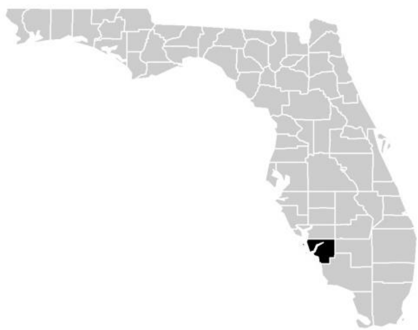
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 15



LEE COUNTY, FLORIDA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BONITA SPRINGS, CITY OF	120680
CAPE CORAL, CITY OF	125095
ESTERO, VILLAGE OF	120260
FORT MYERS, CITY OF	125106
FORT MYERS BEACH, TOWN OF	120673
LEE COUNTY, UNINCORPORATED AREAS	125124
SANIBEL, CITY OF	120402

FEMA

REVISED PRELIMINARY 12/04/2025

REVISED:

TBD

FLOOD INSURANCE STUDY NUMBER
12071CV001D

Version Number 2.8.5.0

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Exhibits

Published Separately

FLOOD INSURANCE STUDY REPORT
LEE COUNTY, FLORIDA

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 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, *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 Lee County, Florida.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC-8) sub-basins affecting each, are shown in Table 1. The 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.

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
Bonita Springs, City of	120680	03090204	12071C0567G 12071C0569G 12071C0586G 12071C0587G 12071C0588G 12071C0589G 12071C0593H 12071C0594G 12071C0625F[1] 12071C0651G 12071C0652G 12071C0653G 12071C0654G	

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
Bonita Springs, City of (continued)	120680	03090204	12071C0656G 12071C0657G 12071C0658G 12071C0659G 12071C0676F 12071C0678F 12071C0679F[1] 12071C0685F[1]	
Cape Coral, City of	125095	03090205 03100103	12071C0065G 12071C0070G 12071C0090F[1] 12071C0095F 12071C0230G 12071C0231G 12071C0232G 12071C0233G 12071C0234G 12071C0240G 12071C0241G 12071C0242G 12071C0243G 12071C0244G 12071C0251G 12071C0252G 12071C0253G 12071C0254G 12071C0258G 12071C0259G 12071C0260G 12071C0261G 12071C0262G 12071C0263G 12071C0264G 12071C0266G 12071C0267G 12071C0268G 12071C0380G 12071C0381G 12071C0382G 12071C0383G 12071C0384G 12071C0392G 12071C0395G 12071C0401G 12071C0402G 12071C0403G 12071C0404G	

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
Cape Coral, City of (continued)	125095	03090205 03100103	12071C0406G 12071C0408G 12071C0411G 12071C0412G 12071C0416G	
Estero, Village of	120260	03090204	12071C0578J 12071C0579H 12071C0583H 12071C0584F 12071C0586G 12071C0587G 12071C0589G 12071C0591H 12071C0592G 12071C0593H 12071C0594G 12071C0625F[1]	
Fort Myers, City of	125106	03090204 03090205	12071C0267G 12071C0268G 12071C0269G 12071C0279G 12071C0286G 12071C0287G 12071C0288H 12071C0289H 12071C0291G 12071C0292G 12071C0295G 12071C0406G 12071C0407G 12071C0409G 12071C0426H 12071C0427G 12071C0428H 12071C0429G 12071C0431G 12071C0432F 12071C0433G 12071C0434F[1] 12071C0445F[1]	
Fort Myers Beach, Town of	120673	03090204 03100103	12071C0553G 12071C0554G 12071C0558G 12071C0566G 12071C0567G 12071C0569G	

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
Lee County, Unincorporated Areas	125124	03090204 03090205 03100103	12071C0017G 12071C0019G 12071C0036G 12071C0038G 12071C0040G 12071C0045G[1] 12071C0065G 12071C0070G 12071C0090F[1] 12071C0095F 12071C0115F 12071C0119F 12071C0120F 12071C0138G 12071C0139F 12071C0143F 12071C0144F[1] 12071C0163F 12071C0164F[1] 12071C0182G 12071C0184G 12071C0192G 12071C0194G[1] 12071C0201G[1] 12071C0203G 12071C0205G 12071C0210G 12071C0211G 12071C0213G 12071C0215G 12071C0220G 12071C0230G 12071C0231G 12071C0232G 12071C0233G 12071C0234G 12071C0240G 12071C0243G 12071C0244G 12071C0251G 12071C0252G 12071C0253G 12071C0254G 12071C0258G 12071C0259G 12071C0260G 12071C0261G 12071C0263G 12071C0266G	

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
Lee County, Unincorporated Areas (continued)	125124	03090204 03090205 03100103	12071C0267G 12071C0268G 12071C0269G 12071C0276G 12071C0277G 12071C0278G 12071C0279G 12071C0281G 12071C0282G 12071C0283G 12071C0284G 12071C0286G 12071C0287G 12071C0289H 12071C0291G 12071C0292G 12071C0295G 12071C0301G 12071C0302G 12071C0303G 12071C0304G 12071C0306G 12071C0307G 12071C0308G 12071C0309G 12071C0311G 12071C0312G 12071C0313F[1] 12071C0314F 12071C0316F 12071C0317F 12071C0318F 12071C0319F[1] 12071C0326G 12071C0327G 12071C0328G 12071C0329G 12071C0336F 12071C0337F 12071C0338F 12071C0339F 12071C0351G 12071C0352G 12071C0353G 12071C0354G 12071C0360G 12071C0362G 12071C0364G 12071C0370G	

