to the following federal and state agencies, tribal governments and other interested parties. Copies of this EA will be made available upon request.

- Cities of Charleston, Barview, North Bend, Coos Bay, and Bunker Hill
- Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians of Oregon
- Confederated Tribes of Siletz Reservation
- Confederated Tribes of the Grand Ronde Community of Oregon
- Coos County
- Coos Watershed Association
- Coquille Tribe of Oregon
- National Oceanic and Atmospheric Administration National Marine Fisheries Service
- Oregon Parks Association
- Oregon State Historic Preservation Office
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of Land Conservation and Development
- Oregon Department of Parks and Recreation
- Oregon Department of State Lands
- Oregon International Port of Coos Bay
- Pacific Northwest Waterways Association
- Smith River Ranchiera
- Southwest Oregon Regional Airport
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

6. *COMPLIANCE WITH LAWS AND REGULATIONS*

The Corps is required to comply with all pertinent Federal and state policies; project compliance is described in the following subsections.

6.1 NATIONAL ENVIRONMENTAL POLICY ACT

National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq., PL 91-190); Council on Environmental Quality Regulations for Implementing NEPA, 40 CFR Parts 1500 to 1508; Corps Regulations for Implementing NEPA, 33 CFR Part 220.

The National Environmental Policy Act (NEPA) was established to ensure that environmental consequences of federal actions are incorporated into an agency's decision-making processes. It establishes a public process whereby parties are identified and opinions solicited on the proposed action. The proposed action and alternative(s) are evaluated in relation to their environmental impacts, and a selection of the most appropriate alternative is made.

This EA has been prepared to update previous NEPA assessments completed for continued maintenance dredging at the Project Site and address potential impacts associated with the proposed Project, in compliance with NEPA.

6.2 CLEAN AIR ACT

The Clean Air Act of 1969, and as amended in 1970, established a comprehensive program for improving and maintaining air quality throughout the United States. Its goals are achieved through permitting of stationary sources, restricting the emission of toxic substances from stationary and mobile sources, and establishing National Ambient Air Quality Standards. Title IV of the Act includes provisions for complying with noise pollution standards.

There is a small, localized short-term reduction in air quality during maintenance dredging due to emissions from equipment, and localized increases in noise levels. These impacts are minor and temporary in nature and cease once dredging is completed. Recently the Corps replaced the older combustion engines on their dredges, which qualified them for California's Portable Engine Registration Program (PERP). The replaced engines meet the stringent California air quality standards, thereby allowing the Corps to use the dredges south of Oregon. By meeting the stricter air quality standards of California, the Corps has minimized, to the most practicable extent possible, GHG emissions from dredging and placement activities.

Minor intermittent periods of increased in-air and in-water noise from dredge and placement activities are anticipated. Sound impacts are, for the most part, temporary in nature and no long-term direct or indirect impacts are anticipated to occur. In-air sound from a dredge barge's foghorn can be quite loud and could disturb local residents during night-time dredging. These disturbances are temporary and are necessary to protect the safety of other boaters within the Project Area and Corps dredge crew during maintenance dredging activities.

6.3 CLEAN WATER ACT

The Clean Water Act (CWA) of 1972 (33 USC 1251 et seq.) and amended in 1977, was passed to restore and maintain chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and waste material into aquatic environments.

Section 404 of the CWA authorizes the Corps to permit the discharge of dredged or fill material into waters of the United States at specified sites. Placement sites are evaluated and authorized through the application of the Section 404(b)(1) Guidelines, further described in 33 CFR 335-338.

Section 401(a)(1) of the CWA requires certification from the state in which a discharge would occur to waters of the United States and is applicable to construction and operation of facilities. The state must certify that the discharge will not violate the states' water quality standards. USEPA retains jurisdiction in limited cases.

Section 402(a)(1) of the CWA authorizes the USEPA, or state in which the USEPA has delegated such authority, to issue permits for the discharge of any pollutant or combination of pollutants under procedures established to implement the National Pollutant Discharge Elimination System (NPDES) program. Regulated categories of discharges generally include point-source discharges and stormwater runoff. Permit conditions are usually required to ensure compliance with all applicable effluent and water quality standards.

