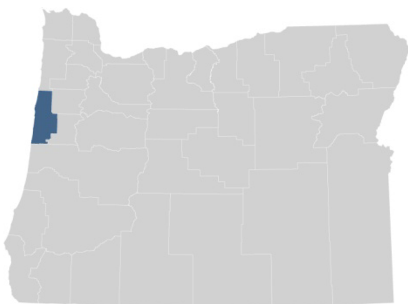
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 2



LINCOLN COUNTY, OREGON

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
DEPOE BAY, CITY OF	**410283**
LINCOLN CITY, CITY OF	**410130**
NEWPORT, CITY OF	**410131**
SILETZ, CITY OF	**410132**
TOLEDO, CITY OF	**410133**
WALDPORT, CITY OF	**410134**
YACHATS, CITY OF	**410135**
CONFEDERATED TRIBES OF SILETZ INDIANS	**410244**
LINCOLN COUNTY, UNINCORPORATED AREAS	**410129**

FEMA

REVISED: OCTOBER 18, 2019

FLOOD INSURANCE STUDY NUMBER

41041CV001B

Version Number 2.3.2.1

TABLE OF CONTENTS
Volume 1

TABLE OF CONTENTS *(continued)*
Volume 1

Figures

Tables

TABLE OF CONTENTS *(continued)*
Volume 2

TABLE OF CONTENTS *(continued)*
Volume 2

Tables (continued)

Exhibits

Published Separately

FLOOD INSURANCE STUDY REPORT
LINCOLN COUNTY, OREGON

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community's regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Lincoln County, Oregon.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Depoe Bay, City of	410283	17100204	41041C0229E, 41041C0233E, 41041C0237E, 41041C0241E	
Lincoln City, City of	410130	17100204	41041C0020E, 41041C0040E, 41041C0107E, 41041C0109E, 41041C0117E, 41041C0126E, 41041C0136E	
Newport, City of	410131	17100204, 17100205	41041C0354E, 41041C0360E, 41041C0362E, 41041C0364E, 41041C0366E, 41041C0368E, 41041C0369E, 41041C0502E, 41041C0504E, 41041C0506E, 41041C0507E, 41041C0508E, 41041C0515E, 41041C0520E	
Siletz, City of	410132	17100204	41041C0381E, 41041C0383E	
Toledo, City of	410133	17100204	41041C0389E, 41041C0393E, 41041C0527E, 41041C0531E	
Waldport, City of	410134	17100205	41041C0655E, 41041C0660E, 41041C0662E, 41041C0665E, 41041C0666E	
Yachats, City of	410135	17100205	41041C0803E, 41041C0811E, 41041C0815E	
Confederated Tribes of Siletz Indians	410244	17100204	41041C0245E, 41041C0275E, 41041C0300E, 41041C0325E, 41041C0381E, 41041C0383E, 41041C0385E, 41041C0420E, 41041C0425E, 41041C0450E	
Lincoln County, Unincorporated Areas	410129	17090003, 17100204, 17100205	41041C0020E, 41041C0025D*, 41041C0040E, 41041C0045E, 41041C0065E, 41041C0070E, 41041C100D*, 41041C0107E, 41041C0109E, 41041C0116E, 41041C0117E, 41041C0120E, 41041C0125D*, 41041C0126E, 41041C0130E, 41041C0135E, 41041C0136E, 41041C0140E, 41041C0145E, 41041C0175E, 41041C0200D*, 41041C0225D*, 41041C0229E, 41041C0233E, 41041C0235E, 41041C0237E, 41041C0239E, 41041C0241E, 41041C0245E, 41041C0250D*, 41041C0275E, 41041C0300E, 41041C0325E, 41041C0350D*, 41041C0352E, 41041C0354E	

*Panel Not Printed

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Lincoln County, Unincorporated Areas (Continued)	410129	17090003, 17100204, 17100205	41041C0360E, 41041C0362E, 41041C0364E, 41041C0366E, 41041C0367D*, 41041C0368E, 41041C0369E, 41041C0375D*, 41041C0380E, 41041C0381E, 41041C0383E, 41041C0385E, 41041C0389E, 41041C0390E, 41041C0393E, 41041C0395E, 41041C0420E, 41041C0425E, 41041C0450E, 41041C0475E, 41041C0500D*, 41041C0502E, 41041C0504E, 41041C0505D*, 41041C0506E, 41041C0507E, 41041C0508E, 41041C0509E, 41041C0515E, 41041C0520E, 41041C0527E, 41041C0531E, 41041C0550E, 41041C0575E, 41041C0600E, 41041C0625E, 41041C0650D*, 41041C0655E, 41041C0660E, 41041C0662E, 41041C0665E, 41041C0666E, 41041C0670E, 41041C0690E, 41041C0695E, 41041C0700E, 41041C0715E, 41041C0720E, 41041C0725D*, 41041C0740E, 41041C0750D*, 41041C0775D*, 41041C0800D*, 41041C0801E, 41041C0802E, 41041C0803E, 41041C0804D*, 41041C0811E, 41041C0815E, 41041C0825E, 41041C0850E, 41041C0875E, 41041C0880E	

*Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 31, “Map Repositories,” within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for Lincoln County became effective on December 18, 2009. Refer to Table 28 for information about subsequent revisions to the FIRMs.

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

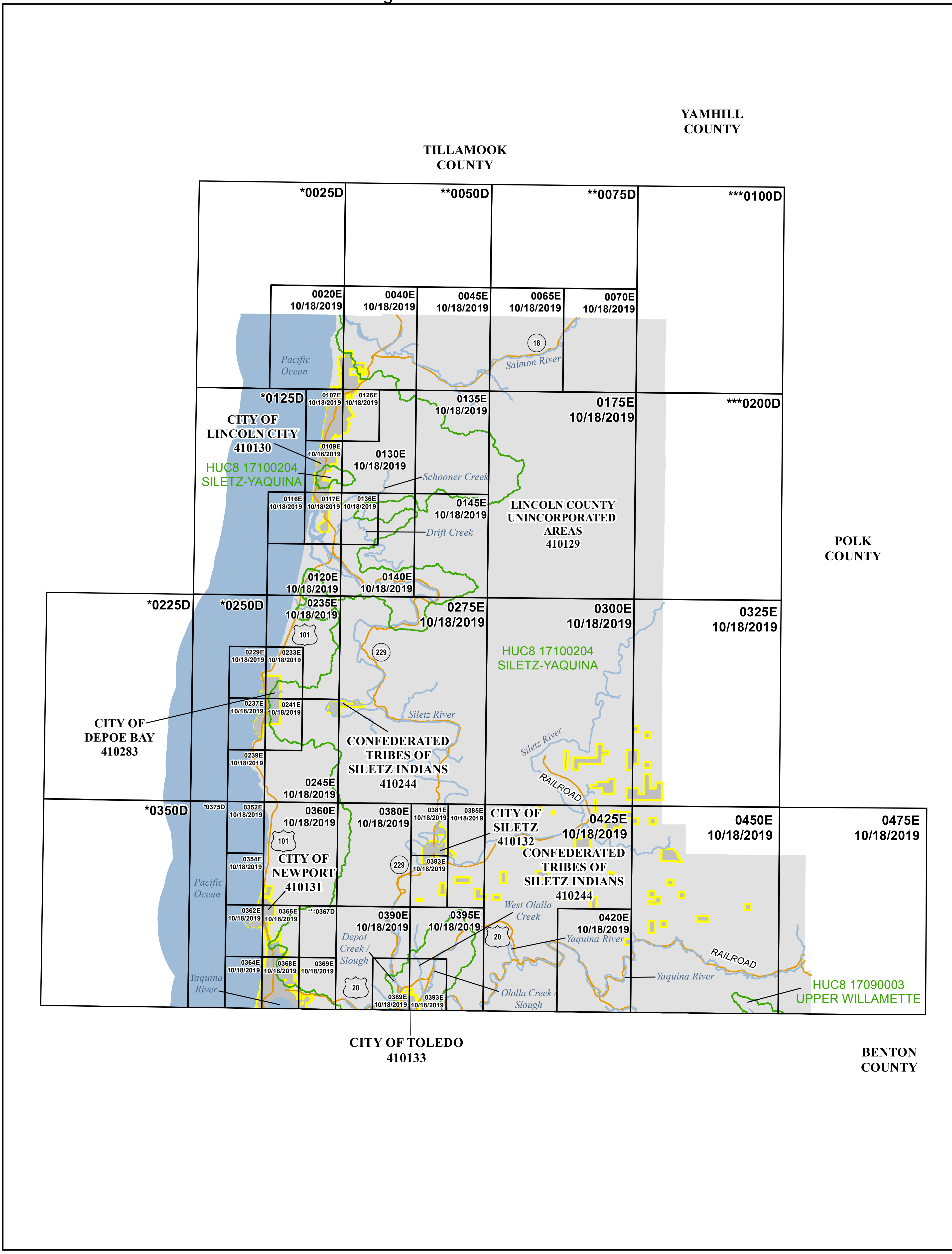
  The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at http://www.fema.gov or contact your appropriate FEMA Regional Office for more information about this program.

- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

  Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database. For all other levees, the user is encouraged to contact the appropriate local community.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at http://www.fema.gov.

Figure 1: FIRM Panel Index



1 inch = 4 miles

N

0 2 4 8 Miles

Map Projection:
NAD 1983 UTM Zone 10N
North American Datum of 1983

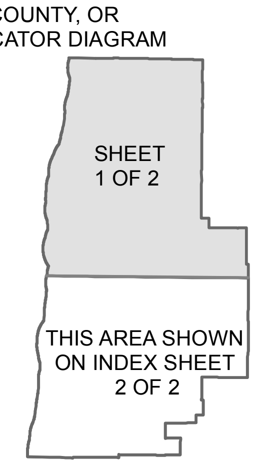
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - OPEN WATER AREA
** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY
*** PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

LINCOLN COUNTY, OR
INDEX LOCATOR DIAGRAM



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

LINCOLN COUNTY, OREGON AND INCORPORATED AREAS

PANELS PRINTED:

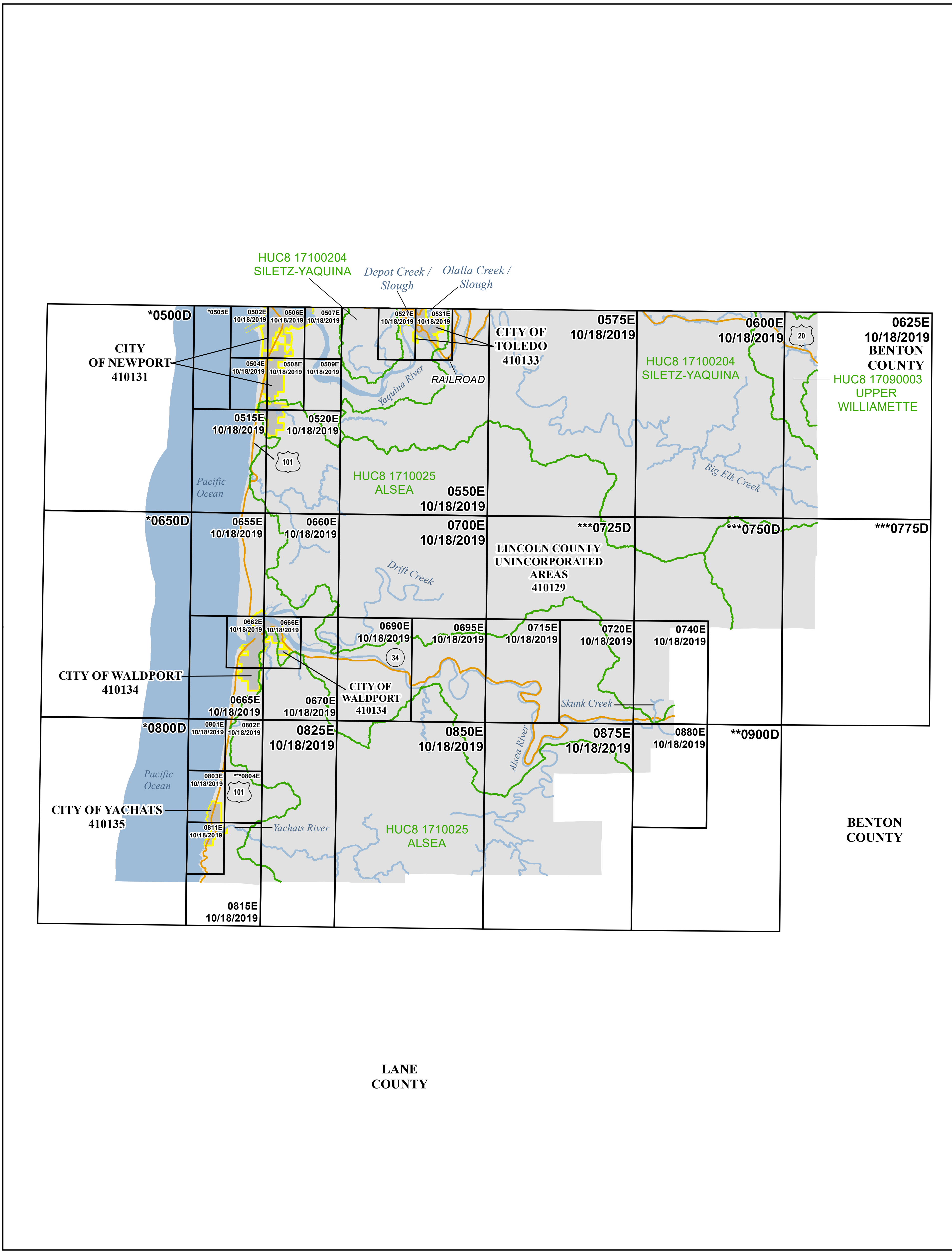
0020, 0040, 0045, 0065, 0070, 0107, 0109, 0116, 0117, 0120, 0126, 0130, 0135, 0136, 0140, 0145, 0175, 0229, 0233, 0235, 0237, 0239, 0241, 0245, 0275, 0300, 0325, 0352, 0354, 0360, 0362, 0364, 0366, 0368, 0369, 0380, 0381, 0383, 0385, 0389, 0390, 0393, 0395, 0420, 0425, 0450, 0475

FEMA

MAP NUMBER
41041CIND1B

MAP REVISED
OCTOBER 18, 2019

Figure 1: FIRM Panel Index (continued)



1 inch = 4 miles

N

0 2 4 8 Miles

Map Projection:
NAD 1983 UTM Zone 10N
North American Datum of 1983

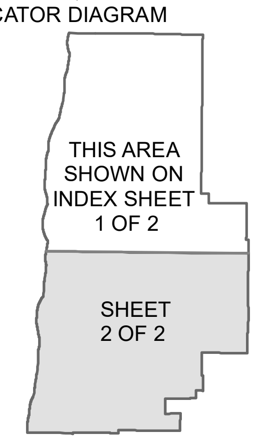
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FIS REPORT FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - OPEN WATER AREA
** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY
*** PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

LINCOLN COUNTY, OR
INDEX LOCATOR DIAGRAM



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

LINCOLN COUNTY, OREGON AND INCORPORATED AREAS

PANELS PRINTED:

0502, 0504, 0506, 0507, 0508, 0509, 0515, 0520, 0527, 0531, 0550, 0575, 0600, 0625, 0655, 0660, 0662, 0665, 0666, 0670, 0690, 0695, 0700, 0715, 0720, 0740, 0801, 0802, 0803, 0811, 0815, 0825, 0850, 0875, 0880

FEMA

MAP NUMBER
41041CIND2B

MAP REVISED
OCTOBER 18, 2019

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information exchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information exchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 28 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the FIS Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

Figure 2. FIRM Notes to Users (continued)

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 10N. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by the Oregon Department of Geology and Mineral Industries (DOGAMI). Data sources include DOGAMI, Oregon Lidar Consortium, Bureau of Land Management, U.S. Geological Survey, Oregon Department of Fish and Wildlife, Oregon Department of Transportation, Oregon Water Resources Department, Oregon Department of Administrative Services Geospatial Enterprise Office, and Lincoln County. Base map information was rectified to 3-foot resolution lidar topographic data acquired in 2008, 2009, 2010, 2011, and 2012. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Figure 2. FIRM Notes to Users (continued)

NOTES FOR FIRM INDEX REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Lincoln County, Oregon, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.
SPECIAL NOTES FOR SPECIFIC FIRM PANELS This Notes to Users section was created specifically for Lincoln County, Oregon, effective October 18, 2019.
FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.
	Regulatory Floodway determined in Zone AE.