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
Lee County, Unincorporated Areas (continued)	125124	03090204 03090205 03100103	12071C0380G 12071C0381G 12071C0383G 12071C0390G 12071C0392G 12071C0395G 12071C0406G 12071C0407G 12071C0408G 12071C0409G 12071C0411G 12071C0412G 12071C0413G 12071C0414G 12071C0416G 12071C0417G 12071C0418G 12071C0419G 12071C0426H 12071C0427G 12071C0428H 12071C0429G 12071C0431G 12071C0432F 12071C0433G 12071C0434F[1] 12071C0436H 12071C0437H 12071C0438H 12071C0439H 12071C0445F[1] 12071C0475F[1] 12071C0476F 12071C0477F 12071C0478F[1] 12071C0479F[1] 12071C0490F[1] 12071C0502G 12071C0506G 12071C0507G 12071C0530G 12071C0531G 12071C0532G 12071C0533G 12071C0534G 12071C0551G 12071C0552G 12071C0553G 12071C0554G	

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
Lee County, Unincorporated Areas (continued)	125124	03090204 03090205 03100103	12071C0556G 12071C0557G 12071C0558G 12071C0559G 12071C0566G 12071C0567G 12071C0569G 12071C0576J 12071C0577J 12071C0578J 12071C0579H 12071C0581G 12071C0582F[1] 12071C0583H 12071C0584F 12071C0586G 12071C0587G 12071C0588G 12071C0589G 12071C0592G 12071C0594G 12071C0625F[1] 12071C0650F[1] 12071C0676F 12071C0677F[1] 12071C0678F 12071C0679F[1] 12071C0685F[1]	
Sanibel, City of	120402	03100103	12071C0370G 12071C0506G 12071C0507G 12071C0508G 12071C0509G 12071C0517G 12071C0530G 12071C0531G 12071C0533G 12071C0534G 12071C0536G 12071C0537G 12071C0541G 12071C0542G[1]	

[1] 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-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains; and 1-percent-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 30, "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 Lee County became effective on August 28, 2008. Refer to Table 27 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 www.fema.gov/flood-insurance/rules-legislation/community-rating-system or contact your appropriate FEMA Regional Office for more information about this program.

- 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 www.fema.gov/flood-maps/tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Lee County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, transportation features, flooding sources, watershed boundaries, and USGS HUC-8 codes.

Figure 1: FIRM Index

1 inch = 14,631 feet 1:175,569

0 6,545 13,090 26,180 39,270 feet

Map Projection:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Vertical Datum: NAVD88

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

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX

LEE COUNTY, FLORIDA, AND INCORPORATED AREAS
PAGE 1 OF 2

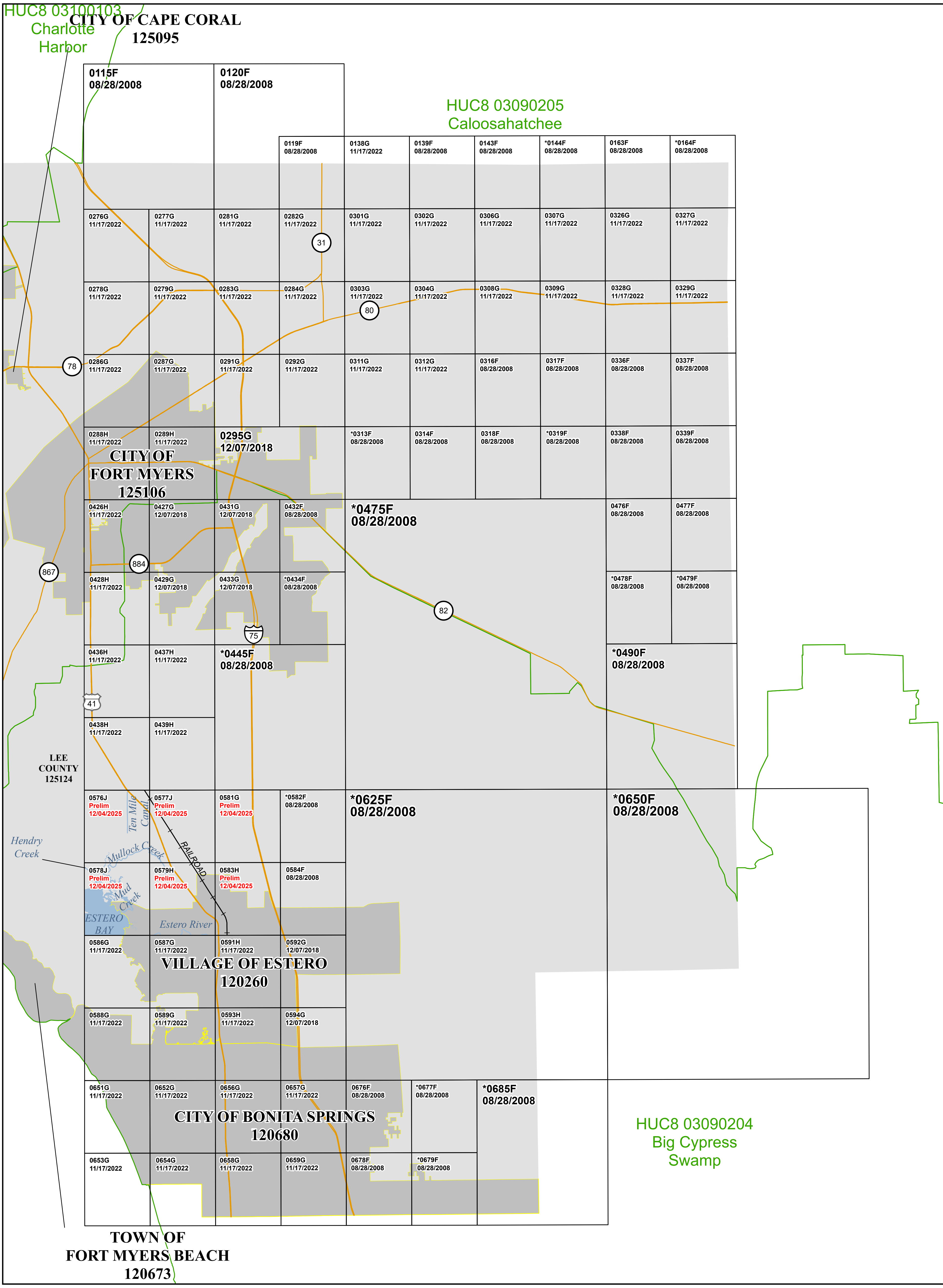
PANELS PRINTED:
0017, 0019, 0036, 0038, 0040, 0065, 0070, 0095, 0182, 0184, 0192, 0203, 0205, 0210, 0211, 0213, 0215, 0220, 0230, 0231, 0232, 0233, 0234, 0240, 0241, 0242, 0243, 0244, 0251, 0252, 0253, 0254, 0258, 0259, 0260, 0261, 0262, 0263, 0264, 0266, 0267, 0268, 0269, 0351, 0352, 0353, 0354, 0360, 0362, 0364, 0370, 0380, 0381, 0382, 0383, 0384, 0390, 0392, 0395, 0401, 0402, 0403, 0404, 0406, 0407, 0408, 0411, 0412, 0413, 0414, 0416, 0417, 0418, 0419, 0502, 0506, 0507, 0508, 0509, 0517, 0530, 0531, 0532, 0533, 0534, 0536, 0537, 0541, 0551, 0552, 0553, 0554, 0556, 0557, 0558, 0559, 0566, 0567, 0569