Although Sections 401 and 404(b)(1) of the CWA apply to the proposed project, by their own terms, only to applications for Federal permits, the Corps has made a policy decision to apply them to their own projects. This policy is set out in Corps regulations at 33 CFR Part 336.

The Preferred Alternative complies with the CWA via the existing Section 401 WQC from the ODEQ, issued on March 31, 2015. The Certification was issued for a period of 10 years and expires on March 31, 2025.

6.4 COASTAL ZONE MANAGEMENT ACT

Under the Coastal Zone Management Act (CZMA), any federal agency conducting or supporting activities directly affecting the coastal zone must demonstrate the activity is, and will proceed in a manner, consistent with approved State's Coastal Zone Management Program, to the maximum extent practicable. As no federal agency activities are categorically exempt from this requirement, the Corps must obtain concurrence from the Oregon Department of Land Conservation and Development (ODLCD) pursuant to Section 307(c)(1) of the CZMA.

CZMA concurrences have been received for ongoing maintenance dredging and placement activities in Coos Bay in the past, the latest received in 2009 for the ODMDS (ODLCD 2009) and 2014 for dredging activities (ODLCD 2014). This CZMA maintenance dredging concurrence is not time-limited, but rather is tied to the project's effects on coastal uses and resources. If future changes to maintenance dredging and disposal activities at Coos Bay will affect any coastal use or resource substantially different than described, the Corps will update CZMA concurrence with the ODLCD.

The Preferred Alternative meets applicable policies and standards of the Oregon's 19 Statewide Planning Goals and Guidelines, the Oregon Ocean Resources Management Plan, the Oregon Territorial Sea Plan and local city and county Comprehensive Plan and Land Use Ordinances.

6.5 COMPREHENSIVE AND ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT

The location of the Project is not within the boundaries of a site designated by the U.S. Environmental Protection Agency or State of Oregon for a response action under Comprehensive and Environmental Response, Compensation and Liability Act, nor is it a part of a National Priority List site.

Three existing hazardous waste sites near the project in the upper channel are noted. Two sites (Chevron USA and Chambers Oil) are bulk fuel storage sites with historical onshore fuel spills. The other site (Hillstrom's) is a former ship repair facility with onshore and sediment contamination from sandblasting, painting, and other repair activities. Levels of tributyltin are of concern at this site. Based on sampling data to date and location relative to the channel, these sites are not expected to affect ongoing maintenance dredging of the channel.

6.6 ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting federal actions that would jeopardize continued existence of such species or result in destruction or adverse modification of any critical habitat of such species. Section 7 of the Act requires consultation regarding protection of such species be conducted with the USFWS and/or the NMFS prior to the Project. The USFWS and the NMFS evaluate potential impacts of all aspects of the project on threatened or endangered species. Their findings are contained in letters that provide an opinion on whether a project will jeopardize the continued existence of endangered species or modify critical habitat. If a jeopardy opinion is issued, the resource agency will provide reasonable and prudent alternatives, if any, that will avoid jeopardy. A non-jeopardy opinion may be accompanied by reasonable and prudent measures to minimize incidental take caused by project implementation.

A Biological Assessment was prepared for the Preferred Alternative for the blue, finback, sei, sperm, humpback and right whales, Steller sea lion, and loggerhead, green, leatherback, and Pacific ridley sea turtles and provided to NMFS on May 14, 2004 to initiate informal consultation. The NMFS provided their "not likely to adversely affect" concurrence letter on July 16, 2004. A determination of "no effect" was made for the western snowy plover, northern spotted owl, Oregon silverspot butterfly, and bull trout, and a "not likely to adversely affect" determination was made for the marbled murrelet. A concurrence letter was received from USFWS on July 13, 2004. Re-initiation with the USFWS for ESA-listed birds has not been necessary because no additional species or critical habitat, or revisions to existing species and habitat have occurred within the Project Area.