Figure 3: Map Legend for FIRM (continued)

OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible
NO SCREEN	Unshaded Zone X: Areas determined to be outside the 0.2% annual chance flood hazard
FLOOD HAZARD AND OTHER BOUNDARY LINES	
(ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct Channel Culvert Storm Sewer	Channel, Culvert, Aqueduct, or Storm Sewer
Dam Jetty Weir	Dam, Jetty, Weir
	Levee, Dike, or Floodwall accredited or provisionally accredited to reduce the flood risk from the 1% annual chance flood.
	Levee, Dike or Floodwall not accredited to reduce the flood risk from the 1% annual chance flood.
Bridge	Bridge

Figure 3: Map Legend for FIRM (continued)

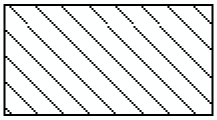
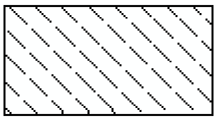
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. See Notes to Users for important information.*	
 **CBRS AREA 09/30/2009**	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 **OTHERWISE PROTECTED AREA 09/30/2009**	Otherwise Protected Area
REFERENCE MARKERS	
22.0 ●	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
(B) 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
(5280) 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
(8) - - - - - - -	Coastal Transect
——-·——— - (blue)	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
——--——— --	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
~~ 513 ~~~~	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity

Figure 3: Map Legend for FIRM (continued)

BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
—	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Lincoln County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 23), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Lincoln County, Oregon, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 13. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

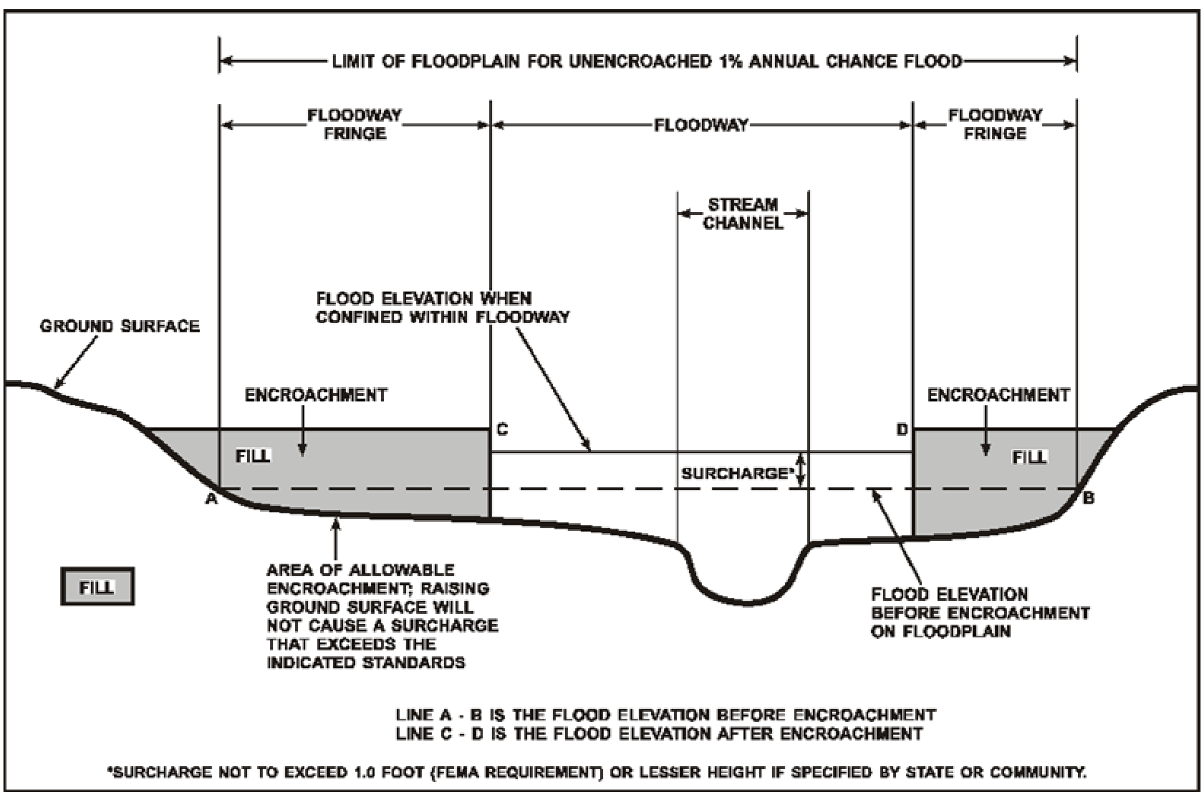
2.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard.

For purposes of the NFIP, a floodway is used as a tool to assist local communities in balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 24, “Floodway Data.”

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Alsea Bay	Waldport, City of; Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	Confluence with Alsea River	1700205		4.56	N	AE	October 1977
Alsea River	Lincoln County, Unincorporated Areas	Confluence with Alsea Bay	County boundary	17100205	26.99		Y	AE	October 1977
Anderson Creek	Newport, City of; Lincoln County, Unincorporated Areas	Confluence with Jeffries Creek	1,000 feet upstream from confluence with Jeffries Creek	17100204	0.63		N	A	February 2016
Anderson Creek (Drift Creek Tributary)	Lincoln County, Unincorporated Areas	Confluence with Drift Creek	3,200 feet upstream from Drift Creek Rd bridge	17100204	0.89		N	A	February 2016
Baldy Creek	Lincoln City, City of	Anchor Avenue	80 feet downstream of Highway 101 bridge	17100204	0.39		N	A	February 2016
Bales Creek	Lincoln County, Unincorporated Areas	Confluence with Yaquina River	1,000 feet upstream of East Fork Bales Creek	17100204	0.65		N	A	February 2016
Bear Creek	Lincoln County, Unincorporated Areas	Confluence with Salmon River	2,100 feet downstream of Southman Creek	17100204	2.20		N	A	February 2016
Beaver Creek (Depot Creek Tributary)	Lincoln County, Unincorporated Areas	400 feet upstream of Highway 20 bridge	At confluence with Jack Creek	17100204	2.40		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Beaver Creek	Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	1,750 feet upstream of Peterson Creek	17100205	9.03		N	A	February 2016
Big Creek	Newport, City of	Highway 101	100 feet downstream of NE Big Creek Road	17100204	0.44		Y	AE	October 1977
Big Elk Creek	Lincoln County, Unincorporated Areas	Confluence with Yaquina River	2,800 feet upstream of Adam Creek	17100204	30.30		N	A	February 2016
Big Rock Creek	Lincoln County, Unincorporated Areas	Confluence with Rock Creek	2,800 upstream of Logsden Road bridge	17100204	0.62		N	A	February 2016
Buck Creek	Lincoln County, Unincorporated Areas	Confluence with Five Rivers	9,100 feet upstream of Wilson Creek	17100205	4.14		N	A	February 2016
Canal Creek	Lincoln County, Unincorporated Areas	Confluence with Alsea River	5,200 feet upstream of West Creek	17100205	3.56		N	A	February 2016
Cascade Creek	Lincoln County, Unincorporated Areas	Confluence with Five Rivers	3 miles upstream of Five Rivers	17100205	2.98		N	A	February 2016
Cedar Creek	Lincoln County, Unincorporated Areas	Confluence with Siletz River	4,800 feet upstream of confluence with Siletz River	17100204	2.58		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Cherry Creek	Lincoln County, Unincorporated Areas	Confluence with Five Rivers	2,600 feet upstream Five River Road bridge	17100205	0.50		N	A	February 2016
Cougar Creek	Lincoln County, Unincorporated Areas	Confluence with Five Rivers	1,000 feet upstream of Five Rivers	17100205	0.64		N	A	February 2016
Coyote Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	3,500 feet upstream of Highway 20 bridge	17100204	0.72		N	A	February 2016
Crab Creek	Lincoln County, Unincorporated Areas	Confluence with Five Rivers	County boundary	17100205	1.26		N	A	February 2016
Deer Creek	Lincoln County, Unincorporated Areas	Confluence with Salmon River	2,500 feet upstream of Old Scenic Highway 101 bridge	17100204	1.06		N	A	February 2016
Depoe Bay	Depoe Bay, City of	Confluence with Pacific Ocean	N/A	17100204		0.02	N	AE	October 1977
Depot Creek (Upper, Approximate)	Lincoln County, Unincorporated Areas	1.5 miles upstream of Highway 20	At Wessel Creek	17100204	3.83		N	A	February 2016
Depot Creek / Slough	Toledo, City of; Lincoln County, Unincorporated Areas	Confluence with Yaquina River	1.5 miles upstream of Highway 20	17100204	3.33		Y	AE	October 1977

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Devils Lake	Lincoln, City of; Lincoln County Unincorporated Areas	Confluence with D River	N/A	1710204		1.32	N	AE	February 1977
Drift Creek (Lower, Detailed)	Lincoln County, Unincorporated Areas	Confluence with Siletz Bay	2,600 feet downstream of Bluff Creek	17100204	3.35		Y	AE	October 1977
Drift Creek (Upper, Approximate	Lincoln County, Unincorporated Areas	2,600 feet downstream of Bluff Creek	600 feet upstream of Odell Creek	17100204	2.16		N	A	February 2016
Drift Creek (Alsea River Tributary)	Lincoln County, Unincorporated Areas	Confluence with Alsea River	6,000 feet upstream of Cougar Creek	17100205	13.15		N	A	February 2016
Elkhorn Creek	Lincoln County, Unincorporated Areas	Confluence with Beaver Creek	1.5 miles upstream of Beaver Creek	17100205	1.58		N	A	February 2016
Fall Creek	Lincoln County, Unincorporated Areas	Confluence with Alsea River	1,300 feet upstream of Skunk Creek	17100205	0.52		N	A	February 2016
Feagles Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	5,600 feet upstream of Feagles Creek Road bridge	1710204	1.14		N	A	February 2016
Five Rivers	Lincoln County, Unincorporated Areas	Confluence with Alsea River	County boundary	17100205	12.20		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Grant Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	2,100 feet downstream of Savage Creek	17100204	1.97		N	A	February 2016
Helms Creek	Lincoln County, Unincorporated Areas	Confluence with Yachats River	2,000 feet upstream of Yachats River	17100205	0.45		N	A	February 2016
Hymes Creek	Lincoln County, Unincorporated Areas	Confluence with Tumtum River	1,000 feet upstream of Highway 20 bridge	17090003	0.29		N	A	February 2016
Jeffries Creek	Newport, City of	Confluence with Big Creek	1,700 feet upstream of Big Creek	17100204	1.06		N	A	February 2016
Keller Creek	Lincoln County, Unincorporated Areas	Confluence with Yachats River	County boundary	17100205	0.42		N	A	February 2016
Little Beaver Creek	Lincoln County, Unincorporated Areas	1 mile upstream of confluence with Depot Slough	1.5 miles upstream of Depot Slough	17100204	0.44		N	A	February 2016
Little Creek	Newport, City of	Confluence with Pacific Ocean	2,500 feet upstream of Highway 101	17100204	0.58		N	A	February 2016
Little Depot Creek	Lincoln County, Unincorporated Areas	Confluence with Depot Creek	1 mile upstream of Depot Creek	17100204	1.04		N	A	February 2016
Little Elk Creek	Lincoln County, Unincorporated Areas	Confluence with Yaquina River	2 miles upstream of Highway 20 bridge	17100204	9.18		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Mill Creek	Lincoln County, Unincorporated Areas	Confluence with Siletz River	3,000 feet upstream of Cerine Creek	17100204	1.72		N	A	February 2016
North Depoe Bay Creek	Depoe Bay, City of	Confluence with Depoe Bay	1,200 feet upstream of Depoe Bay dam	17100204	0.60		N	A	February 2016
North Fork Yachats River	Lincoln County, Unincorporated Areas	Confluence with Yachats River	2,000 upstream of Williamson Creek	17100205	2.89		N	A	February 2016
Nute Slough	Lincoln County, Unincorporated Areas	Confluence with Yaquina River	5,000 feet upstream of Hidden Valley Rd bridge	17100204	3.41		N	A	February 2016
Olalla Creek / Slough	Toledo, City of; Lincoln County Unincorporated Areas	Confluence with Yaquina River	At Highway 20	17100204	7.06		Y	AE	October 1977
Oliver Creek	Lincoln County, Unincorporated Areas	Confluence with South Beaver Creek	4,200 feet upstream of South Beaver Creek Rd bridge	17100205	1.00		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Pacific Ocean	Depoe Bay, City of; Lincoln City, City of; Newport, City of; Waldport, City of; Yachats, City of; Lincoln County, Unincorporated Areas	Entire Lincoln County coastline	Entire Lincoln County coastline	N/A	70.5		N	VE, AE	July 2014
Reynolds Creek	Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	2,200 feet upstream of Big Creek	17100205	0.52		N	A	February 2016
Rock Creek	Lincoln County, Unincorporated Areas; Confederated Tribes of Siletz Indians	Confluence with Siletz River	Confluence with Big Rock Creek	17100204	5.57		N	A	February 2016
Salmon Creek	Lincoln County, Unincorporated Areas	Confluence with Salmon River	1,200 feet downstream of Calkins Creek	17100204	1.34		N	A	February 2016
Salmon River (Lower, Detailed)	Lincoln County, Unincorporated Areas	Downstream of N Old Scenic Highway 101	1,000 feet upstream of Swampy Creek	17100204	8.09		Y	AE	October 1977
Salmon River (Lower, Approximate)	Lincoln County, Unincorporated Areas	County boundary	Downstream of N Old Scenic Highway 101	17100204	4.11		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Salmon River (Upper, Approximate)	Lincoln County, Unincorporated Areas	1,000 feet upstream of confluence with Swampy Creek	County boundary	17100204	2.46		N	A	February 2016
Schoolhouse Creek	Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	5,000 feet upstream of Highway 101	17100204	1.33		N	A	February 2016
Schooner Creek	Lincoln City, City of; Lincoln County, Unincorporated Areas	Confluence with Siletz Bay	1,600 feet downstream of Fall Creek	17100204	5.05		Y	AE	October 1977
Shotpouch Creek	Lincoln County, Unincorporated Areas	Confluence with Tumtum River	1,900 feet downstream of Shotpouch Rd bridge	17090003	0.78		N	A	February 2016
Sijota Creek	Lincoln County, Unincorporated Areas	Confluence with Siletz Bay	2,900 feet upstream of runway culvert	17100204	1.534		N	A	February 2016
Siletz Bay	Lincoln City, City of; Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	N/A	17100204		2.35	N	AE	October 1977
Siletz Bay (Coastal Analysis)	Lincoln City, City of; Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	N/A	17100204		0.06	N	VE	August 1998