FEMA

MAP NUMBER
12071CIND1D

EFFECTIVE DATE
Prelim Issue Date: 12/04/2025

Figure 1: FIRM Index



1 inch = 14,833 feet | 1:177,998

N

0 | 6,635 | 13,270 | 26,540 | 39,810 feet

Map Projection:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Vertical Datum: NAVD88

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 - NO SPECIAL FLOOD HAZARD AREAS

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX

LEE COUNTY, FLORIDA, AND INCORPORATED AREAS
PAGE 2 OF 2

PANELS PRINTED:
0115, 0119, 0120, 0138, 0139, 0143, 0163, 0276, 0277, 0278, 0279, 0281, 0282, 0283, 0284, 0286, 0287, 0288, 0289, 0291, 0292, 0295, 0301, 0302, 0303, 0304, 0306, 0307, 0308, 0309, 0311, 0312, 0314, 0316, 0317, 0318, 0326, 0327, 0328, 0329, 0336, 0337, 0338, 0339, 0426, 0427, 0428, 0429, 0431, 0432, 0433, 0436, 0437, 0438, 0439, 0476, 0477, 0576, 0577, 0578, 0579, 0581, 0583, 0584, 0586, 0587, 0588, 0589, 0591, 0592, 0593, 0594, 0651, 0652, 0653, 0654, 0656, 0657, 0658, 0659, 0676, 0678

U.S. DEPARTMENT OF HOMELAND SECURITY
FEMA

MAP NUMBER
12071CIND2D

EFFECTIVE DATE
Prelim Issue Date: 12/04/2025

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), 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 Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at 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 Flood Map Service Center website or by calling the FEMA Mapping and Insurance 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 Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 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 Non-Coastal 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 (NAVD88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

Figure 2: FIRM Notes to Users

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.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may have reduced flood hazards due to flood control structures. Refer to Section 4.3 "Dams and Other Flood Hazard Reduction 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 State Plane Transverse Mercator, Florida West Zone 0902. The horizontal datum was the North American Datum of 1983 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 www.ngs.noaa.gov.

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 30 of this FIS Report.

BASE MAP INFORMATION (TBD): Base map information shown on the FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

BASE MAP INFORMATION (11/17/2022): Base map information shown on the FIRM was provided by Lee County, dated 2008 and 2018; the Florida Department of Transportation, dated 2017 and 2018; the U.S. Department of Agriculture, dated 2018; and the U.S. Department of Transportation, dated 2017. 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

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Lee County, Florida, 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 27 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.

ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on the FIRM panels issued before TBD.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Lee County, Florida, effective TBD.

LIMIT OF MODERATE WAVE ACTION: Zone AE has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between Zone VE and the LiMWA (or between the shoreline and the LiMWA for areas where Zone VE is not identified) will be similar to, but less severe than, those in Zone VE.

Note: Some Special Flood Hazard Areas with elevations may not appear with elevation labels if the Base Flood Elevation or Cross-section line which communicates the elevation for the location appears on the adjacent panel. Please see the Panel Locator Diagram on this map panel to determine the adjacent panel and find the elevation feature there, or alternatively use the Flood Insurance Study report for detailed elevations by flood source.

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.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Lee County.

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.
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

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 Hazard due to Accredited or Provisionally Accredited Levee System: Area is shown as reduced flood hazard from the 1-percent-annual-chance or greater flood by a levee system. Overtopping or failure of any levee system is possible.
	Area with Undetermined Flood Hazard due to Non-Accredited Levee System: Analysis and mapping procedures for non-accredited levee systems were applied resulting in a flood insurance rate zone where flood hazards are undetermined, but possible.
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 of minimal 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
Bridge	Bridge

Figure 3: Map Legend for FIRM

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
	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
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

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-percent-annual-chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-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 Lee 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-percent-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 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1-percent and 0.2-percent-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-percent-annual-chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-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 Lee County, 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 12. 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-percent-annual-chance floodplain corresponds to the SFHAs. The 0.2-percent-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.