A BA was prepared for the Preferred Alternative for the southern DPS Pacific eulachon, OC or SONCC coho salmon, and the southern DPS green sturgeon and submitted to NMFS on April 7, 2009 to initiate formal consultation and request their Biological Opinion. On May 28, 2010, NMFS concurred with the

Corps' determination that the Preferred Alternative is "not likely to adversely affect" the southern DPS Pacific elauchon and concluded that the Preferred Alternative will not jeopardize the continued existence of the OC or SONCC coho salmon or the southern DPS green sturgeon. NMFS also concurred with the Corps' determination that the proposed action is "not likely to adversely affect" Southern Resident killer whales or southern DPS of Pacific eulachon and that the critical habitats supporting the OC coho salmon and southern DPS green sturgeon would not be destroyed or adversely modified with the Preferred Alternative (NMFS 2010). Critical habitat for the SONCC coho salmon is not located within the Project Area.

An updated BA has been submitted to the NMFS to analyze effects on newly designated critical habitat for the southern DPS of Pacific eulachon and leatherback sea turtle and for minor changes to the proposed action (Corps 2013b). The Corps concluded that the Preferred Alternative will not adversely destroy or modify critical habitat for the leatherback sea turtle. Critical habitat for Pacific eulachon is not designated within the Project Area.

6.7 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Sustainable Fisheries Act of 1996 amended the Magnuson-Stevens Act establishing requirements for essential fish habitat (EFH) for commercially important fish. EFH is defined by the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Project Area for the Preferred Alternative is designated as EFH for a number of fish species. An EFH analysis was included in the NMFS BiOp (2010). There would be temporary, limited, short-term modifications to EFH during maintenance dredging and placement activities. With in-water work timing and best BMPs potential impacts to EFH are minimized.

6.8 FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act (FWCA) of 1958 directs federal agencies to prevent the loss and damage to fish and wildlife resources in 16 U.S.C. §§ 661-667e; specifically, wildlife resources shall be given equal consideration in light of water-resource development programs. Consultation with the USFWS is required when activities result in the control of, diversion or modification to any natural habitat or associated water body, altering habitat quality and/or quantity for fish and wildlife.

The Preferred Alternative is an ongoing, operations and maintenance action; therefore Section 2(a) consultation requirements of the FWCA are not applicable.

6.9 MARINE MAMMAL PROTECTION ACT

The Marine Mammal Protection Act (MMPA) of 1972 prohibits the take or harassment of marine mammals. In the NMFS BiOp (NMFS 2010), NMFS found that that all potential adverse effects to ESA-listed marine mammals from the Preferred Alternative are discountable or insignificant and concurred with the Corps' determination of "may affect, not likely to adversely affect" for Steller sea lions, blue whales, fin whales, humpback whales, and Southern Resident killer whales. Other marine mammals protected under the MMPA could use the Project Area for foraging (i.e. harbor seals). Noise, vibration or turbidity from dredging and placement activities are not anticipated to result in substantial impacts as these animals are highly mobile, can move quickly to nearby resources to continue their behaviors and are likely accustomed to maritime activities in the area. Vessel strikes of marine mammals in the river or around the ODMDS are unlikely as the barge-sized vessels used for dredging and placement activities move slowly throughout the area.

6.10 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act of 1918 makes it unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. The Preferred Alternative complies with this Act because there is no likelihood that the action will result in the taking of any migratory birds.

6.11 BALD AND GOLDEN EAGLE PROTECTION ACT

The Bald and Golden Eagle Protection Act of 1940, provides for the protection of bald and golden eagles by prohibiting (except under certain specified conditions) the taking, possession, and commerce of such birds.

The Preferred Alternative is a marine in-water operational action that will not result in any modification of bald or golden eagle habitat or disturb nesting bald or golden eagles. Therefore, there is no potential for disturbance of nesting bald or golden eagles and thus the activity complies with this Act.

6.12 NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the National Historic Preservation Act requires that federally assisted or federally permitted projects account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places.

Impacts on historic sites are not anticipated. Coordination with the Oregon State Historic Preservation Office (SHPO) has occurred as part of past NEPA assessments for this ongoing operational Project (SHPO 1982, OAS 1976). The Corps more recently coordinated with SHPO on March 4, 2014 and again received a concurrence letter on March 21, 2014.