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Siletz River (Lower, Detailed)	Lincoln County, Unincorporated Areas	Confluence with Siletz Bay	700 feet downstream of Reed Creek	17100204	9.61		Y	AE	October 1977
Siletz River (Middle, Detailed)	Lincoln County, Unincorporated Areas	1.2 miles downstream of confluence with Cedar Creek	400 feet upstream of Hough Creek	17100204	3.22		Y	AE	October 1977
Siletz River (Upper, Detailed)	Siletz, City of; Lincoln County, Unincorporated Areas; Confederated Tribes of Siletz Indians	600 feet upstream of confluence with Spencer Creek	500 feet upstream of Mill Creek	17100204	14.30		Y	AE	October 1977
Siletz River (Lower, Approximate)	Lincoln County, Unincorporated Areas; Confederated Tribes of Siletz Indians	700 feet downstream of confluence with Reed Creek	1.2 miles downstream of Cedar Creek	17100204	11.20		N	A	February 2016
Siletz River (Middle, Approximate)	Lincoln County, Unincorporated Areas	400 feet upstream of confluence with Hough Creek	600 feet upstream of Spencer Creek	17100204	9.86		N	A	February 2016
Siletz River (Upper, Approximate)	Lincoln County, Unincorporated Areas	500 feet upstream of confluence with Mill Creek	County boundary	17100204	16.51		N	A	February 2016
Skunk Creek	Lincoln County, Unincorporated Areas	Confluence with Fall Creek	1,600 feet upstream of Hatchery Creek	17100205	0.54		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Slick Rock Creek	Lincoln County, Unincorporated Areas	Confluence with Salmon River	1,800 feet upstream of Trout Creek	17100204	1.73		N	A	February 2016
South Beaver Creek	Lincoln County, Unincorporated Areas	Confluence with Beaver Creek	1,600 feet upstream of Grave Creek	17100205	4.54		N	A	February 2016
South Depoe Bay Creek	Depoe Bay, City of	Confluence with Depoe Bay	400 feet upstream of Depoe Bay	17100204	0.20		N	A	February 2016
Spout Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	1,400 feet upstream of Harlan-Burnt Woods Rd bridge	17100204	0.68		N	A	February 2016
Sugarbowl Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	2.3 miles upstream of GL Ridenour bridge	17100204	2.25		N	A	February 2016
Sunshine Creek	Lincoln County, Unincorporated Areas	Confluence with Siletz River	1,100 feet upstream of Siletz River	17100204	0.69		N	A	February 2016
Thiel Creek	Newport, City of; Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	4,600 feet upstream of Highway 101 bridge	17100205	3.02		N	A	February 2016
Trout Creek	Lincoln County, Unincorporated Areas	Confluence with Slick Rock Creek	1,100 feet upstream of Slick Rock Creek	17100204	0.72		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Tumtum River	Lincoln County, Unincorporated Areas	County boundary	2 miles upstream of Highway 20 bridge	17090003	5.31		N	A	February 2016
Tumtum River Tributary 1	Lincoln County, Unincorporated Areas	Confluence with Tumtum River	2,800 feet upstream of Highway 20 bridge	17090003	0.59		N	A	February 2016
Unnamed Stream (Depot Creek Tributary)	Lincoln County, Unincorporated Areas	Confluence with Depot Creek	2,500 feet upstream of Depot Creek	17100204	0.53		N	A	February 2016
Unnamed Stream (Sugarbowl Creek Tributary)	Lincoln County, Unincorporated Areas	Confluence with Sugarbowl Creek	2,500 feet upstream of Sugarbowl Creek	17100204	0.51		N	A	February 2016
Unnamed Tumtum West Tributary	Lincoln County, Unincorporated Areas	Confluence with Tumtum River	900 feet upstream of Bennett Ln bridge	17090003	0.24		N	A	February 2016
Walker Creek	Lincoln County, Unincorporated Areas	Confluence with Alsea River	4,200 feet upstream of North Bayview Rd bridge	17100205	0.79		N	A	February 2016
West Olalla Creek (Lower, Detailed)	Lincoln County, Unincorporated Areas	Confluence with Olalla Slough	2,300 feet upstream of Fairway Drive	17100204	2.39		Y	AE	October 1977
West Olalla Creek (Upper, Approximate)	Lincoln County, Unincorporated Areas	2,300 feet upstream of Fairway Drive	1,700 feet downstream of West Olalla Creek dam	17100204	1.47		N	A	February 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Wilson Creek	Lincoln County, Unincorporated Areas	Confluence with Buck Creek	2,000 feet upstream of East Wilson Creek Road bridge	17100205	0.60		N	A	February 2016
Wolf Creek	Lincoln County, Unincorporated Areas	Confluence with Big Elk Creek	500 feet upstream of Wolf Creek Road bridge	17100204	0.86		N	A	February 2016
Wright Creek	Lincoln County, Unincorporated Areas	2,300 feet upstream of confluence with Poole Slough	1.5 miles upstream of Poole Slough	17100204	1.33		N	A	February 2016
Yachats River (Lower, Detailed)	Yachats, City of; Lincoln County, Unincorporated Areas	Confluence with Pacific Ocean	500 feet downstream of Wolf Creek	17100205	1.80		Y	AE	October 1977
Yachats River (Upper, Approximate)	Lincoln County, Unincorporated Areas	500 feet downstream of confluence with Wolf Creek	County boundary	17100205	11.17		N	A	February 2016
Yaquina Bay	Newport, City of	Confluence with Pacific Ocean	2 miles upstream of Pacific Ocean	17100204		0.93	N	AE	July 2014
Yaquina River (Lower, Detailed)	Newport, City of; Toledo, City of; Lincoln County, Unincorporated Areas	2 miles upstream of Pacific Ocean	700 feet downstream of Mill Creek	17100204	12.66		N	AE	October 1977
Yaquina River (Middle, Detailed)	Lincoln County, Unincorporated Areas	2,000 feet downstream of confluence with Big Elk Creek	400 feet downstream of Little Carlisle Creek	17100204	1.25		Y	AE	October 1977

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Yaquina River (Upper, Detailed)	Lincoln County, Unincorporated Areas	1,400 feet upstream of confluence with Eddy Creek	2,500 feet downstream of Trout Creek	17100204	3.61		Y	AE	October 1977
Yaquina River (Lower, Approximate)	Lincoln County, Unincorporated Areas	700 feet downstream of confluence with Mill Creek	2,000 feet downstream of Big Elk Creek	17100204	7.03		N	A	February 2016
Yaquina River (Middle, Approximate)	Lincoln County, Unincorporated Areas	400 feet downstream of confluence with Little Carlisle Creek	1,400 feet upstream of Eddy Creek	17100204	12.28		N	A	February 2016
Yaquina River (Upper, Approximate)	Lincoln County, Unincorporated Areas	2,500 feet downstream of confluence with Trout Creek	3,000 feet downstream of Little Yaquina River	17100204	14.03		N	A	February 2016

All floodways that were developed for this FIS project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and l% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

2.4 Non-Encroachment Zones

This section is not applicable to this FIS project.

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1% annual chance flood and the geometry of the floodplain. Floods in these areas are typically caused by storm events. However, for areas on or near ocean coasts, large rivers, or large bodies of water, BFE and floodplain boundaries may need to be based on additional components, including storm surges and waves. Communities on or near ocean coasts face flood hazards caused by offshore seismic events as well as storm events.

Coastal flooding sources that are included in this FIS project are shown in Table 2.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun.
- *Storm surge* is the additional water depth that occurs during large storm events. These

events can bring air pressure changes and strong winds that force water up against the shore.

- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1% annual chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1% annual chance storm. The 1% annual chance storm surge can be determined from analyses of tidal gage records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the effects of waves.

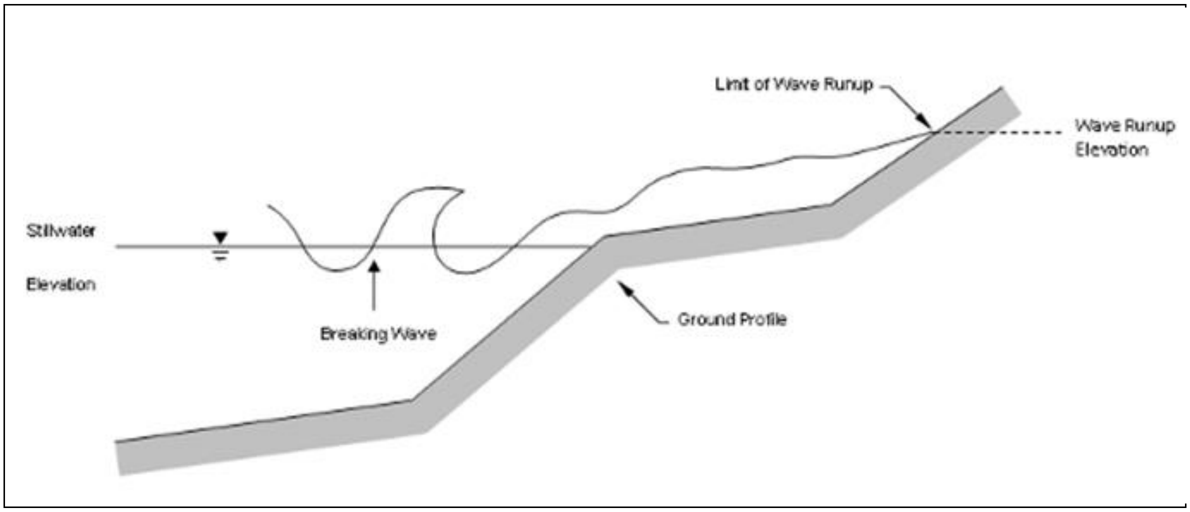
- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1% annual chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since tidal gages are often sited in areas sheltered from wave action and do not capture this information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate.
- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore.
- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land.
- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier.

Figure 5: Wave Runup Transect Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1% annual chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm. The methods that were used for calculation of total stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report. Location of total stillwater elevations for coastal areas are shown in Figure 8, “1% Annual Chance Total Stillwater Levels for Coastal Areas.”

In some areas, the 1% annual chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1% annual chance storm surge. The methods that were used for calculation of wave hazards are described in Section 5.3 of this FIS Report.

Table 26 presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

Coastal BFEs are calculated as the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm plus the additional flood hazard from overland wave effects (storm-induced erosion, overland wave propagation, wave runup and wave overtopping).

Where they apply, coastal BFEs are calculated along transects extending from offshore to the limit of coastal flooding onshore. Results of these analyses are accurate until local topography, vegetation, or development type and density within the community undergoes major changes.

Parameters that were included in calculating coastal BFEs for each transect included in this FIS Report are presented in Table 17, "Coastal Transect Parameters." The locations of transects are shown in Figure 9, "Transect Location Map." More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

Certain areas along the open coast and other areas may have higher risk of experiencing structural damage caused by wave action and/or high-velocity water during the 1% annual chance flood. These areas will be identified on the FIRM as Coastal High Hazard Areas.

- *Coastal High Hazard Area (CHHA)* is a SFHA extending from offshore to the inland limit of the primary frontal dune (PFD) or any other area subject to damages caused by wave action and/or high-velocity water during the 1% annual chance flood.
- *Primary Frontal Dune (PFD)* is a continuous or nearly continuous mound or ridge of sand with relatively steep slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.

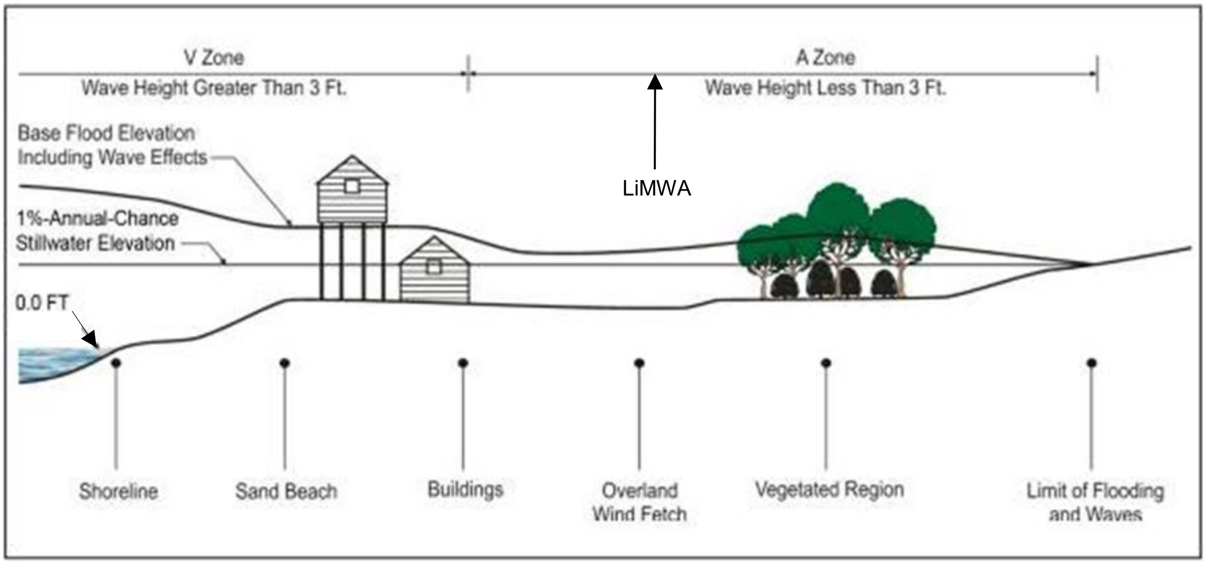
CHHAs are designated as "V" zones (for "velocity wave zones") and are subject to more stringent regulatory requirements and a different flood insurance rate structure. The areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the FIRM.

The landward limit of the PFD occurs at a point where there is a distinct change from a relatively steep slope to a relatively mild slope; this point represents the landward extension of Zone VE. Areas of lower risk in the CHHA are designated with Zone V on the FIRM. More detailed information about the identification and designation of Zone VE is presented in Section 6.4 of this FIS Report.

Areas that are not within the CHHA but are SFHAs may still be impacted by coastal flooding and damaging waves; these areas are shown as "A" zones on the FIRM.