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 (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Bayshore Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 975 feet upstream of Jamestown Circle	03090205	1.4	--	Y	AE	2018
Bayshore Creek	Lee County, Unincorporated Areas	Approximately 975 feet upstream of Jamestown Circle	Nalle Grade Road	03090205	3.3	--	Y	AE	2002
Bedman Creek / Dog Canal	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1.3 mile upstream of State Route 80/ Palm Beach Boulevard	03090205	2.1	--	Y	AE	2018
Bedman Creek / Dog Canal	Lee County, Unincorporated Areas	Approximately 1.3 mile upstream of State Route 80/ Palm Beach Boulevard	Approximately 8.3 miles upstream of Palm Beach Boulevard	03090205	6.8	--	Y	AE	2002
Billy Creek	Lee County, Unincorporated Areas; Fort Myers, City of	Mouth at Caloosahatchee River	Approximately 35 feet upstream of Ortiz Avenue	03090205	3.5	--	Y	AE	2018
Billy Creek	Lee County, Unincorporated Areas; Fort Myers, City of	Approximately 35 feet upstream of Ortiz Avenue	Approximately 0.4 mile upstream of Ortiz Circle	03090205	0.6	--	Y	AE	2002
Caloosahatchee River	Cape Coral, City of; Lee County, Unincorporated Areas; Fort Myers, City of	Mouth at San Carlos Bay	At the Hendry County boundary	03090205	30.0	--	N	AE, VE	2018
Carrell Canal	Fort Myers, City of	Mouth at Caloosahatchee River	Approximately 150 feet upstream of McGregor Boulevard	03090205	0.6		Y	AE	2018
Carrell Canal	Fort Myers, City of	Approximately 150 feet upstream of McGregor Boulevard	Approximately 375 feet upstream of Evans Avenue	03090205	1.4	--	Y	AE	2002

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
Chapel Branch Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1,924 feet upstream of Bayshore Road	03090205	2.2	--	Y	AE	2018
Chapel Branch Creek	Lee County, Unincorporated Areas	Approximately 1,924 feet upstream of Bayshore Road	Approximately 740 feet upstream of Rich Road	03090205	1.7	--	Y	AE	2002
Charlotte Harbor	Cape Coral, City of; Lee County, Unincorporated Areas	Entire shoreline within Lee County	Entire shoreline within Lee County	03100103	43.8	--	N	AE, VE	2018
Cypress Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 0.8 mile upstream of River Road	03090205	1.6	--	Y	AE	2018
Cypress Creek	Lee County, Unincorporated Areas	Approximately 0.8 mile upstream of River Road	Approximately 3.0 miles upstream of River Road	03090205	2.2	--	Y	AE	2002
Daughtrey Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1.3 mile upstream of Bayshore Road	03090205	3.4	--	Y	AE	2018
Daughtrey Creek	Lee County, Unincorporated Areas	Approximately 1.3 mile upstream of Bayshore Road	Approximately 0.9 mile upstream of Nalle Grade Road	03090205	3.5	--	Y	AE	2002
East Branch Daughtrey Creek	Lee County, Unincorporated Areas	Mouth at Daughtrey Creek	Approximately 270 feet upstream of Samville Road	03090205	0.6	--	Y	AE	2018
East Branch Daughtrey Creek	Lee County, Unincorporated Areas	Approximately 270 feet upstream of Samville Road	Nalle Grade Road	03090205	3.7	--	Y	AE	2002
East Branch Yellow Fever Creek	Cape Coral, City of; Lee County, Unincorporated Areas	Mouth at Yellow Fever Creek	Approximately 130 feet upstream of Pine Island Road	03090205	0.4	--	Y	AE	2018
East Branch Yellow Fever Creek	Cape Coral, City of; Lee County, Unincorporated Areas	Approximately 130 feet upstream of Pine Island Road	Approximately 75 feet upstream of U.S. 41	03090205	2.6	--	Y	AE	2002

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
Estero Bay	Bonita Springs, City of; Estero, Village of; Fort Myers Beach, Town of; Lee County, Unincorporated Areas	Entire shoreline within Lee County	Entire shoreline within Lee County	03090204	90.9	--	N	AE, VE	2018
Estero River	Estero, Village of	Mouth at Caloosahatchee River	Approximately 890 feet upstream of Rivers Ford	03090204	4.2	--	Y	AE	2018
Estero River	Estero, Village of; Lee County, Unincorporated Areas	Approximately 890 feet upstream of Rivers Ford	Approximately 400 feet upstream of Estero Parkway	03090204	1.4	--	Y	AE	2002
Fichter Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 20 feet upstream of Fichters Creek Lane	03090205	1.0	--	Y	AE	2018
Fichter Creek	Lee County, Unincorporated Areas	Approximately 20 feet upstream of Fichters Creek Lane	Approximately 60 feet upstream of Fichters Creek Lane	03090205	0.01	--	Y	AE	2002
Ford Street Canal	Fort Myers, City of	Mouth at Caloosahatchee River	Approximately 0.4 mile upstream of Michigan Avenue	03090205	0.8	--	Y	AE	2018
Ford Street Canal	Fort Myers, City of	Approximately 0.4 mile upstream of Michigan Avenue	Approximately 1,125 feet upstream of Canal Street	03090205	1.3	--	Y	AE	2002
Gasparilla Sound	Lee County, Unincorporated Areas	Entire shoreline within Lee County	Entire shoreline within Lee County	N/A	7.8	--	N	AE, VE	2018
Gulf of America	Bonita Springs, City of; Fort Myers Beach, Town of; Lee County, Unincorporated Areas; Sanibel, City of	Entire shoreline within Lee County	Entire shoreline within Lee County	N/A	48.4	--	N	AE, VE	2018
Halfway Creek	Estero, Village of; Lee County, Unincorporated Areas	Mouth at Estero River	U.S. 41	03090204	3.8	--	Y	AE	2018