6.13 NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT

This Act provides for the protection of Native American and Native Hawaiian cultural items, established ownership and control of cultural items, human remains, and associated funerary objects to Native Americans. It also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal land, and provides for the protection, inventory, and repatriation of cultural items, human remains, and funerary objects. There are no recorded historic properties within the immediate Project Area and the probability of locating human remains is extremely low given that maintenance dredging and placement activities have been ongoing at this site since the early 1900’s.

Coordination with tribal governments has been completed in the past for this ongoing activity and was again recently completed on February 28, 2013. The Corps received no concerns or comments from the contacted tribal governments.

If human remains are discovered during construction, the Corps will be responsible for following all requirements of this Act.

6.14 ENVIRONMENTAL JUSTICE

Executive Order 12898 requires federal agencies to consider and minimize potential impacts on subsistence, low-income, or minority communities. The goal is to ensure that no person or group of people shoulder a disproportionate share of any negative environmental affects resulting from programs. The Preferred Alternative does not cause changes in population, economics, or other indicators of social well-being. It does not result in a disproportionately high or adverse effect on minority or low-income populations. There are no environmental justice implications of the Preferred Alternative.

6.15 FLOODPLAIN MANAGEMENT

Executive Order 11988 requires federal agencies to consider how their actions may encourage future development in floodplains, and to minimize such development. The Preferred Alternative will not encourage development in or alter any floodplain areas.

6.16 PROTECTION OF WETLANDS

Executive Order 11990 requires federal agencies to minimize the destruction, loss or degradation of wetlands. The Preferred Alternative does not affect any wetlands.

6.17 FEDERAL LEADERSHIP IN ENVIRONMENTAL, ENERGY AND ECONOMIC PERFORMANCE

Executive Order 13514 requires federal agencies to increase energy efficiency; measure, report, conserve and reduce their GHG emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse, and stormwater management; eliminate waste, recycle, and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services; design, construct, maintain, and operate high performance sustainable buildings in sustainable locations; strengthen the vitality and livability of the communities in which federal facilities are located; and inform federal employees about and involve them in the achievement of these goals.

Both of the Corps dredges were recently upgraded to meet stringent California air quality standards. The Essayons underwent a major engine overhaul in 2009. In 2011, the *Yaquina’s* dredge pump and engines were replaced and now meet Category 1, USEPA Tier II standards for main diesel and auxiliary engines.

The Preferred Alternative complies with this Executive Order because no development will occur and all actions will be conducted in a manner to be as energy efficient as possible and prevent pollution and spills.

6.18 PRIME AND UNIQUE FARMLANDS

There are no prime and unique farmlands in the Project Area.

7. REFERENCES

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FINDING OF NO SIGNIFICANT IMPACT
COOS BAY MAINTENANCE DREDGING PROJECT
COOS BAY, COOS COUNTY, OREGON

I have reviewed the Environmental Assessment (EA) titled *Environmental Assessment – Coos Bay Maintenance Dredging* (U.S. Army Corps of Engineers 2013) and find that the selected course of action, described as the Preferred Alternative in the EA will not significantly affect the quality of the human environment and that an Environmental Impact Statement (EIS) is not required. The EA, along with applicable supporting environmental documentation, provide a basis for the evaluation and conclusions.

Any human action has the potential for minor to moderate or even severe impacts and consequences. This Finding of No Significant Impact (FONSI) and associated EA have listed all of the important considerations of the proposed Project and their environmental impacts. These impacts, both individually and cumulatively, are NOT SIGNIFICANT as "significant" has been defined by NEPA law, regulations, and case law.

Introduction

Coos Bay is located on the Oregon coast approximately 200 miles south of the Columbia River in Coos County. Federal authorizations exist in Coos Bay for the following navigation channels: (1) Coos River Entrance Channel (RM -1 to 1); (2) Coos River Navigation Channel (RM 1 to 12); (3) Coos River Navigation Channel (RM 12 to 15); (4) Charleston Access Channel; and, (5) the Coos and Millicoma Rivers Project. All river channels except for Coos Bay Channel from RM 15 to RM 17 and the Coos and Millicoma Rivers Project are regularly maintenance-dredged to accommodate efficient and safe deep-draft commercial navigation. Dredged material is placed within multiple authorized and approved in-water dredged material placement locations, including both ocean and in-bay sites. Recent sampling, testing and evaluation of sediments to be dredged from Coos Bay federal navigation channels indicates that all dredge sediments meet federal guidelines for unconfined in-water placement.