Figure 6, "Coastal Transect Schematic," illustrates the relationship between the base flood elevation, the 1% annual chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE areas in an area without a PFD subject to overland wave propagation. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

Figure 6: Coastal Transect Schematic



Methods used in coastal analyses in this FIS project are presented in Section 5.3 and mapping methods are provided in Section 6.4 of this FIS Report.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, "Map Legend for FIRM." In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this FIS Project.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, "Map Legend for FIRM" In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17: Coastal Transect Parameters due to the presence of wave effects. The higher the elevation should be used for construction and/or floodplain management purposes.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, "Map Legend for FIRM." Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in the unincorporated and incorporated areas of Lincoln County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Depoe Bay, City of	A, AE, VE, X
Lincoln City, City of	A, AE, VE, X
Newport, City of	A, AE, AO, VE, X
Siletz, City of	AE, X
Toledo, City of	AE, X
Waldport, City of	A, AE, VE, X
Yachats, City of	AE, VE, X
Lincoln County, Unincorporated Areas	A, AE, VE, X

3.2 Coastal Barrier Resources System

The Coastal Barrier Resources Act (CBRA) of 1982 was established by Congress to create areas along the Atlantic and Gulf coasts and the Great Lakes, where restrictions for Federal financial assistance including flood insurance are prohibited. In 1990, Congress passed the Coastal Barrier Improvement Act (CBIA), which increased the extent of areas established by the CBRA and added “Otherwise Protected Areas” (OPA) to the system. These areas are collectively referred to as the John. H Chafee Coastal Barrier Resources System (CBRS). The CBRS boundaries that have been identified in the project area are in Table 4, “Coastal Barrier Resource System Information.”

Table 4: Coastal Barrier Resources System Information

[Not Applicable to this FIS Project]

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 5 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 5: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Alsea	17100205	Alsea River	This watershed encompasses the southern half of the county, with its headwaters in the Coastal Range	839
Siletz-Yaquina	17100204	Siletz River, Yaquina River	This watershed encompasses the northern half of the county, with its headwaters in the Coastal Range	876
Upper Williamette	17090003	Shotpouch Creek, Tumtum River	This watershed encompasses the center of the eastern-most county border	26.35

4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for Lincoln County by flooding source.

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems[1]
All sources	Flooding in Lincoln County usually occurs during the winter months (from October to April). Lincoln County is a coastal county with both riverine and coastal flooding sources. Riverine flooding typically results in Lincoln County when snow accumulates in the upper reaches of watersheds. When a warm southwest storm occurs in the region, the heavy rainfall, when combined with an increase in snowmelt, causes riverine flooding. The storms that produce coastal flooding often bring heavy rain, causing high flows in rivers. At estuaries and at the mouths of rivers, these flows are held back by high ocean levels, causing increased flood hazards.
Alsea River	On the Alsea River, the maximum recorded flood occurred on December 22, 1964. Other significant flooding events occurred in December 1955, November 1960, January of 1972 and 1974, December 1980, February 1996, and December 1998.
Yaquina River	The flood of record for the upper reaches of the Yaquina River occurred November 16, 1973. Other significant flood events on the upper Yaquina River occurred in December 1975, February 1986 and January 1980. In the City of Toledo the maximum flood of record on the Yaquina River occurred in December 1964. There are no gage records in Toledo; the information was provided by interviews and observations of high-water marks.
Siletz River	The maximum flood of record on the Siletz River occurred on November 26, 1999. Other significant flooding events occurred in November 1998, February 1996, November 1909, and March 1931. An additional significant flood occurred in 1921 as the result of precipitation and the breaking of a small log pond dam in the community of Valsetz. Flooding associated with the 1921 event significantly affected low-lying areas in the City of Siletz.

[1]From Lincoln County FIS Report published on December 18, 2009 (FEMA 2009)

Table 6: Principal Flood Problems *(continued)*

Flooding Source	Description of Flood Problems[1]
Pacific Ocean	Along the coast, high spring tides combine with storm surges produced by strong winds from winter storms, causing extensive coastal flooding. One of the most significant ocean floods in Oregon history occurred on January 3, 1939, when wind-driven waves caused extensive damage. In February and December 1967 Lincoln City was battered by unusually destructive storm waves. The waves were generated by the cumulative effect of prolonged southwesterly winds and high stillwater levels exceeding seven feet. In 1964, a tsunami caused considerable damage to several communities along the Oregon coast. Other years of significant open-coast flooding were 1952, 1960, 1964, and 1973. Along the coast, there are areas designated as sheet flow caused by wave action from coastal flooding. The D River outlet of Devils Lake in Lincoln City becomes choked with sand, logs, and other debris, causing Devils Lake to rise and flood surrounding homes. Devils Lake residents experienced flooding in 1972.

[1]From Lincoln County FIS Report published on December 18, 2009 (FEMA 2009)

Table 7 contains information about historic flood elevations in the communities within Lincoln County.

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak[1]	Event Date	Approximate Recurrence Interval (years)	Source of Data
Alder Brook	Near Rose Lodge, Oregon	14.22	1/21/1972	N/A	USGS gage 14303700
Alsea River	Near Tidewater, Oregon	27.44	12/22/1965	N/A	USGS gage 14306500
Deer Creek	Near Salado, Oregon	4.21	1/28/1965	N/A	USGS gage 14306810
Drift Creek	Near Salado, Oregon	9.86	1965	N/A	USGS gage 14306600
Five Rivers	Near Fisher, Oregon	21.08	1/21/1972	N/A	USGS gage 14306400
Flynn Creek	Near Salado, Oregon	4.73	1/21/1972	N/A	USGS gage 14306800
Lyndon Creek	Near Waldport, Oregon	9.04	1/28/1965	N/A	USGS gage 14306830
Mill Creek	Near Toledo, Oregon	5.83	1/27/1965	N/A	USGS gage 14306036

[1]In feet relative to gage datum

Table 7: Historic Flooding Elevations *(continued)*

Flooding Source	Location	Historic Peak[1]	Event Date	Approximate Recurrence Interval (years)	Source of Data
Needle Branch	Near Salado, Oregon	3.75	1/11/1972	N/A	USGS gage 14306700
Siletz River	At Siletz, Oregon	28.62	11/26/1999	N/A	USGS gage 14305500
South Fork Weiss Creek	Near Waldport, Oregon	7.54	1/28/1965	N/A	USGS gage 14306850
Sunshine Creek	Near Valsetz, Oregon	4.28	2/1/1987	N/A	USGS gage 14304350
Yaquina River	Near Chitwood, Oregon	14.43	11/16/1973	N/A	USGS gage 14306030

[1]In feet relative to gage datum

4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within Lincoln County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 8: Non-Levee Flood Protection Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Pacific Ocean	N/A	Revetments	Numerous locations, including Gleneden Beach, Lincoln Beach, Lincoln City, Newport, Yachats, Wakonda Beach, and Tillicum Beach	Rip-rap along the Lincoln County coastline
Pacific Ocean	N/A	Seawalls	Lincoln City and Newport	Seawalls along the Lincoln County coastline
Yaquina River	N/A	Dike	Boone Slough	Overtopped by the 1%-annual-chance event
Yaquina River	N/A	Dike	Dahl Road in Toledo	Overtopped by the 1%-annual-chance event

4.4 Levees

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44

CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the risk from the 1% annual chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate FIRM flood zone.

Levee systems that are determined to reduce the risk from the 1% annual chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with Section 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee's certification status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3 and in Table 9. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system not longer meets Section 65.10, FEMA will de-accredit the levee system and issue an effective FIRM showing the levee-impacted area as a SFHA.

FEMA coordinates its programs with USACE, who may inspect, maintain, and repair levee systems. The USACE has authority under Public Law 84-99 to supplement local efforts to repair flood control projects that are damaged by floods. Like FEMA, the USACE provides a program to allow public sponsors or operators to address levee system maintenance deficiencies. Failure to do so within the required timeframe results in the levee system being placed in an inactive status in the USACE Rehabilitation and Inspection Program. Levee systems in an inactive status are ineligible for rehabilitation assistance under Public Law 84-99.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levees that exist within Lincoln County. Table 9, "Levees," lists all accredited levees, PALs, and de-accredited levees shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levees identified as PALs in the table are labeled on the FIRM to indicate their provisional status.

Please note that the information presented in Table 9 is subject to change at any time. For that reason, the latest information regarding any USACE structure presented in the table should be obtained by contacting USACE and accessing the USACE national levee database. For levees owned and/or operated by someone other than the USACE, contact the local community shown in Table 31.

Table 9: Levees

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84- 99 Program?	FIRM Panel(s)	Levee Status
Lincoln County, Unincorporated Areas	Siletz Bay	Left	Non-USACE	No	2005000211	No	41041C0120E	Non-Accredited
Lincoln County, Unincorporated Areas	Siletz River	Left	Non-USACE	No	2005000212	No	41041C0120E, 41041C0140E	Non-Accredited
Lincoln County, Unincorporated Areas	Millport Slough	Right	Non-USACE	No	2005000212	No	41041C0140E	Non-Accredited
Lincoln County, Unincorporated Areas	Siletz River	Left	Non-USACE	No	2005000214	No	41041C0120E	Non-Accredited
Lincoln County, Unincorporated Areas	Siletz River	Left	Non-USACE	No	2005000214	No	41041C0120E	Non-Accredited
Lincoln County, Unincorporated Areas	Yaquina River	Right Bank	USACE – Portland District	Yes	5005000033	No	41041C0550E	Non-Accredited
Lincoln County, Unincorporated Areas	Yaquina River	Right Bank	USACE – Portland District	Yes	5005000033	No	41041C0550E	Non-Accredited
Toledo, City of; Lincoln County, Unincorporated Areas	Depot Creek	Both	USACE – Portland District	Yes	5005000034	No	41041C0389E, 41041C0527E	Non-Accredited

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 17.) Stream gage information is provided in Table 12.

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Alsea River	At Confluence with Darkey Creek	382.5	35,200	46,600	51,100	61,400
	At Confluence with Canal Creek	370.3	34,200	45,200	49,600	59,500
	At Confluence with Scott Creek	345.6	32,000	42,300	46,400	55,700
	At Confluence with Grass Creek	330.6	30,700	40,600	44,700	53,600
	At Confluence with Five Rivers	321.4	30,100	39,800	43,700	52,400
	At Confluence with Five Rivers Road	200.9	30,900	27,700	30,400	36,500
	At Confluence with Fall Creek	197.7	30,200	26,700	29,300	35,200
	At Confluence with Digger Creek	160.8	17,600	23,300	25,600	30,700
Big Creek	At U.S. Highway 101	5.4	890	1,170	1,240	1,440
Depot Creek	At Confluence with Yaquina River	20.8	2,575	3,435	3,860	4,720
	At Confluence with Beaver Creek	19.3	2,500	3,200	3,600	4,400
Drift Creek	At U.S. Highway 101	40.7	6,300	8,500	9,500	11,700
Olalla Creek	At Olalla Barrier (10th Street in Toledo)	10.4	1,500	1,985	2,175	2,720
	At Confluence with West Olalla Creek	4.4	640	840	920	1,150
Salmon River	At Old Coast Highway	60.7	8,850	11,700	13,000	15,800
	At Cross Section L	57.2	8,358	11,049	12,277	14,921
	At Cross Section P	53.8	7,880	10,419	11,576	14,070
	At Cross Section S	48.1	7,092	9,375	10,417	12,660
	At Cross Section Z	32.5	4,884	6,456	7,174	8,719
	At Confluence with Treat River	27.3	4,146	5,482	6,090	7,403

Table 10: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
	At Cross Section AN	24.4	3,726	4,956	5,473	6,652
	At Cross Section AS	23.5	3,597	4,755	5,284	6,422
Schooner Creek	U.S. Highway 101	18.0	2,271	3,629	4,025	4,883
	At Cross Section R	14.2	2,222	2,909	3,227	3,914
	At Confluence with Erickson Creek	13.4	2,100	2,750	3,050	3,700
Siletz River	At U.S. Highway 101	305.0	44,373	56,206	61,383	72,476
	At Cross Section I	300.0	43,682	55,330	60,426	71,347
	At Cross Section M	298.0	43,405	54,980	60,044	70,895
	At Cross Section Q	294.0	42,851	54,278	59,278	69,991
	At Cross Section AC	270.7	39,631	50,189	54,813	64,718
	At Cross Section AF	264.8	38,769	49,132	53,658	63,354
	At Cross Section AI	251.3	36,921	46,757	51,064	60,292
	At Cross Section AO	221.0	32,679	41,393	44,661	52,286
	At Cross Section BE	211.8	31,384	39,753	42,891	50,214
	At Cross Section BN	202.0	30,000	38,000	41,000	48,000
	At Cross Section BX	181.9	27,153	34,393	37,108	43,444
	At Cross Section CE	134.2	20,335	25,758	27,791	32,536
West Olalla Creek	At Confluence with Olalla Creek	4.2	600	800	880	1,080
Yachats River	At U.S. Highway 101	44.0	5,880	7,930	9,110	11,000
	At Confluence with Spring Creek	41.6	5,570	7,520	8,640	10,500

Table 10: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Yaquina River	At Confluence with Pacific Ocean	253.0	26,800	36,400	40,100	50,200*
	At Coquille Point	245.0	25,900	35,400	38,900	48,700*
	At Confluence with Mill Creek	186.1	20,000	27,200	30,000	37,500*
	At Cross Section A	173.5	18,700	25,500	28,000	35,000
	At Confluence with Elk Creek	83.6	9,300	12,700	14,000	17,500
	At Cross Section G	82.0	9,200	12,500	13,800	17,200
	At Cross Section H	59.9	6,800	9,300	10,200	12,800
	At Confluence with Little Elk Creek	39.3	4,600	6,200	6,800	8,600
	At Cross Section AA	37.6	4,400	6,000	6,600	8,200

*Flows transferred from gage near Chitwood

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this FIS Project]

Table 11: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Alsea Bay	Section of bay adjacent to Bayshore, downstream of Highway 101	13.0	*	14.0	14.4	14.9
	Section of bay adjacent to W.P. Keady State Wayside, downstream of Highway 101	15.8	*	16.6	16.8	17.3
	Section of bay adjacent to downtown Waldport, upstream of Highway 101	13.9	*	14.6	14.8	15.4
	Eastern section of bay, east of downtown Waldport, City of	12.8	*	13.6	13.8	14.3
Depoe Bay	Entire bay, in Depoe Bay, City of	12.8	*	13.7	14.0	14.8
Devils Lake	Entire lake, adjacent to Lincoln City, City of	16.3	*	17.0	17.3	17.8
Red River	Waldport, City of	12.7	*	13.1	13.2	13.6
Siletz Bay	Western and northern sections of the bay	12.5	*	13.2	13.6	14.3

*Not calculated for this FIS project

Table 11: Summary of Non-Coastal Stillwater Elevations *(continued)*

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Siletz Bay (continued)	Southeastern section of the Bay	13.9	*	15.1	15.6	16.7
	Central eastern section of the Bay	12.8	*	13.7	14.0	14.8
Siletz Bay (coastal analysis, no transects)	Eastern section, nearest Schooner Creek	*	*	*	16.0	*
	Second eastern-most section	*	*	*	19.0	*
	Central section	*	*	*	16.0	*
	Second western-most section	*	*	*	18.0	*
	Western section, nearest mouth of Siletz bay	*	*	*	21.0	*
Yaquina Bay	Newport, City of	11.1	11.3	11.4	11.6	11.8