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
Halfway Creek	Estero, Village of	U.S. 41	Approximately 100 feet upstream of Railroad	03090204	0.5	--	Y	AE	2012
Halls Creek	Lee County, Unincorporated Areas	Mouth at Cypress Creek	Approximately 0.6 mile upstream of River Road	03090205	1.0	--	Y	AE	2002
Hancock Creek	Cape Coral, City of; Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 75 feet upstream of Commerce Creek Boulevard	03090205	3.3	--	Y	AE	2018
Hancock Creek	Cape Coral, City of	Approximately 75 feet upstream of Commerce Creek Boulevard	Approximately 100 feet upstream of Diplomat Parkway	03090205	0.4	--	Y	AE	2002
Hendry Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	U.S. 41	03090204	11.0	--	Y	AE	2002
Hendry Creek West	Lee County, Unincorporated Areas	Mouth at Hendry Creek	Just upstream of Winkler Road	03090204	1.9	--	N	AE	2018
Hickey Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Hickey Creek Drainageway	03090205	1.8	--	Y	AE	2018
Hickey Creek Drainageway	Lee County, Unincorporated Areas	Mouth at Hickey Creek	Approximately 0.4 mile upstream of confluence with Hickey Creek	03090205	0.4	--	Y	AE	2018
Hickey Creek Drainageway	Lee County, Unincorporated Areas	Approximately 0.4 mile upstream of confluence with Hickey Creek	Approximately 1.1 miles upstream of 17th Street	03090205	4.0	--	Y	AE	2002
Imperial River	Bonita Springs, City of; Lee County, Unincorporated Areas	Mouth at Fish Trap Bay	Just upstream of Bonita Grade Road	03090204	8.1	--	Y	AE	1995
Kickapoo Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1,300 feet upstream of Old Bayshore Road	03090205	0.9	--	Y	AE	2002

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
L-3 Canal	Fort Myers, City of; Lee County, Unincorporated Areas	Confluence at L Canal	Approximately 0.4 mile upstream of Fowler Street	03090205	2.5	--	Y	AE	2002
Leitner Creek	Bonita Springs, City of	Mouth at Imperial River	Approximately 835 feet upstream of East Terry Street	03090204	0.8	--	Y	AE	2018
Leitner Creek	Bonita Springs, City of	Approximately 835 feet upstream of East Terry Street	Approximately 1,525 feet upstream of I-75 North Bound	03090204	1.6	--	Y	AE	2002
Little Bokeelia Bay	Lee County, Unincorporated Areas	Entire shoreline within Lee County	Entire shoreline within Lee County	03100103	3.1	--	N	AE, VE	2018
Manuels Branch	Fort Myers, City of	Mouth at Caloosahatchee River	Cleveland Avenue	03090205	0.8	--	Y	AE	2018
Manuels Branch	Fort Myers, City of	Cleveland Avenue	Approximately 970 feet upstream of Evans Avenue	03090205	1.0	--	Y	AE	2002
Marsh Point Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Just upstream of Laurel Lane	03090205	2.4	--	Y	AE	2018
Marsh Point Creek	Lee County, Unincorporated Areas	Just upstream of Laurel Lane	Tucker Lane	03090205	1.2	--	Y	AE	2002
Matlacha Pass	Cape Coral, City of; Lee County, Unincorporated Areas	Entire shoreline within Lee County	Entire shoreline within Lee County	03100103	123.2	--	N	AE, VE	2018
Mullock Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Just upstream of Oriole Road	03090204	4.8	--	Y	AE	2023
Mullock Creek Tributary	Lee County, Unincorporated Areas	Confluence at Mullock Creek	Approximately 100 feet upstream of South Tamiami Trail	03090204	2.0	--	Y	AE	2023
North Colonial Waterway	Fort Myers, City of	Confluence with Ten Mile Canal	Approximately 600 feet upstream of Province Park Boulevard	03090204	2.0	--	Y	AE	2012

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
Oak Creek	Bonita Springs, City of	Mouth at Imperial River	Imperial Parkway	03090204	2.3	--	Y	AE	2018
Oak Creek	Bonita Springs, City of	Imperial Parkway	Approximately 1,000 feet upstream of Imperial Parkway	03090204	0.2	--	Y	AE	2002
Orange River	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1.3 miles upstream of Buckingham Road	03090205	7.3	--	Y	AE	2018
Orange River	Lee County, Unincorporated Areas	Approximately 1.3 miles upstream of Buckingham Road	Approximately 2.5 miles upstream of Buckingham Road	03090205	1.8	--	Y	AE	2002
Owl Creek	Lee County, Unincorporated Areas	Confluence at Trout Creek	Approximately 30 feet upstream of SR 31	03090205	1.7	--	Y	AE	2018
Owl Creek	Lee County, Unincorporated Areas	Approximately 30 feet upstream of SR 31	Approximately 1,200 feet upstream of Shirly Lane	03090205	0.7	--	Y	AE	2002
Palm Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 0.4 mile upstream of Bayshore Road	03090205	0.9	--	Y	AE	2018
Palm Creek	Lee County, Unincorporated Areas	Approximately 0.4 mile upstream of Bayshore Road	Approximately 0.6 mile upstream of Reuben Road	03090205	2.4	--	Y	AE	2002
Pine Island Sound	Lee County, Unincorporated Areas; Sanibel, City of	Entire shoreline within Lee County	Entire shoreline within Lee County	03100103	172.0	--	N	AE, VE	2018
Popash Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1.5 miles upstream of Leetana Road	03090205	2.7	--	Y	AE	2018
Popash Creek	Lee County, Unincorporated Areas	Approximately 1.5 miles upstream of Leetana Road	Charlotte County boundary	03090205	3.1	--	Y	AE	2002