Purpose and Need

The purpose of the proposed action is to maintain the Coos Bay Federal Navigation Project (the "Project") at its federally authorized depths and widths by periodically removing channel-restricting shoals of naturally occurring sediment material. These ongoing maintenance dredging activities provide adequate channel dimensions for reliable navigation to river mile (RM) 15. By maintaining adequate navigational depths, the Project serves to decrease vessel waiting times and increase reliable navigability of the bay.

The Project is needed because periodic shoals develop within the Coos Bay navigation channels due to the buildup of materials from fluvial and marine origins. Shoals and sedimentation can restrict or prohibit vessel navigation and dredging to authorized depths and widths is critical to keeping the river and harbor open and to sustaining important navigation components of the local and state economy, as well as maintaining reliable access to a U.S. Coast Guard (USCG) "critical harbor of refuge[1]" for vessels in need.

The Proposed Action, Preferred Alternative

The Preferred Alternative involves dredging of shoals within Coos Bay federal navigation channels to authorized depths and widths, with the allowance of advanced maintenance and overdepth dredging. The method of dredging will be hopper dredge, hydraulic cutterhead (pipeline) dredge, or mechanical dredge. Dredging and placement activities generally occur between about June 15 or July 1 to October 31 or November 30 depending on the specific location (of any given year) with a few additional days of dredging/placement completed in April, May, or early June depending on need. Specific proposed dredge and placement actions are summarized in Table F-1.

Table F-1. Proposed Maintenance Dredging and Placement Activities

Location	Authorized Depth, Advanced Maintenance, Overdepth (feet, MLLW)	Dredge Frequency (years)	Dredge Period	Approx. Duration (days)	Max. Dredge Volume (cubic yards)**	Last Dredged	Placement Location
Entrance Channel (RM -1 to 1)	47 + 5 + 3	1	15 June – 31 Oct (5 days in Apr or May)	~20	1,000,000	2012	ODMDS/ In-bay
Lower Navigation Channel (RM 1 to 12)	37 + 3 + 3	1	15 June – 31 Oct (6 days in Apr and May)	~35	300,000	2012	ODMDS/ In-bay
Upper Navigation Channel (RM 12 to 15)	37 + 3 + 3	1	1 July – 31 Oct	~100	1,000,000	2009	ODMDS/ In-bay
Charleston Access Channel	17/16 + 2 + 3*	1	1 July – 30 Nov (3 days in Apr, May, and June)	~30	40,000	2009	ODMDS/ In-bay

* 17 feet deep from the Lower Navigation Channel past the Charleston Marina and 16 feet deep to Charleston.

** Volume includes advanced maintenance and overdepth.

[1] The Corps defines "critical harbor of refuge" as a harbor that provides safe haven to boaters that represent the sole site for protection based on a public safety and regional distance requirement.

Public and Agency Involvement

Ongoing maintenance dredging and placement activities at Coos Bay have been assessed and coordinated with the involvement of the public, applicable state and federal agencies, and tribal governments. A Public Notice was last issued on March 22, 2004. Dredging and dredged material placement activities have not changed significantly since that time and coordination continues on a regular basis as regulations and project details change or are updated.

The updated EA was completed in November 2013 and both the EA and FONSI are available on the Corps' website.

Environmental Effects

The effects described in the EA are minor and temporary impacts to water quality and benthic habitat and organisms. These short-term effects are reduced below a level of significance by a number of conservation measures (i.e. adherence to in-water work periods which avoid key outmigration periods for Endangered Species Act (ESA) listed anadromous salmonids, turbidity monitoring, minimization of maintenance dredging to only the authorized and previously dredged channel footprints and approved use of existing dredged material placement sites, etc.). The Corps determined that impacts to cultural and historic resources are unlikely and coordination with tribal governments and the State Historic Preservation Office (SHPO) is complete.

Final Determination

The Corps is required to make every effort to fulfill all statutory authorized project purposes and directions provided by the Congress in the project authorization documents.