*Not calculated for this FIS project

Table 12: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Sunshine Creek	14304350	USGS	Sunshine Creek near Valsetz, OR	7	10/1/1985	9/30/1991
Siletz River	14305500	USGS	Siletz River at Siletz, OR	202	10/1/1905	7/21/2011
Yaquina River	14306030	USGS	Yaquina River near Chitwood, OR	71	10/1/1972	9/30/1991
Mill Creek	14306036	USGS	Mill Creek Near Toledo, OR	4	10/1/1960	9/30/1973
North Fork Beaver Creek	14306050	USGS	N Fork Beaver Creek near Seal Rock, OR	10	7/1/1965	9/30/1967
Fall Creek	14306300	USGS	Fall Creek near Alsea, OR	29	10/1/1960	9/30/1963
Five Rivers	14306400	USGS	Five Rivers near Fisher, OR	114	10/1/1960	9/30/1990
Alsea River	14306500	USGS	Alsea River near Tidewater, OR	334	10/1/1939	7/21/2011
Drift Creek	14306600	USGS	Drift Creek near Salado, OR	21	9/1/1958	9/30/1970
Needle Branch	14306700	USGS	Needle Branch near Salado, OR	0.27	9/25/1958	9/30/1973
Flynn Creek	14306800	USGS	Flynn Creek near Salado, OR	1	9/1/1958	9/30/1973
Deer Creek	14306810	USGS	Deer Creek near Salado, OR	1	9/1/1958	9/30/1973
Beaver Creek	14306065	USGS	Beaver Creek at NW Beaver Valley Drive, near Seal Rock, OR	20	5/26/2010	4/22/2011
South Beaver Creek	14306075	USGS	South Beaver Creek near Seal Rock, OR	8	5/25/2010	4/21/2011
Beaver Creek	14306080	USGS	Beaver Creek Below S Beaver Creek near Seal Rock, OR	31	5/25/2010	6/1/2010
Beaver Creek	14306085	USGS	Beaver Creek at Highway 101 near Seal Rock, OR	34	5/26/2010	6/1/2010

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway

Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 13: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Alsea River	Confluence with Alsea Bay	County boundary	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Anderson Creek	Confluence with Jeffries Creek	1,000 feet upstream from confluence with Jeffries Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Anderson Creek (Drift Creek Tributary)	Confluence with Drift Creek	3,200 feet upstream from Drift Creek Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Baldy Creek	Anchor Ave	80 feet downstream of Highway 101 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Bales Creek	Confluence with Yaquina River	1,000 feet upstream of East Fork Bales Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Bear Creek	Confluence with Salmon River	2,100 feet downstream of Southman Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Beaver Creek (Depot Creek Tributary)	400 feet upstream of Highway 20 bridge	At confluence with Jack Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Beaver Creek	Confluence with Pacific Ocean	1,750 feet upstream of Peterson Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Big Creek	Highway 101	100 feet downstream of NE Big Creek Rd	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Big Elk Creek	Confluence with Yaquina River	2,800 feet upstream of Adam Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Big Rock Creek	Confluence with Rock Creek	2,800 upstream of Logsden Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Buck Creek	Confluence with Five Rivers	9,100 feet upstream of Wilson Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Canal Creek	Confluence with Alsea River	5,200 feet upstream of West Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Cascade Creek	Confluence with Five Rivers	3 miles upstream of Five Rivers	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Cedar Creek	Confluence with Siletz River	4,800 feet upstream of confluence with Siletz River	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits: Downstream Limit	Study Limits: Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cherry Creek	Confluence with Five Rivers	2,600 feet upstream Five River Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Cougar Creek	Confluence with Five Rivers	1,000 feet upstream of Five Rivers	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Coyote Creek	Confluence with Big Elk Creek	3,500 feet upstream of Highway 20 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Crab Creek	Confluence with Five Rivers	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Deer Creek	Confluence with Salmon River	2,500 feet upstream of Old Scenic Highway 101 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits: Downstream Limit	Study Limits: Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Depot Creek (Upper, Approximate)	1.5 miles upstream of Highway 20	At Wessel Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Depot Creek / Slough	Confluence with Yaquina River	1.5 miles upstream of Highway 20	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Drift Creek (Lower, Detailed)	Confluence with Siletz Bay	2,600 feet downstream of Bluff Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Drift Creek (Upper, Approximate	2,600 feet downstream of Bluff Creek	600 feet upstream of Odell Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Drift Creek (Alsea River Tributary)	Confluence with Alsea River	6,000 feet upstream of Cougar Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Elkhorn Creek	Confluence with Beaver Creek	1.5 miles upstream of Beaver Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Fall Creek	Confluence with Alsea River	1,300 feet upstream of Skunk Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Feagles Creek	Confluence with Big Elk Creek	5,600 feet upstream of Feagles Creek Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Five Rivers	Confluence with Alsea River	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Grant Creek	Confluence with Big Elk Creek	2,100 feet downstream of Savage Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits: Downstream Limit	Study Limits: Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Helms Creek	Confluence with Yachats River	2,000 feet upstream of Yachats River	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Hymes Creek	Confluence with Tumtum River	1,000 feet upstream of Highway 20 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Jeffries Creek	Confluence with Big Creek	1,700 feet upstream of Big Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Keller Creek	Confluence with Yachats River	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Little Beaver Creek	1 mile upstream of confluence with Depot Slough	1.5 miles upstream of Depot Slough	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Little Creek	Confluence with Pacific Ocean	2,500 feet upstream of Highway 101	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Little Depot Creek	Confluence with Depot Creek	1 mile upstream of Depot Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Little Elk Creek	Confluence with Yaquina River	2 miles upstream of Highway 20 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Mill Creek	Confluence with Siletz River	3,000 feet upstream of Cerine Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
North Depoe Bay Creek	Confluence with Depoe Bay	1,200 feet upstream of Depoe Bay dam	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
North Fork Yachats River	Confluence with Yachats River	2,000 upstream of Williamson Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Nute Slough	Confluence with Yaquina River	5,000 feet upstream of Hidden Valley Road bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Olalla Creek / Slough	Confluence with Yaquina River	Highway 20	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Oliver Creek	Confluence with South Beaver Creek	4,200 feet upstream of South Beaver Creek Road bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Reynolds Creek	Confluence with Pacific Ocean	2,200 feet upstream of Big Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Rock Creek	Confluence with Siletz River	Confluence with Big Rock Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Salmon Creek	Confluence with Salmon River	1,200 feet downstream of Calkins Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Salmon River (Lower, Detailed)	Downstream of N Old Scenic Highway 101	1,000 feet upstream of Swampy Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Salmon River (Lower, Approximate)	County boundary	Downstream of N Old Scenic Highway 101	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Salmon River (Upper, Approximate)	1,000 feet upstream of confluence with Swampy Creek	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Schoolhouse Creek	Confluence with Pacific Ocean	5,000 feet upstream of Highway 101	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Schooner Creek	Confluence with Siletz Bay	1,600 feet downstream of Fall Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Shotpouch Creek	Confluence with Tumtum River	1,900 feet downstream of Shotpouch Road bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Sijota Creek	Confluence with Siletz Bay	2,900 feet upstream of runway culvert	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Siletz River (Lower, Detailed)	Confluence with Siletz Bay	700 feet downstream of Reed Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Siletz River (Middle, Detailed)	1.2 miles downstream of confluence with Cedar Creek	400 feet upstream of Hough Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Siletz River (Upper, Detailed)	600 feet upstream of confluence with Spencer Creek	500 feet upstream of Mill Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Siletz River (Lower, Approximate)	700 feet downstream of confluence with Reed Creek	1.2 miles downstream of Cedar Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Siletz River (Middle, Approximate)	400 feet upstream of confluence with Hough Creek	600 feet upstream of Spencer Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Siletz River (Upper, Approximate)	500 feet upstream of confluence with Mill Creek	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Skunk Creek	Confluence with Fall Creek	1,600 feet upstream of Hatchery Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Slick Rock Creek	Confluence with Salmon River	1,800 feet upstream of Trout Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
South Beaver Creek	Confluence with Beaver Creek	1,600 feet upstream of Grave Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
South Depoe Bay Creek	Confluence with Depoe Bay	400 feet upstream of Depoe Bay	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Spout Creek	Confluence with Big Elk Creek	1,400 feet upstream of Harlan-Burnt Woods Road bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Sugarbowl Creek	Confluence with Big Elk Creek	2.3 miles upstream of GL Ridenour bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Sunshine Creek	Confluence with Siletz River	1,100 feet upstream of Siletz River	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Thiel Creek	Confluence with Pacific Ocean	4,600 feet upstream of Highway 101 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Trout Creek	Confluence with Slick Rock Creek	1,100 feet upstream of Slick Rock Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Tumtum River	County boundary	2 miles upstream of Highway 20 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Tumtum River Tributary 1	Confluence with Tumtum River	2,800 feet upstream of Highway 20 bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Stream (Depot Creek Tributary)	Confluence with Depot Creek	2,500 feet upstream of Depot Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Unnamed Stream (Sugarbowl Creek Tributary)	Confluence with Sugarbowl Creek	2,500 feet upstream of Sugarbowl Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Unnamed Tumtum West Tributary	Confluence with Tumtum River	900 feet upstream of Bennett Lane bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Walker Creek	Confluence with Alsea River	4,200 feet upstream of North Bayview Road bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
West Olalla Creek (Lower, Detailed)	Confluence with Olalla Slough	2,300 feet upstream of Fairway Drive	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
West Olalla Creek (Upper, Approximate)	2,300 feet upstream of Fairway Drive	1,700 feet downstream of West Olalla Creek dam	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Wilson Creek	Confluence with Buck Creek	2,000 feet upstream of East Wilson Creek Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Wolf Creek	Confluence with Big Elk Creek	500 feet upstream of Wolf Creek Rd bridge	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Wright Creek	2,300 feet upstream of confluence with Poole Slough	1.5 miles upstream of Poole Slough	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Yachats River (Lower, Detailed)	Confluence with Pacific Ocean	500 feet downstream of Wolf Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits: Downstream Limit	Study Limits: Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Yachats River (Upper, Approximate)	500 feet downstream of confluence with Wolf Creek	County boundary	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Yaquina River (Lower Detailed, Detailed)	2 miles upstream of Pacific Ocean	700 feet downstream of Mill Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Yaquina River (Middle, Detailed)	2,000 feet downstream of confluence with Big Elk Creek	400 feet downstream of Little Carlisle Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Yaquina River (Upper, Detailed)	1,400 feet upstream of confluence with Eddy Creek	2,500 feet downstream of Trout Creek	Log Pearson Type III Frequency Analysis[1]	HEC-2	October 1977	AE	Detailed study including bathymetric field survey, land use roughness considerations, and hydraulic structure dimensions.
Yaquina River (Lower, Approximate)	700 feet downstream of confluence with Mill Creek	2,000 feet downstream of Big Elk Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 13: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits: Downstream Limit	Study Limits: Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Yaquina River (Middle, Approximate)	400 feet downstream of confluence with Little Carlisle Creek	1,400 feet upstream of Eddy Creek	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.
Yaquina River (Upper, Approximate)	2,500 feet downstream of confluence with Trout Creek	3,000 feet downstream of Little Yaquina River	USGS/OWRD Regional Regression Model for Western Oregon[2]	HEC-RAS 4.1.0[3]	February 2016	A	Approximate study based on lidar topographic data with generalized roughness and assumed hydraulic structure dimensions.

[1]WRC 1976

[2]Cooper 2005

[3]USACE 2010

Table 14: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Alsea River	0.030-0.055	0.035-0.100
Anderson Creek	0.040	0.040
Anderson Creek (Drift Creek Tributary)	0.040	0.040
Baldy Creek	0.040	0.040
Bales Creek	0.040	0.040
Bear Creek	0.040	0.040
Beaver Creek	0.040	0.040
Beaver Creek (Depot Creek Tributary)	0.040	0.040
Big Creek	0.030-0.055	0.035-0.100
Big Elk Creek	0.040	0.040
Big Rock Creek	0.040	0.040
Buck Creek	0.040	0.040
Canal Creek	0.040	0.040
Cascade Creek	0.040	0.040
Cedar Creek	0.040	0.040
Cherry Creek	0.040	0.040
Cougar Creek	0.040	0.040
Coyote Creek	0.040	0.040
Crab Creek	0.040	0.040
Deer Creek	0.040	0.040
Depot Creek	0.040	0.040
Depot Creek / Slough	0.030-0.055	0.035-0.100
Drift Creek	0.040	0.040
Drift Creek (Alsea River Tributary)	0.040	0.040
Elkhorn Creek	0.040	0.040
Fall Creek	0.040	0.040
Feagles Creek	0.040	0.040
Five Rivers	0.040	0.040
Grant Creek	0.040	0.040
Helms Creek	0.040	0.040
Hymes Creek	0.040	0.040
Jeffries Creek	0.040	0.040
Keller Creek	0.040	0.040
Little Beaver Creek	0.040	0.040
Little Creek	0.040	0.040
Little Depot Creek	0.040	0.040
Little Elk Creek	0.040	0.040
Mill Creek	0.040	0.040
North Depoe Bay Creek	0.040	0.040
North Fork Yachats River	0.040	0.040
Nute Slough	0.040	0.040
Oliver Creek	0.040	0.040
Reynolds Creek	0.040	0.040
Rock Creek	0.040	0.040

Table 14: Roughness Coefficients *(continued)*

Flooding Source	Channel "n"	Overbank "n"
Salmon Creek	0.040	0.040
Salmon River	0.030-0.055	0.035-0.100
Salmon River (Lower, Approximate)	0.040	0.040
Salmon River (Upper, Approximate)	0.040	0.040
Schoolhouse Creek	0.040	0.040
Schooner Creek	0.030-0.055	0.035-0.100
Shotpouch Creek	0.040	0.040
Sijota Creek	0.040	0.040
Siletz River (Lower, Approximate)	0.040	0.040
Siletz River (Lower, Detailed)	0.055	0.120
Siletz River (Middle, Approximate)	0.040	0.040
Siletz River (Middle, Detailed)	0.055	0.120
Siletz River (Upper, Approximate)	0.040	0.040
Siletz River (Upper, Detailed)	0.055	0.120
Skunk Creek	0.040	0.040
Slick Rock Creek	0.040	0.040
South Beaver Creek	0.040	0.040
South Depoe Bay Creek	0.040	0.040
Spout Creek	0.040	0.040
Sugarbowl Creek	0.040	0.040
Sunshine Creek	0.040	0.040
Thiel Creek	0.040	0.040
Trout Creek	0.040	0.040
Tumtum River	0.040	0.040
Unnamed Stream (Depot Creek Tributary)	0.040	0.040
Unnamed Stream (Sugarbowl Creek Tributary)	0.040	0.040
Unnamed Stream (Tumtum River Tributary 1)	0.040	0.040
Unnamed Stream (Tumtum River Tributary 2)	0.040	0.040
Walker Creek	0.040	0.040
West Olalla Creek	0.030-0.055	0.035-0.100
West Olalla Creek (Upper, Approximate)	0.040	0.040
Wilson Creek	0.040	0.040
Wolf Creek	0.040	0.040
Yachats River	0.030-0.055	0.035-0.100
Yachats River (Upper, Approximate)	0.040	0.040

Table 14: Roughness Coefficients *(continued)*

Flooding Source	Channel "n"	Overbank "n"
Yaquina River (Lower, Approximate)	0.040	0.040
Yaquina River (Lower, Detailed)	0.030-0.055	0.035-0.100
Yaquina River (Middle, Approximate)	0.040	0.040
Yaquina River (Middle, Detailed)	0.030-0.055	0.035-0.100
Yaquina River (Upper, Approximate)	0.040	0.040
Yaquina River (Upper, Detailed)	0.030-0.055	0.035-0.100