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
Powell Creek / Powell Bypass	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 0.5 mile upstream of North Evalena Lane	03090205	2.8	--	Y	AE	2018
Powell Creek / Powell Bypass	Lee County, Unincorporated Areas	Approximately 0.5 mile upstream of North Evalena Lane	Approximately 2.0 miles upstream of Mellow Drive	03090205 03100103	4.1	--	Y	AE	2002
Powell Creek (Upstream of Confluence of Powell Bypass)	Lee County, Unincorporated Areas	Approximately 2.7 miles upstream of mouth	Tucker Lane	03090205	2.1	--	N	AE	*
Powell Creek Tributary No. 1	Lee County, Unincorporated Areas	Mouth at Powell Creek	Approximately 650 feet upstream of Arrowhead Boulevard	03090205	2.7	--	N	AE	*
San Carlos Bay	Fort Myers Beach, Town of; Lee County, Unincorporated Areas; Sanibel, City of	Entire shoreline within Lee County	Entire shoreline within Lee County	03090204 03090205 03100103	62.2	--	N	AE, VE	2018
Six Mile Cypress Slough	Lee County, Unincorporated Areas	Mouth at Ten Mile Canal	Approximately 1.7 miles upstream of confluence at Ten Mile Canal	03090204	1.7	--	Y	AE	2018
Six Mile Cypress Slough	Fort Myers, City of; Lee County, Unincorporated Areas	Approximately 1.7 miles upstream of confluence at Ten Mile Canal	Approximately 1.3 miles upstream of Colonial Boulevard	03090204 03090205	7.3	--	Y	AE	2002
South Branch	Estero, Village of	Confluence with Estero River	Approximately 0.9 miles upstream of Sanctuary Drive	03090204	2.4	--	Y	AE	2012
Spanish Canal	Lee County, Unincorporated Areas	Mouth at Spanish Creek	Approximately 0.8 miles upstream of mouth at Spanish Creek	03090205	0.8	--	Y	AE	2018

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
Spanish Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1,800 feet upstream of confluence of Spanish Canal	03090205	1.2	--	Y	AE	2018
Spanish Creek	Lee County, Unincorporated Areas	Approximately 1,800 feet upstream of confluence of Spanish Canal	Approximately 1,120 feet upstream of Persimmon Ridge Road	03090205	1.3	--	Y	AE	2002
Spring Creek	Bonita Springs, City of	Mouth at Caloosahatchee River	Approximately 1,000 feet upstream of Old 41 Road	03090204	5.3	--	Y	AE	2002
Stricklin Gully	Lee County, Unincorporated Areas	Confluence at Trout Creek	Approximately 1.4 miles upstream of confluence at Trout Creek	03090205	1.4	--	Y	AE	2002
Stroud Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1,300 feet upstream of St. Paul Road	03090205	4.5	--	Y	AE	2002
Telegraph Creek	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Just upstream of Telegraph Creek Lane	03090205	1.7	--	Y	AE	2018
Telegraph Creek	Lee County, Unincorporated Areas	Just upstream of Telegraph Creek Lane	Approximately 1.5 miles upstream of Telegraph Creek Lane	03090205	1.6	--	Y	AE	2002
Ten Mile Canal	Fort Myers, City of; Lee County, Unincorporated Areas	Mouth at Mullock Creek	Approximately 0.9 mile upstream of confluence of North Colonial Waterway	03090204 03090205	9.5	--	Y	AE	2012
Tributary L-1 (Yellow Fever Creek Tributary)	Lee County, Unincorporated Areas	Cleveland Avenue/ U.S. Route 41	Pine Island Road	03090205	0.6	--	N	AE	2018

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
Tributary L-2 (Yellow Fever Creek Tributary)	Lee County, Unincorporated Areas	Cleveland Avenue/ U.S. Route 41	Pine Island Road	03090205	0.3	--	N	AE	2018
Trout Creek / Curry Lake Canal	Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 1.1 miles upstream of River Road	03090205	3.1	--	Y	AE	2018
Trout Creek / Curry Lake Canal	Lee County, Unincorporated Areas	Approximately 1.1 miles upstream of River Road	Charlotte County boundary	03090205	1.7	--	Y	AE	2002
Winkler Canal	Fort Myers, City of; Lee County, Unincorporated Areas	Mouth at Caloosahatchee River	Approximately 150 feet upstream of Evans Avenue	03090205	2.1	--	Y	AE	2018
Yellow Fever Creek	Cape Coral, City of; Lee County, Unincorporated Areas	Confluence at Hancock Creek	Approximately 0.5 mile upstream of Littleton Road	03090205	2.7	--	Y	AE	2018
Zone A Ponding Areas	Bonita Springs, City of; Cape Coral, City of; Fort Myers, City of; Lee County, Unincorporated Areas; Estero, Village of	All within Lee County	All within Lee County	03090204 03090205 03100103	--	7.5	N	A	*