In fulfilling the authorization, the Corps is also required to take into account other applicable legal mandates. While acknowledging the impacts discussed in the EA and outlined above, the Corps is required by NEPA to make a determination of the significance of those impacts. The Council of Environmental Quality (CEQ) has defined *significance* in 40 CFR 1508.27. A checklist of considerations that help in making the determination of whether impacts of a project rise to the level of "significantly affecting the quality of the human environment" is provided at 40CFR 1508.27. Following is the checklist from (1) to (10):

(1) <u>This item is a reminder that 'significant impacts' includes both beneficial and harmful impacts.</u> Beneficial impacts of this Project are primarily related to maintaining safe and reliable navigation in Coos Bay. Environmental impacts have been addressed in the EA. Effects include minor and temporary impacts to water quality (increased turbidity) and benthic habitat and organisms (removal or burial of benthic species and habitat), and intermittent increases in in-air and in-water noise levels from dredge and vessel operations that may temporarily disturb local residents or wildlife. These short-term effects are reduced below a level of adverse significance by a number of conservation measures (i.e. adherence to in-water work periods which avoid key outmigration periods for ESA-listed anadromous salmonids, turbidity monitoring, minimization of maintenance dredging to only the authorized and

previously dredged channel footprints and approved use of existing dredged material placement sites, etc.). Other effects are beneficial and include ocean placement of dredged material within the nearshore when possible, maintaining sediment within the littoral cell, and the ongoing maintenance of accessible and navigable channels to support continued water-dependent commercial and recreational commerce and activities.

A finding of no significant environmental effects is not biased by the beneficial effects of the action.

(2) Public health and safety: The Project will have no adverse impact to public health and safety. Maintenance dredging and placement effects are considered short-term, localized and temporary and will not adversely affect public health and safety.

Ongoing Corps maintenance dredging maintains access and reliable navigation into Coos Bay important to foreign and domestic commerce of the United States as well as maintaining a U.S. Coast Guard (USCG) "critical harbor of refuge" for vessels in need.

Prior to dredging, the Corps coordinates the work schedule with the Port, the USCG and the Crab Commission. The USCG then issues a Notice to Mariners. Corps personnel also conduct visual water quality monitoring from the dredge. In heavy fog conditions, a foghorn is used and personnel on the dredge watch from the bow. Dredge vessels operate at low speed and accidents or vessel interference are not anticipated. Compliance with operational BMPs on the dredge vessels are strictly adhered to, which reduces the probability and magnitude of a vessel leak or spill. Over the past 14 years, the Corps has averaged about one "minor" incident a year along the entire west coast (California to Alaska) during dredging activities by the Essayons or Yaquina dredges.

There is a small, localized short-term reduction in air quality during maintenance dredging due to emissions from equipment, and localized increases in noise levels. These impacts are minor and temporary in nature and cease once dredging is completed. Recently the Corps replaced the older combustion engines on their dredges, which now meet the stringent California air quality standards. By meeting these stricter air quality standards, the Corps has minimized emissions from dredging and placement activities.

(3) Unique characteristics of geographical area (such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas): The Project Area includes the Coos River Estuary and the Pacific Ocean in the vicinity of the Entrance Channel. Dredging and placement activities do not occur outside of federally authorized channels and, therefore, do not adversely affect nearby shorelines or beach parks. Impacts on historic sites are not anticipated and there are no recorded historic properties within the immediate Project Area.

(4) Are effects on quality of human environment controversial: The effects of the Project are well known and not controversial. Reliable access and navigation within the federally authorized channels require periodic maintenance dredging in order to provide safe and reliable passage. The types of activities proposed to continue have been taking place for the last century and there

are no known scientific controversies over the impacts of the Project. The effects of the proposed action have been analyzed and re-analyzed by the Corps and other resource agencies, such as the Oregon Department of Environmental Quality (ODEQ), Oregon Department of land Conservation and development (ODLCD), the SHPO, the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS).

(5) Are the risks uncertain or unique: No highly uncertain, unique, or unknown risks to the human environment were identified during the analysis of the Preferred Alternative. Dredging and dredged material placement techniques and features are standard and well understood for this type of Project.