5.3 Coastal Analyses

For the areas of Lincoln County that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for this FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 15 summarizes the methods and/or models used for the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Table 15: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Storm Surge	Statistical analyses of non-tidal residuals derived from measured tides (40-year record)	July 2012
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Stillwater Levels	Statistical analyses of non-tidal residuals derived from measured tides (40-year record) with GEV/Peak-over-threshold statistical analysis	July 2012

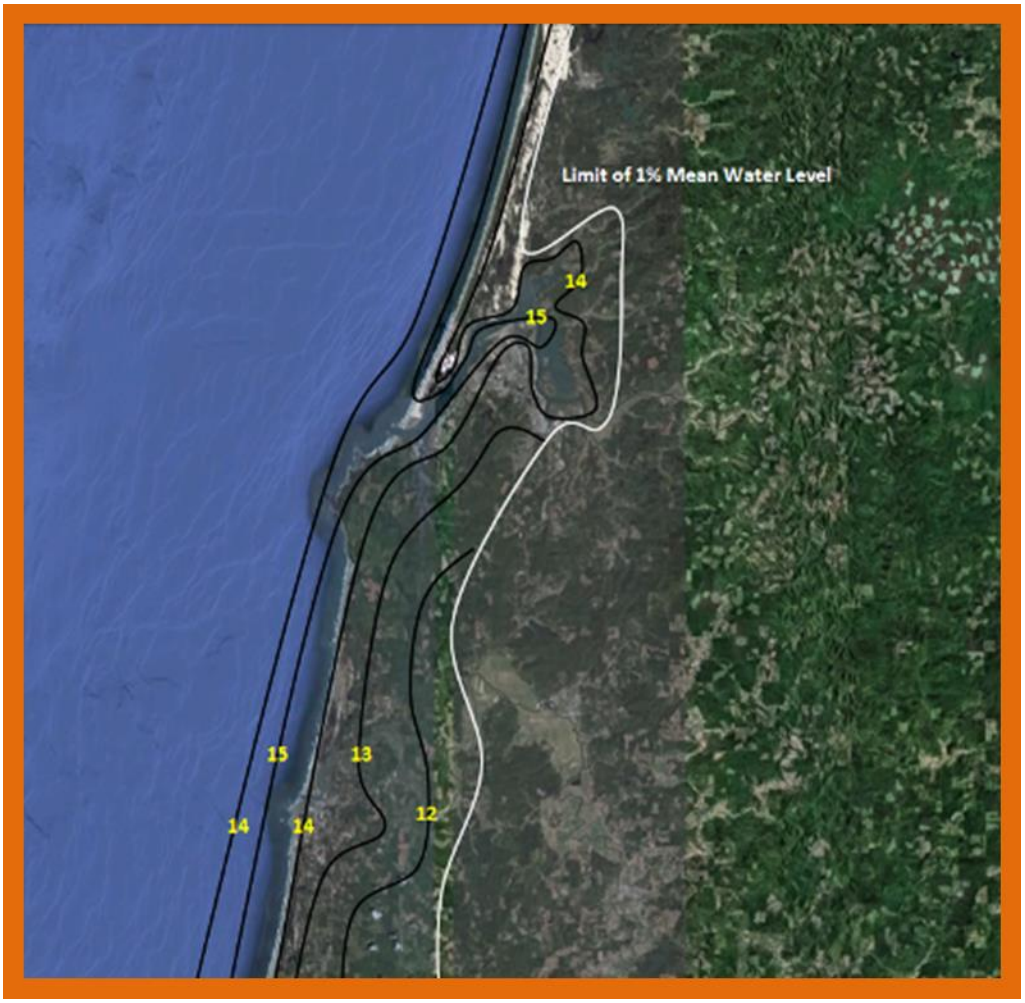
Table 15: Summary of Coastal Analyses *(continued)*

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Dune Erosion Analysis	Kriebel and Dean 1993	July 2012
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Wave Generation	Measured time series of waves derived from NDBC buoys – 30-year record	July 2012
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Wave Modeling	SWAN	January 2013
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Wave Setup	Intergrated in the Stockdon et al. 2006 wave runup calculation. Can be calculated from equation #10 in Stockdon.	July 2013
Pacific Ocean	Entire coastline of Lincoln County	Entire coastline of Lincoln County	Wave Runup	Stockdon et al. 2006/TAW (van der Meer 2002) with GEV/Peak-over-threshold statistical analysis	July 2013

5.3.1 Total Stillwater Elevations

The total stillwater elevations (stillwater including storm surge plus wave setup) for the 1% annual chance flood were determined for areas subject to coastal flooding. The models and methods that were used to determine storm surge and wave setup are listed in Table 15. The stillwater elevation that was used for each transect in coastal analyses is shown in Table 17, “Coastal Transect Parameters.” Figure 8 shows the total stillwater elevations for the 1% annual chance flood that was determined for this coastal analysis.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas



Astronomical Tide

Astronomical tidal statistics were generated directly from the measured tides using the harmonic analysis method of least squares approach (Boon 2004) to estimate the amplitude and phase for any set of tidal constituents in Matlab. This approach was used to define the predicted tides, which were then subtracted from the measured tides to yield non-tidal residuals used to assess the frequency and magnitudes of storms surges on the Oregon coast.

Storm Surge Statistics

Storm surge is modeled based on characteristics of actual storms responsible for significant coastal flooding. The characteristics of these storms are typically determined by statistical study of the regional historical record of storms or by statistical study of tidal gages.

Tidal gages can be used instead of historic records of storms when the available tidal gage record for the area represents both the astronomical tide component and the storm surge component. Table 16 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the stillwater elevations.

Table 16: Tide Gage Analysis Specifics

Gage Name	Managing Agency of Tide Gage Record	Gage Type	Start Date	End Date	Statistical Methodology
9435380	NOAA	Tide	1967	2005	Peak-Over-Threshold

Wave Setup Analysis

Wave setup was computed during the storm surge modeling through the methods and models listed in Table 15 and included in the frequency analysis for the determination of the total stillwater elevations. In all cases Stockdon et al., (2006) was used to derive calculations of the wave runup and ultimately the total water level for dune-backed beaches. For beaches backed with structures or bluffs, Stockdon was used to initially calculate the 2% water level at the structure or bluff toe and subsequently the bore height. TAW was used with the local structure slope to calculate the wave runup on the structure or bluff face.

5.3.2 Waves

SWAN (Simulating WAves Nearshore) version number 40.81, a third generation wave model developed at the Technical University of Delft in the Netherlands (Booij et al. 1999; Ris et al. 1999), was used in this study. The model solves the spectral action balance equation using finite differences for a spectral or parametric input specified along the boundaries. The SWAN runs were executed in stationary mode and included physics that account for shoaling, refraction, and breaking. A matrix of SWAN runs were executed in order to assist with the development of a lookup table for transforming waves offshore from Lincoln County.

5.3.3 Coastal Erosion

A single storm episode can cause extensive erosion in coastal areas. Storm-induced erosion was evaluated to determine the modification to existing topography that is expected to be associated with flooding events. Erosion was evaluated using the methods listed in Table 15. The post-event eroded profile was used for the subsequent transect-based onshore wave hazard analyses.

5.3.4 Wave Hazard Analyses

Overland wave hazards were evaluated to determine the combined effects of ground elevation, vegetation, and physical features on overland wave propagation and wave runup. These analyses were performed at representative transects along all shorelines for which waves were expected to be present during the floods of the selected recurrence intervals. The results of these analyses were used to determine elevations for the 1% annual chance flood.

Transect locations were chosen with consideration given to the physical land characteristics as well as development type and density so that they would closely represent conditions in their locality. Additional consideration was given to changes in the total stillwater elevation. Transects were spaced close together in areas of complex topography and dense development or where total stillwater elevations varied. In areas having more uniform characteristics, transects were spaced at larger intervals. Transects shown in Figure 9, “Transect Location Map,” are also depicted on the FIRM. Table 17 provides the location, stillwater elevations, and starting wave conditions for each transect evaluated for overland wave hazards. In this table, “starting” indicates the parameter value at the beginning of the transect.

Wave Height Analysis

Wave height analyses were performed to determine wave heights and corresponding wave crest elevations for the areas inundated by coastal flooding and subject to overland wave propagation hazards. Refer to Figure 6 for a schematic of a coastal transect evaluated for overland wave propagation hazards.

Wave heights and wave crest elevations were modeled using the methods and models listed in Table 15, “Summary of Coastal Analyses”.

Wave Runup Analysis

Wave runup analyses were performed to determine the height and extent of runup beyond the limit of stillwater inundation for the 1% annual chance flood. Wave runup elevations were modeled using the methods and models listed in Table 15.