*Data not available

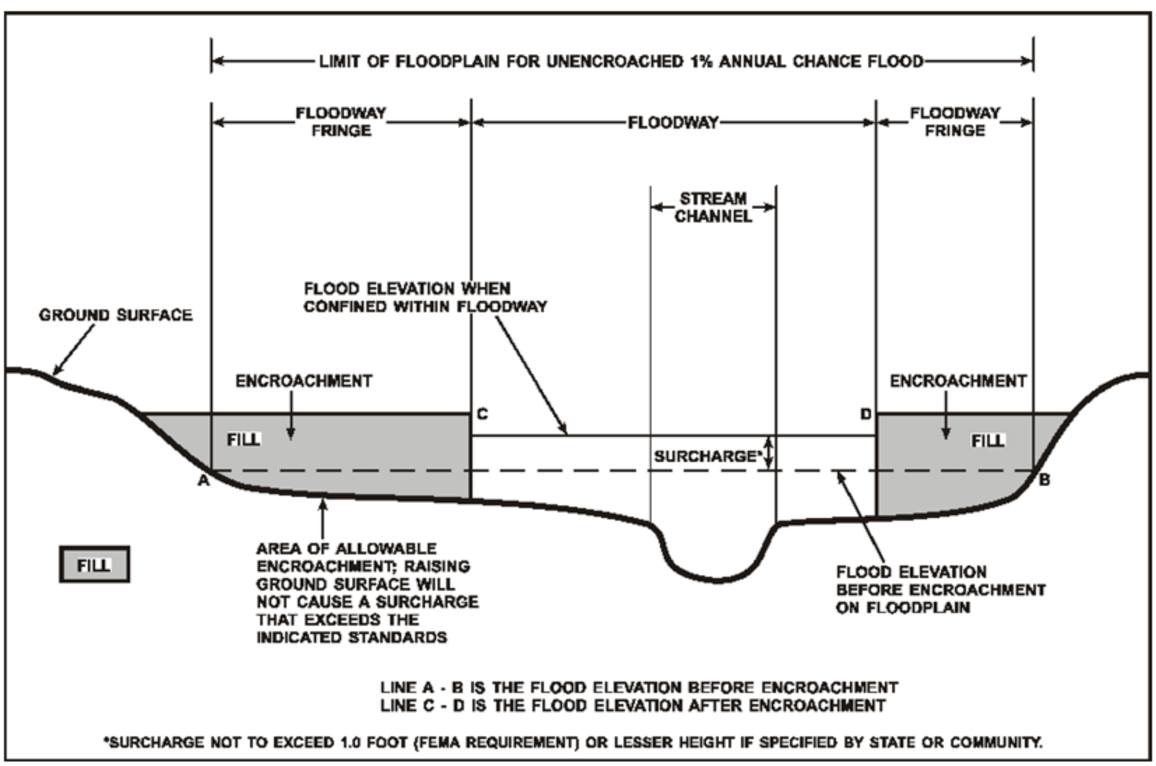
2.2 Floodways

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-percent-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-percent-annual-chance flood. The floodway fringe is the area between the floodway and the 1-percent-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-percent-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 23, “Floodway Data.”

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1-percent-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 BFE is the elevation of the 1-percent-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.

BFEs are primarily intended for flood insurance rating purposes. 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. 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. For example, the user may use the FIRM to determine the stream station of a location of interest and then use the profile to determine the 1-percent annual chance elevation at that location. Because only selected cross sections may be shown on the FIRM for riverine areas, the profile should be used to obtain the flood elevation between mapped cross sections. Additionally, for riverine areas, whole-foot elevations shown on the FIRM may not exactly reflect the elevations derived from the hydraulic analyses; therefore, elevations obtained from the profile may more accurately reflect the results of the hydraulic analysis.

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk 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-percent-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.

Coastal flooding sources that are included in this Flood Risk 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-percent-annual-chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1-percent-annual-chance storm. The 1-percent-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-percent-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.

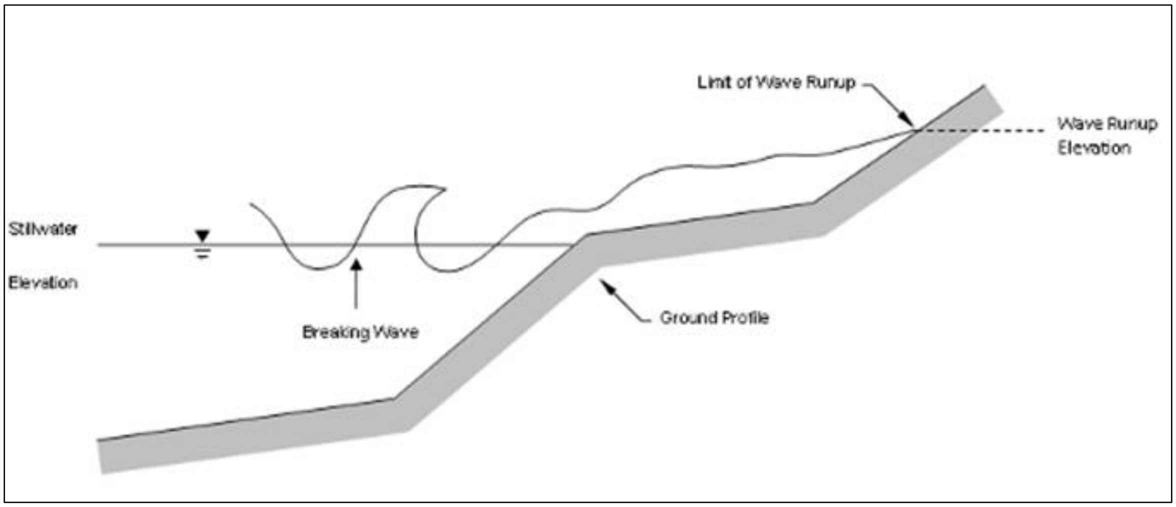
- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate.

- *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 America, 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-percent-annual-chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1-percent-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-percent-annual-chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1-percent-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 25 presents the types of coastal analyses that were used in mapping the 1-percent-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-percent-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 16, “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-percent-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-percent-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.