(6) Future Precedents: The Corps is required to provide safe, efficient and effective navigable waterways as congressionally authorized at Coos Bay through the Rivers and Harbors Acts of 1910, 1919, 1922, 1927, 1930, 1935, 1946, 1948, 1960 and 1970. Ongoing operations and maintenance for the Project remain necessary and is a benefit for reliable access and navigation. This action sets no precedent for future actions with significant effects.

(7) Cumulative Impacts: The cumulative effects analysis in this EA considered the effects of implementing the proposed action in association with past, present, and reasonably foreseeable future actions in and adjacent to the Project Area. These actions primarily relate to supporting existing and growth of the maritime industry in the region. The potential cumulative effects associated with the proposed action were evaluated in this EA and no cumulatively significant, adverse effects were identified.

(8) National Register of Historic Places and other historical and culturally significant places: The Project will have no impacts on any protected historical or cultural features or properties. A determination of No Effect to historic properties was made and a letter of concurrence was received from the SHPO on March 21, 2014.

(9) Endangered Species Act (ESA): The Corps completed ESA Section 7 consultation with the NMFS and USFWS for species under their respective jurisdictions. The Corps concluded that the Preferred Alternative is "not likely to adversely affect" the blue, (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis*), sperm (*Physeter macrocephalus*), humpback (*Megaptera novaeangliae*), and right whales (*Balaena glacialis*). Nor will the action adversely affect loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), or Pacific ridley sea turtles (*Lepidochelys olivacea*). The Corps received concurrence on this determination from NMFS on July 16, 2004. A determination of "no effect" was made by USFWS for the western snowy plover (*Charadrius alexandrinus nivosus*), northern spotted owl (*Strix occidentalis caurina*), Oregon silverspot butterfly *(Speyeria zerene hippolyta)*, and bull trout (*Salvelinus confluentus*). A "not likely to adversely affect" determination was made for the marbled murrelet (*Brachyramphus marmoratus*). A concurrence letter was received from USFWS on July 13, 2004.

On May 28, 2010, the Corps received a biological opinion from NMFS concurring with the Corps' determination that the Preferred Alternative is "not likely to adversely affect" the southern DPS Pacific eulachon (*Thaleichthys pacificus*) and that the Preferred Alternative will not jeopardize the continued existence of the Oregon Coast (OC) and Southern Oregon/Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*) or the southern DPS green sturgeon (*Acipenser medirostris*). NMFS also concurred with the Corps' determination that the proposed action is "not likely to adversely affect" Southern Resident killer whales (*Orcinus orca*) or southern DS of Pacific eulachon and that the critical habitats supporting the OC coho and southern DPS green sturgeon would not be destroyed or adversely modified with the Preferred Alternative (NMFS 2010). Critical habitat for the SONCC coho salmon is not located in the Project Area.

An updated BA being developed to analyze effects on newly designated critical habitat for the southern DPS of Pacific eulachon and leatherback sea turtle and for minor changes to the proposed action. Critical habitat for Pacific eulachon is not designated within the Project Area.

(10) Other Legal Requirements: A discussion of compliance with applicable regulations and laws is included in the EA. There are no known violations of any other federal, state, or local law in the Proposed Action.

The Corps is required to make every effort to fulfill all statutory authorized project purposes following the balance of purposes and other directions provided by the Congress in the authorization documents. The Corps is also required to take into account other legal mandates such as the Endangered Species Act, the Clean Water Act, and the Coastal Zone Management Act. As was noted in the EA, impacts to ESA species and water quality will be minimized by using a variety of conservation measures designed to minimize impacts. A 401 Water Quality Certificate was obtained on 31 March 2015 from the Oregon Department of Environmental Quality. This certification remains current for the proposed action. The most recent Coastal Zone Management Act Consistency Determination for dredging was obtained from the Oregon Department of Land Conservation and Development (DLCD) in a letter dated May 8, 2014. The Coastal Zone Management Act Consistency Determination from DLCD remains current for the proposed action.

Based upon the EA, I have determined that the proposed action will not significantly affect the quality of the human environment and that an environmental impact statement is not warranted.

Date: 20151218

Jose L. Aguilar
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District Commander