Table 17: Coastal Transect Parameters

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	1	25.4	28.7	30.4	34.8	11.5	11.8
Pacific Ocean	2	29.4	34.2	36.5	42.8	11.5	11.8
Pacific Ocean	3	29.9	30.1	30.2	30.2	11.5	11.8
Pacific Ocean	4	22.6	26.5	28.5	34.0	11.5	11.8
Pacific Ocean	5	27.5	27.9	27.9	280	11.5	11.8
Pacific Ocean	6	27.7	30.7	32.1	35.3	11.5	11.8
Pacific Ocean	7	23.8	26.1	27.0	29.1	11.5	11.8
Pacific Ocean	8	21.2	23.0	23.8	25.4	11.5	11.8
Pacific Ocean	9	22.5	25.4	26.4	28.2	11.5	11.8
Pacific Ocean	10	21.1	24.4	25.9	29.7	11.5	11.8
Pacific Ocean	11	24.2	30.8	35.0	49.4	11.5	11.8
Pacific Ocean	12	33.6	38.5	40.4	44.0	11.5	11.8
Pacific Ocean	13	26.1	31.6	34.2	40.8	11.5	11.8
Pacific Ocean	14	23.4	30.3	34.8	51.0	11.5	11.8
Pacific Ocean	15	24.4	27.6	28.8	31.1	11.5	11.8
Pacific Ocean	16	28.4	30.0	30.5	31.3	11.5	11.8
Pacific Ocean	17	27.4	33.0	35.4	40.9	11.5	11.8
Pacific Ocean	18	27.0	29.0	29.6	30.6	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	19	21.9	27.5	30.6	39.8	11.5	11.8
Pacific Ocean	20	27.7	29.8	30.4	31.3	11.5	11.8
Pacific Ocean	21	29.8	32.8	33.8	35.5	11.5	11.8
Pacific Ocean	22	29.1	32.3	33.4	35.2	11.5	11.8
Pacific Ocean	23	32.1	36.0	37.4	39.9	11.5	11.8
Pacific Ocean	24	20.8	24.8	27.0	33.8	11.5	11.8
Pacific Ocean	25	32.6	36.8	38.4	41.8	11.5	11.8
Pacific Ocean	26	24.7	27.3	28.1	29.4	11.5	11.8
Pacific Ocean	27	20.8	24.4	26.4	32.3	11.5	11.8
Pacific Ocean	28	24.3	30.0	32.6	39	11.5	11.8
Pacific Ocean	29	26.9	32.1	34.2	38.7	11.5	11.8
Pacific Ocean	30	21.0	23.8	25.2	28.9	11.5	11.8
Pacific Ocean	31	20.9	22.8	23.5	25.1	11.5	11.8
Pacific Ocean	32	22.4	25.5	26.9	30.6	11.5	11.8
Pacific Ocean	33	32.0	38.2	41.0	48.0	11.5	11.8
Pacific Ocean	34	29.7	33.5	34.9	37.7	11.5	11.8
Pacific Ocean	35	36.0	41.7	44.1	50.0	11.5	11.8
Pacific Ocean	36	28.8	35.1	38.0	45.3	11.5	11.8
Pacific Ocean	37	30.5	34.5	36.0	38.9	11.5	11.8
Pacific Ocean	38	20.9	25.4	28.0	36.7	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	39	29.8	34.1	35.8	39.3	11.5	11.8
Pacific Ocean	40	25.5	29.6	31.4	35.9	11.5	11.8
Pacific Ocean	41	27.2	31.1	32.9	36.9	11.5	11.8
Pacific Ocean	42	27.7	31.7	32.9	34.9	11.5	11.8
Pacific Ocean	43	29.2	34.3	36.4	41.2	11.5	11.8
Pacific Ocean	44	30.5	34.7	36.5	40.4	11.5	11.8
Pacific Ocean	45	23.1	30.2	34.9	51.7	11.5	11.8
Pacific Ocean	46	32.2	36.1	37.5	40.1	11.5	11.8
Pacific Ocean	47	23.4	29.3	32.7	43.3	11.5	11.8
Pacific Ocean	48	22.8	27.4	29.8	37.0	11.5	11.8
Pacific Ocean	49	29.0	33.9	36.2	42.2	11.5	11.8
Pacific Ocean	50	27.7	31.1	32.3	34.6	11.5	11.8
Pacific Ocean	51	27.2	32.2	34.3	39.3	11.5	11.8
Pacific Ocean	52	22.0	24.2	25.2	27.5	11.5	11.8
Pacific Ocean	53	20.4	22.3	23.2	25.1	11.5	11.8
Pacific Ocean	54	22.3	24.3	25.2	27.1	11.5	11.8
Pacific Ocean	55	29.6	34.2	35.8	38.8	11.5	11.8
Pacific Ocean	56	23.1	25.2	26.1	28.2	11.5	11.8
Pacific Ocean	57	28.0	32.2	33.7	36.9	11.5	11.8
Pacific Ocean	58	20.9	22.9	23.8	25.8	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	59	21.0	25.2	27.5	34.8	11.5	11.8
Pacific Ocean	60	22.0	24.3	25.4	28.1	11.5	11.8
Pacific Ocean	61	25.5	29.4	30.7	33.4	11.5	11.8
Pacific Ocean	62	21.0	23.7	25.0	28.6	11.5	11.8
Pacific Ocean	63	20.4	25.9	29.3	40.9	11.5	11.8
Pacific Ocean	64	25.9	29.4	30.6	32.8	11.5	11.8
Pacific Ocean	65	22.3	26.8	29.3	36.7	11.5	11.8
Pacific Ocean	66	21.3	23.4	24.4	26.5	11.5	11.8
Pacific Ocean	67	22.8	25.1	26.1	28.3	11.5	11.8
Pacific Ocean	68	22.0	24.0	24.9	26.9	11.5	11.8
Pacific Ocean	69	23.2	25.8	27.1	30.2	11.5	11.8
Pacific Ocean	70	19.5	21.7	22.8	25.5	11.5	11.8
Pacific Ocean	71	19.8	21.8	22.8	25.1	11.5	11.8
Pacific Ocean	72	20.5	22.4	23.2	25.1	11.5	11.8
Pacific Ocean	73	20.5	23.4	24.9	29.3	11.5	11.8
Pacific Ocean	74	23.9	26.3	27.3	29.6	11.5	11.8
Pacific Ocean	75	30.8	34.3	35.8	39.5	11.5	11.8
Pacific Ocean	76	21.1	23.5	24.6	27.6	11.5	11.8
Pacific Ocean	77	22.8	24.8	25.7	27.7	11.5	11.8
Pacific Ocean	78	22.8	24.7	25.5	27.2	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	79	20.7	22.8	23.7	26.0	11.5	11.8
Pacific Ocean	80	25.7	28.7	30.1	33.5	11.5	11.8
Pacific Ocean	81	21.6	24.1	25.4	28.5	11.5	11.8
Pacific Ocean	82	23.2	27.9	30.2	36.8	11.5	11.8
Pacific Ocean	83	21.2	26.2	29.3	39.8	11.5	11.8
Pacific Ocean	84	21.1	23.4	24.5	27.3	11.5	11.8
Pacific Ocean	85	20.9	22.9	23.7	25.7	11.5	11.8
Pacific Ocean	86	21.0	23.1	24.0	26.1	11.5	11.8
Pacific Ocean	87	20.6	22.4	23.1	24.9	11.5	11.8
Pacific Ocean	88	20.1	22.1	23.0	25.2	11.5	11.8
Pacific Ocean	89	21.9	28.6	33.0	48.2	11.5	11.8
Pacific Ocean	90	21.0	22.8	23.5	25.2	11.5	11.8
Pacific Ocean	91	26.3	32.1	34.8	41.3	11.5	11.8
Pacific Ocean	92	21.4	23.4	24.3	26.2	11.5	11.8
Pacific Ocean	93	27.4	33.5	36.2	42.8	11.5	11.8
Pacific Ocean	94	27.2	33.3	36.0	42.8	11.5	11.8
Pacific Ocean	95	22.5	26.8	28.9	34.9	11.5	11.8
Pacific Ocean	96	36.3	41.8	44.1	49.3	11.5	11.8
Pacific Ocean	97	28.2	35.2	38.5	46.8	11.5	11.8
Pacific Ocean	98	32.8	40.2	43.7	52.5	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	99	31.7	38.8	42.2	50.8	11.5	11.8
Pacific Ocean	100	30.2	35.2	37.2	41.4	11.5	11.8
Pacific Ocean	101	26.0	32.5	36.3	48.6	11.5	11.8
Pacific Ocean	102	25.9	31.8	34.5	41.0	11.5	11.8
Pacific Ocean	103	30.4	38.3	43.4	61.6	11.5	11.8
Pacific Ocean	104	27.2	32.5	35.3	43.1	11.5	11.8
Pacific Ocean	105	19.1	20.7	21.5	23.2	11.5	11.8
Pacific Ocean	106	19.2	20.6	21.2	22.4	11.5	11.8
Pacific Ocean	107	25.7	28.6	29.9	33.3	11.5	11.8
Pacific Ocean	108	23.3	25.4	26.3	28.4	11.5	11.8
Pacific Ocean	109	28.6	32.6	33.8	36.0	11.5	11.8
Pacific Ocean	110	27.7	31.6	33.3	37.5	11.5	11.8
Pacific Ocean	111	28.3	34.1	36.5	41.9	11.5	11.8
Pacific Ocean	112	26.6	30.3	31.9	35.3	11.5	11.8
Pacific Ocean	113	38.4	42.4	43.8	46.5	11.5	11.8
Pacific Ocean	114	33.6	39.5	42.0	47.9	11.5	11.8
Pacific Ocean	115	29.0	35.3	38.2	45.0	11.5	11.8
Pacific Ocean	116	31.8	36.5	38.4	42.4	11.5	11.8
Pacific Ocean	117	29.0	34.2	36.3	40.8	11.5	11.8
Pacific Ocean	118	23.1	25.2	26.0	28.1	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	119	22.9	29.7	34.2	50.9	11.5	11.8
Pacific Ocean	120	26.1	32.5	35.6	43.6	11.5	11.8
Pacific Ocean	121	33.0	37.2	38.7	41.7	11.5	11.8
Pacific Ocean	122	33.1	39.0	41.6	47.7	11.5	11.8
Pacific Ocean	123	29.2	35.8	38.9	46.3	11.5	11.8
Pacific Ocean	124	37.8	43.0	45.2	49.9	11.5	11.8
Pacific Ocean	125	24.3	31.2	35.3	48.7	11.5	11.8
Pacific Ocean	126	23.0	24.7	25.4	26.8	11.5	11.8
Pacific Ocean	127	29.0	33.9	35.7	39.3	11.5	11.8
Pacific Ocean	128	28.3	37.2	42.2	57.6	11.5	11.8
Pacific Ocean	129	33.6	39.6	42.3	48.5	11.5	11.8
Pacific Ocean	130	28.2	33.3	35.4	39.8	11.5	11.8
Pacific Ocean	131	29.8	35.6	38.2	44.5	11.5	11.8
Pacific Ocean	132	24.3	32.4	37.7	56.8	11.5	11.8
Pacific Ocean	133	29.2	35.8	38.9	46.3	11.5	11.8
Pacific Ocean	134	33.8	40.6	43.4	49.6	11.5	11.8
Pacific Ocean	135	23.6	29.0	31.9	40.4	11.5	11.8
Pacific Ocean	136	27.5	29.8	30.3	31.0	11.5	11.8
Pacific Ocean	137	27.6	34.9	38.5	48.1	11.5	11.8
Pacific Ocean	138	29.3	34.0	35.9	40.2	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	139	21.3	23.5	24.4	27.0	11.5	11.8
Pacific Ocean	140	24.5	28.4	30.5	36.6	11.5	11.8
Pacific Ocean	141	23.9	27.1	28.7	33.0	11.5	11.8
Pacific Ocean	142	24.1	28.3	30.6	37.9	11.5	11.8
Pacific Ocean	143	21.4	24.0	25.3	28.6	11.5	11.8
Pacific Ocean	144	21.3	23.7	24.8	27.6	11.5	11.8
Pacific Ocean	145	29.2	33.4	34.9	37.9	11.5	11.8
Pacific Ocean	146	27.9	34.3	37.2	44.6	11.5	11.8
Pacific Ocean	147	21.6	25.4	27.5	33.7	11.5	11.8
Pacific Ocean	148	35.8	38.5	39.1	39.9	11.5	11.8
Pacific Ocean	149	31.2	35.4	37.2	41.0	11.5	11.8
Pacific Ocean	150	23.2	28.0	30.6	38.2	11.5	11.8
Pacific Ocean	151	21.5	23.7	24.7	27.2	11.5	11.8
Pacific Ocean	152	20.1	21.7	22.4	23.8	11.5	11.8
Pacific Ocean	153	28.6	31.7	32.5	33.7	11.5	11.8
Pacific Ocean	154	19.4	21.3	22.2	24.4	11.5	11.8
Pacific Ocean	155	19.3	21.2	22.1	24.3	11.5	11.8
Pacific Ocean	156	19.8	21.9	22.9	25.2	11.5	11.8
Pacific Ocean	157	19.9	21.9	22.9	25.2	11.5	11.8
Pacific Ocean	158	20.0	22.2	23.3	26.2	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	159	19.1	21.2	22.2	24.8	11.5	11.8
Pacific Ocean	160	22.1	24.1	24.9	26.7	11.5	11.8
Pacific Ocean	161	33.3	37.1	38.1	39.7	11.5	11.8
Pacific Ocean	162	50.8	53.5	54.3	55.4	11.5	11.8
Pacific Ocean	163	22.9	27.3	29.7	37.0	11.5	11.8
Pacific Ocean	164	27.8	32.4	34.3	38.5	11.5	11.8
Pacific Ocean	165	31.9	36.9	38.8	42.9	11.5	11.8
Pacific Ocean	166	27.0	30.4	31.8	34.5	11.5	11.8
Pacific Ocean	167	27.5	29.9	30.7	32.0	11.5	11.8
Pacific Ocean	168	31.5	37.1	39.3	44.0	11.5	11.8
Pacific Ocean	169	25.2	29.8	31.9	37.2	11.5	11.8
Pacific Ocean	170	32.7	40.7	44.6	55.1	11.5	11.8
Pacific Ocean	171	31.4	37.6	39.9	44.5	11.5	11.8
Pacific Ocean	172	30.5	35.0	36.4	38.8	11.5	11.8
Pacific Ocean	173	31.5	35.9	37.7	41.5	11.5	11.8
Pacific Ocean	174	27.0	31.1	33.1	38.5	11.5	11.8
Pacific Ocean	175	24.0	30.5	34.6	49.1	11.5	11.8
Pacific Ocean	176	33.2	41.8	45.9	56.1	11.5	11.8
Pacific Ocean	177	31.6	39.7	43.4	52.7	11.5	11.8
Pacific Ocean	178	23.3	29.5	33.6	48.6	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	179	30.4	38.4	42.2	51.9	11.5	11.8
Pacific Ocean	180	25.1	32.2	36.2	49.0	11.5	11.8
Pacific Ocean	181	21.5	23.9	24.9	27.6	11.5	11.8
Pacific Ocean	182	22.5	27.5	30.5	40.4	11.5	11.8
Pacific Ocean	183	26.4	29.7	30.6	32.1	11.5	11.8
Pacific Ocean	184	27.2	32.3	34.3	38.5	11.5	11.8
Pacific Ocean	185	28.7	34.6	37.2	43.7	11.5	11.8
Pacific Ocean	186	25.7	32.5	36.6	49.7	11.5	11.8
Pacific Ocean	187	29.5	32.3	33.3	35.1	11.5	11.8
Pacific Ocean	188	40.9	46.2	48.2	52.3	11.5	11.8
Pacific Ocean	189	43.0	47.8	49.7	53.5	11.5	11.8
Pacific Ocean	190	39.5	47.8	51.8	62.1	11.5	11.8
Pacific Ocean	191	45.9	48.4	49.2	50.4	11.5	11.8
Pacific Ocean	192	38.7	45.1	47.9	54.4	11.5	11.8
Pacific Ocean	193	41.5	44.5	45.6	47.9	11.5	11.8
Pacific Ocean	194	37.5	39.5	40.0	40.8	11.5	11.8
Pacific Ocean	195	40.4	42.3	42.9	43.8	11.5	11.8
Pacific Ocean	196	39.7	42.6	43.6	45.5	11.5	11.8
Pacific Ocean	197	35.2	37.7	38.6	40.1	11.5	11.8
Pacific Ocean	198	43.2	46.2	47.4	49.6	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	199	51.0	54.2	55.5	58.2	11.5	11.8
Pacific Ocean	200	35.5	37.5	38.1	39.1	11.5	11.8
Pacific Ocean	201	41.7	44.2	45.2	47.0	11.5	11.8
Pacific Ocean	202	43.1	46.0	47.1	49.4	11.5	11.8
Pacific Ocean	203	42.8	45.6	46.6	48.6	11.5	11.8
Pacific Ocean	204	37.2	39.3	40.0	41.3	11.5	11.8
Pacific Ocean	205	26.3	31.3	33.8	40.9	11.5	11.8
Pacific Ocean	206	26.8	30.8	32.5	36.1	11.5	11.8
Pacific Ocean	207	39.6	41.6	42.2	43.2	11.5	11.8
Pacific Ocean	208	44.5	47.0	47.9	49.4	11.5	11.8
Pacific Ocean	209	43.7	47.1	48.4	51.2	11.5	11.8
Pacific Ocean	209B	35.8	39.9	41.5	44.5	11.5	11.8
Pacific Ocean	210	36.8	45.7	50.2	62.7	11.5	11.8
Pacific Ocean	211	32.8	37.3	39.2	43.2	11.5	11.8
Pacific Ocean	212	33.9	37.3	38.6	41.3	11.5	11.8
Pacific Ocean	213	44.3	45.1	45.3	45.5	11.5	11.8
Pacific Ocean	214	45.3	47.8	48.6	50.0	11.5	11.8
Pacific Ocean	215	25.4	30.3	33.2	42.3	11.5	11.8
Pacific Ocean	216	39.5	44.4	46.4	51.0	11.5	11.8
Pacific Ocean	217	27.9	31.3	32.6	34.9	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	218	19.4	21.5	22.4	24.9	11.5	11.8
Pacific Ocean	219	26.3	28.7	29.8	32.2	11.5	11.8
Pacific Ocean	220	30.9	33.7	34.8	37.4	11.5	11.8
Pacific Ocean	221	36.2	40.6	42.6	47.3	11.5	11.8
Pacific Ocean	222	35.0	38.5	39.6	41.6	11.5	11.8
Pacific Ocean	223	33.8	37.5	38.8	41.3	11.5	11.8
Pacific Ocean	224	32.4	39.0	41.8	48.5	11.5	11.8
Pacific Ocean	225	37.9	43.0	45.0	49.2	11.5	11.8
Pacific Ocean	226	34.4	39.1	41.2	46.1	11.5	11.8
Pacific Ocean	227	31.4	38.2	41.6	50.8	11.5	11.8
Pacific Ocean	228	29.4	35.2	37.5	42.8	11.5	11.8
Pacific Ocean	229	27.4	32.1	34.6	42.4	11.5	11.8
Pacific Ocean	230	30.7	36.2	38.3	42.8	11.5	11.8
Pacific Ocean	231	31.3	35.6	37.8	43.7	11.5	11.8
Pacific Ocean	232	34.4	42.1	45.4	52.6	11.5	11.8
Pacific Ocean	233	34.0	39.7	42.2	48.0	11.5	11.8
Pacific Ocean	234	32.4	36.9	38.6	42.5	11.5	11.8
Pacific Ocean	235	34.9	39.7	41.6	45.7	11.5	11.8
Pacific Ocean	236	24.4	27.4	28.9	32.7	11.5	11.8
Pacific Ocean	237	31.3	37.9	40.7	47.0	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	238	34.3	38.1	39.6	43.0	11.5	11.8
Pacific Ocean	239	24.1	30.0	33.6	46.4	11.5	11.8
Pacific Ocean	240	25.9	28.3	29.3	31.8	11.5	11.8
Pacific Ocean	241	25.2	31.9	36.1	50.7	11.5	11.8
Pacific Ocean	242	27.8	32.2	33.7	36.5	11.5	11.8
Pacific Ocean	243	32.7	42.1	46.6	58.2	11.5	11.8
Pacific Ocean	244	27.2	29.9	31.0	33.7	11.5	11.8
Pacific Ocean	245	26.1	28.6	29.6	32.0	11.5	11.8
Pacific Ocean	246	27.2	31.1	33.1	38.7	11.5	11.8
Pacific Ocean	247	26.2	28.6	29.6	31.9	11.5	11.8
Pacific Ocean	248	25.6	28.2	29.4	32.2	11.5	11.8
Pacific Ocean	249	29.2	33.0	34.8	39.5	11.5	11.8
Pacific Ocean	250	27.3	29.5	30.4	32.2	11.5	11.8
Pacific Ocean	251	26.3	28.8	29.9	32.5	11.5	11.8
Pacific Ocean	252	28.1	31.6	33.3	37.6	11.5	11.8
Pacific Ocean	253	32.4	35.9	37.5	41.1	11.5	11.8
Pacific Ocean	254	29.8	33.7	35.6	40.3	11.5	11.8
Pacific Ocean	255	24.9	28.1	29.6	33.9	11.5	11.8
Pacific Ocean	256	24.8	28.3	30.1	35.2	11.5	11.8
Pacific Ocean	257	26.7	30.8	32.9	39.1	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	258	31.1	35.0	36.9	41.9	11.5	11.8
Pacific Ocean	259	25.3	28.6	30.2	34.7	11.5	11.8
Pacific Ocean	260	20.8	22.9	23.9	26.2	11.5	11.8
Pacific Ocean	261	24.9	27.8	29.1	32.4	11.5	11.8
Pacific Ocean	262	25.6	28.0	29.0	31.1	11.5	11.8
Pacific Ocean	263	27.3	32.9	35.9	44.7	11.5	11.8
Pacific Ocean	264	22.6	28.0	31.4	43.2	11.5	11.8
Pacific Ocean	265	25.0	28.5	30.4	35.8	11.5	11.8
Pacific Ocean	266	27.7	33.0	35.8	44.1	11.5	11.8
Pacific Ocean	267	29.5	36.1	39.2	46.8	11.5	11.8
Pacific Ocean	268	29.9	35.3	38.0	45.3	11.5	11.8
Pacific Ocean	269	25.2	27.2	27.9	29.6	11.5	11.8
Pacific Ocean	270	24.5	28.7	30.9	37.4	11.5	11.8
Pacific Ocean	271	27.8	31.2	32.3	34.0	11.5	11.8
Pacific Ocean	272	29.4	33.5	34.9	37.5	11.5	11.8
Pacific Ocean	273	25.2	27.9	29.1	31.8	11.5	11.8
Pacific Ocean	274	29.5	33.5	34.7	36.8	11.5	11.8
Pacific Ocean	275	37.2	42.9	45.1	49.7	11.5	11.8
Pacific Ocean	276	27.9	32.4	34.7	40.5	11.5	11.8
Pacific Ocean	277	24.3	27.1	28.4	31.7	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	278	30.8	35.2	36.9	40.4	11.5	11.8
Pacific Ocean	279	32.0	36.2	37.5	39.5	11.5	11.8
Pacific Ocean	280	29.0	32.8	34.1	36.6	11.5	11.8
Pacific Ocean	281	27.3	31.3	32.8	35.8	11.5	11.8
Pacific Ocean	282	27.0	29.7	30.7	32.8	11.5	11.8
Pacific Ocean	283	20.9	23.1	24.1	26.6	11.5	11.8
Pacific Ocean	284	27.7	31.9	33.6	37.1	11.5	11.8
Pacific Ocean	285	25.0	27.6	28.7	31.4	11.5	11.8
Pacific Ocean	286	28.3	34.5	37.1	43.0	11.5	11.8
Pacific Ocean	287	26.2	33.8	38.7	56.4	11.5	11.8
Pacific Ocean	288	26.9	28.9	29.3	29.9	11.5	11.8
Pacific Ocean	289	30.1	35.5	38.4	46.4	11.5	11.8
Pacific Ocean	290	27.0	29.6	30.7	33.3	11.5	11.8
Pacific Ocean	291	28.0	30.9	32.2	35.1	11.5	11.8
Pacific Ocean	292	28.3	33.1	35.5	41.9	11.5	11.8
Pacific Ocean	293	28.7	34.7	38.0	47.3	11.5	11.8
Pacific Ocean	294	32.7	39.5	42.5	49.5	11.5	11.8
Pacific Ocean	295	25.4	30.1	32.2	37.1	11.5	11.8
Pacific Ocean	296	30.2	37.6	41.1	49.9	11.5	11.8
Pacific Ocean	297	23.4	27.6	29.9	36.3	11.5	11.8

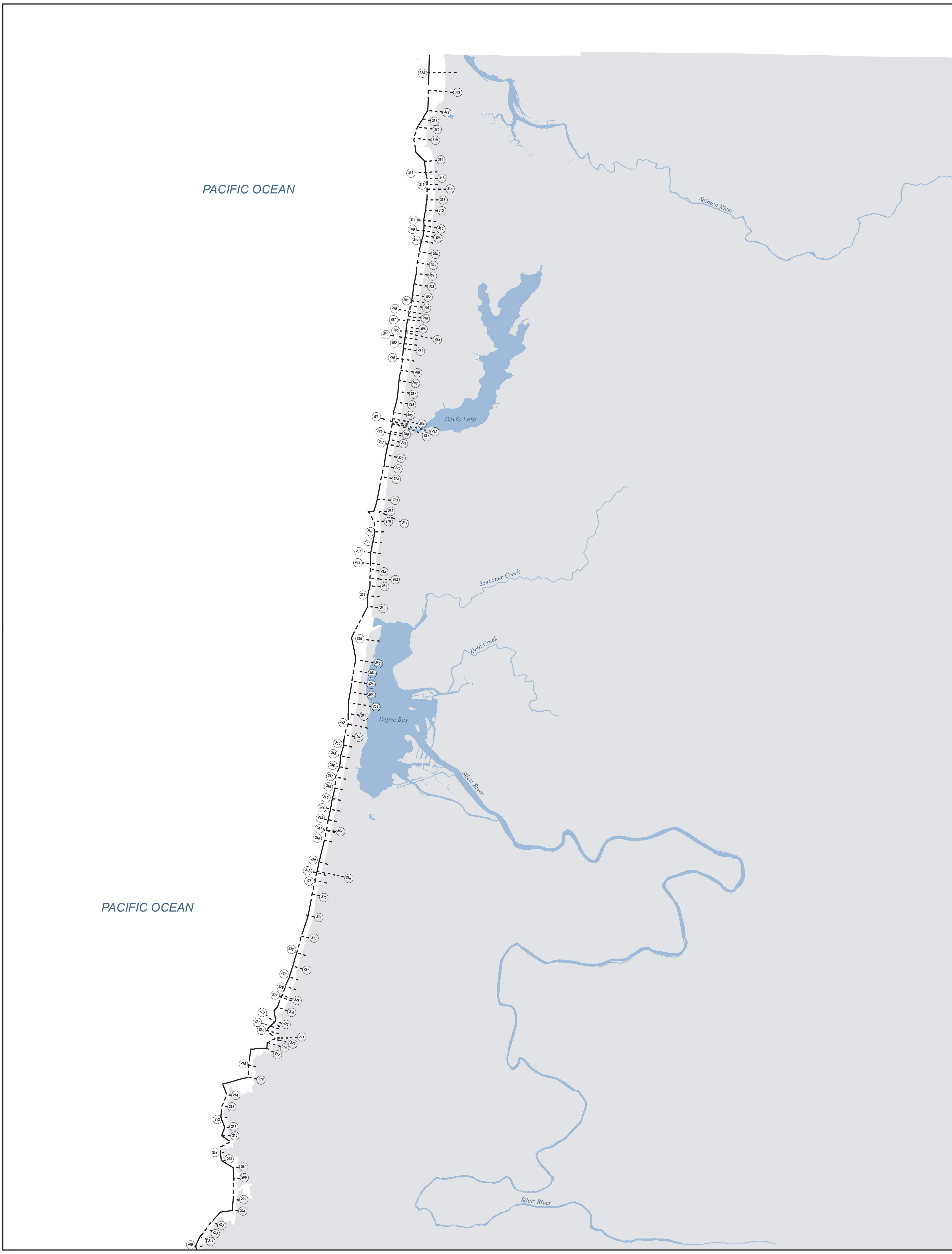
Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	298	21.1	22.8	23.4	24.8	11.5	11.8
Pacific Ocean	299	22.7	25.7	27.1	31.0	11.5	11.8
Pacific Ocean	300	23.7	25.8	26.7	28.8	11.5	11.8
Pacific Ocean	301	23.6	28.2	30.8	38.7	11.5	11.8
Pacific Ocean	302	22.4	24.3	25.0	26.7	11.5	11.8
Pacific Ocean	303	22.7	25.5	26.9	30.5	11.5	11.8
Pacific Ocean	304	31.6	37.4	39.4	43.3	11.5	11.8
Pacific Ocean	305	29.5	34.0	35.7	39.1	11.5	11.8
Pacific Ocean	306	33.7	38.8	40.5	43.8	11.5	11.8
Pacific Ocean	307	28.8	33.3	34.8	37.8	11.5	11.8
Pacific Ocean	308	31.5	36.9	39.1	44.2	11.5	11.8
Pacific Ocean	309	31.6	37.2	39.5	44.3	11.5	11.8
Pacific Ocean	310	22.4	24.3	25.1	26.9	11.5	11.8
Pacific Ocean	311	25.0	31.7	35.6	48.1	11.5	11.8
Pacific Ocean	312	23.9	26.7	27.9	30.8	11.5	11.8
Pacific Ocean	313	29.4	33.3	34.5	36.6	11.5	11.8
Pacific Ocean	314	26.9	29.7	30.7	32.5	11.5	11.8
Pacific Ocean	315	27.9	31.6	32.7	34.6	11.5	11.8
Pacific Ocean	316	31.1	35.9	37.6	40.8	11.5	11.8
Pacific Ocean	317	23.8	27.8	30.1	36.6	11.5	11.8

Table 17: Coastal Transect Parameters *(continued)*

Flood Source	Coastal Transect	Total Water Levels T_{wl} (ft NAVD88)				Stillwater Elevations S_{wl} (ft NAVD88)	
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pacific Ocean	318	33.8	39.8	42.0	46.0	11.5	11.8
Pacific Ocean	319	24.3	26.1	26.9	28.4	11.5	11.8
Pacific Ocean	320	30.2	33.2	34.5	37.5	11.5	11.8
Pacific Ocean	321	28.6	32.1	33.5	36.3	11.5	11.8
Pacific Ocean	322	27.8	33.0	35.7	43.4	11.5	11.8
Pacific Ocean	323	32.3	37.9	40.2	45.5	11.5	11.8
Pacific Ocean	324	25.4	28.8	30.5	34.8	11.5	11.8

Figure 9: Transect Location Map



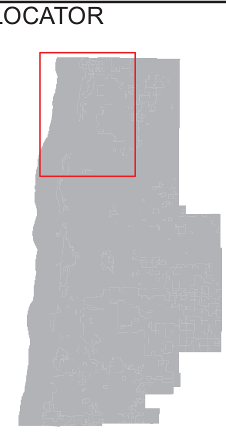
1 inch = 1 miles

N

Miles
0 0.5 1 2

Map Projection:
NAD 1983 UTM Zone 10N
North American Datum of 1983

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

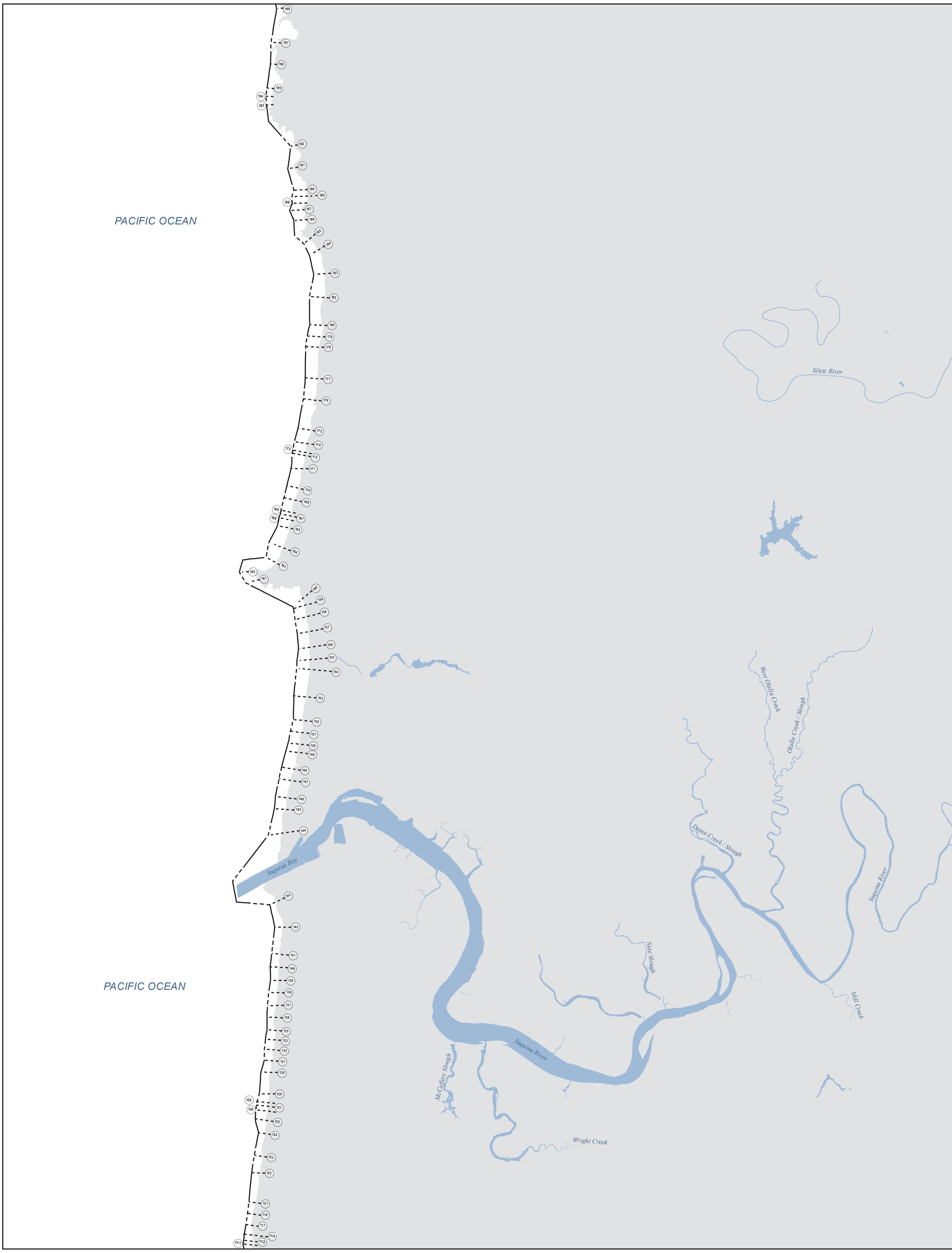
Transect Locator Map

PANELS PRINTED:

0020E, 0107E, 0109E, 0117E, 0120E, 0229E, 0233E, 0235E, 0237E, 0241E

FEMA

Figure 9: Transect Location Map



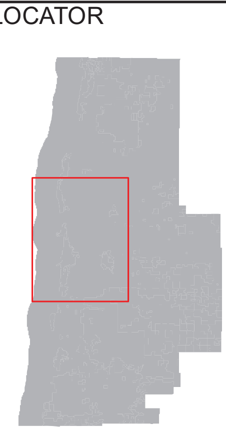
1 inch = 1 miles

N

0 0.5 1 2 Miles

Map Projection:
NAD 1983 UTM Zone 10N
North American Datum of 1983

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Transect Locator Map

PANELS PRINTED:

0237E, 0239E, 0241E, 0352E, 0354E, 0360E, 0362E, 0364E, 0366E, 0368E, 0502E, 0504E, 0515E

FEMA

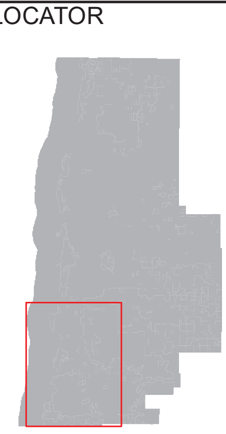
Figure 9: Transect Location Map

1 inch = 1 miles

0 0.5 1 2 Miles

Map Projection:
NAD 1983 UTM Zone 10N
North American Datum of 1983

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Transect Locator Map

PANELS PRINTED:

0515E, 0655E, 0662E, 0665E, 0801E, 0802E, 0803E, 0811E, 0815E

FEMA

5.4 Alluvial Fan Analyses

This section is not applicable to this FIS project.

Table 18: Summary of Alluvial Fan Analyses

[Not Applicable to this FIS Project]

Table 19: Results of Alluvial Fan Analyses

[Not Applicable to this FIS Project]