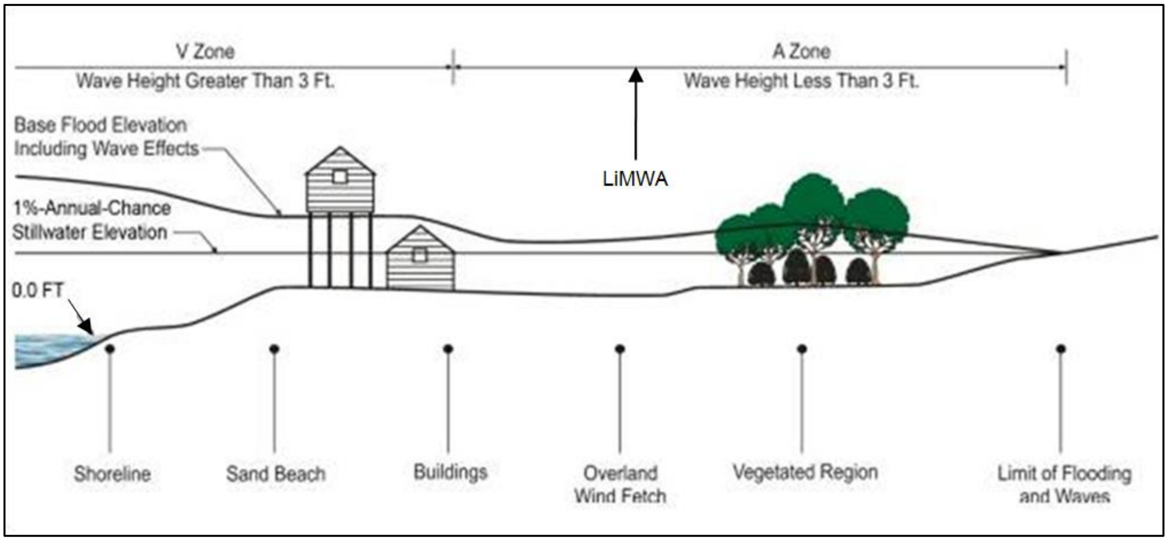
CHHAs are designated as “V” zones (for “velocity wave zones”) and are subject to more stringent regulatory requirements and a different flood insurance rate structure. The areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the 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-percent-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 Flood Risk 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 16 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

Laboratory tests and field investigations have shown that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE building construction. Wood-frame, light gage steel, or masonry walls on shallow footings or slabs are subject to damage when exposed to waves less than 3 feet in height. Other flood hazards associated with coastal waves (floating debris, high velocity flow, erosion, and scour) can also damage Zone AE construction.

Therefore, a LiMWA boundary may be shown on the FIRM as an informational layer to assist coastal communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The location of the LiMWA relative to Zone VE and Zone AE is shown in Figure 6.

The effects of wave hazards in Zone AE between Zone VE (or the shoreline where Zone VE is not identified) and the limit of the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot or greater breaking waves are projected to occur during the 1-percent-annual-chance flooding event. Communities are therefore encouraged to adopt and enforce more stringent floodplain management requirements than the minimum NFIP requirements in the LiMWA. The NFIP Community Rating System provides credits for these actions.

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-percent-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-percent-annual-chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Lee County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Bonita Springs, City of	A, AE, VE, X
Cape Coral, City of	A, AE, VE, X
Estero, Village of	AE, AH, VE, X
Fort Myers, City of	A, AE, AH, VE, X
Fort Myers Beach, Town of	AE, VE, X
Lee County, Unincorporated Areas	A, AE, AH, AO, VE, X
Sanibel, City of	AE, AO, VE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 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 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Big Cypress Swamp	03090204	Big Cypress Swamp	The watershed is located in Lee, Hendry, Collier, Monroe, Broward, and Dade counties.	2,847
Caloosahatchee	03090205	Caloosahatchee River	The watershed runs through Lee, Hendry, and Glades counties from Lake Okeechobee to San Carlos Bay.	1,403
Charlotte Harbor	03100103	Charlotte Harbor	The watershed is located in Sarasota, Charlotte, and Lee counties.	606

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Lee County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Caloosahatchee River	The Caloosahatchee River is a broad estuary and, under certain conditions, storm surges generated at its mouth can intrude far upstream.
Gulf of America	Flooding in the coastal regions primarily flood from hurricanes and tropical storms. Not all storms which pass close to the study areas produce extremely high storm surges. Similarly, storms which produce extreme conditions in one area may not necessarily produce critical conditions in other parts of the study area. However, with the condition of high winds directed onshore, the storms surges produced can inundate the coastal islands and flood the coastal areas behind them for some distance inland. Wave action which accompanies wind-generated storms can cause flooding, erosion, and structural damage, particularly on the offshore islands. The rainfall which usually accompanies hurricanes and tropical storms can aggravate the flood situation, particularly in areas where the secondary drainage system is poorly developed.

Table 6 contains information about historic flood elevations in the communities within Lee County.

Table 6: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Gulf of America	Fort Myers and Punta Rassa	*	1926	*	FEMA 2018
Gulf of America	Fort Myers	*	1947	*	FEMA 2018
Gulf of America	Eastern Island	*	1960	*	NRCS high water marks
Gulf of America	Fort Myers	*	1985	*	FEMA 2018
Gulf of America	Lee County	*	1987	*	FEMA 2018
Gulf of America	Fort Myers	*	1988	*	FEMA 2018
Gulf of America	Lee County	*	1992	*	FEMA 2018
Gulf of America	Fort Myers	*	1994	*	FEMA 2018
Gulf of America	Lee County	*	1995	*	FEMA 2018
Gulf of America	Fort Myers	*	1998	*	FEMA 2018
Gulf of America	Lee County	*	1999	*	FEMA 2018
Gulf of America	Lee County	*	2001	*	FEMA 2018
Gulf of America	Estero Bay, near Horseshoe Key	4.2	2004	*	USGS gage
Gulf of America	Caloosahatchee River, near For Myers	3.4 – 3.6	2004	*	USGS gage

*Data not available

4.3 Dams and Other Flood Hazard Reduction Measures

Table 7 contains information about non-levee flood protection measures within Lee County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 7: Dams and Other Flood Hazard Reduction Measures

[Not Applicable to this Flood Risk Project]

4.4 Levees Systems

This section is not applicable to this Flood Risk Project.

Table 8: Levees Systems

[Not Applicable to this Flood Risk Project]

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-percent-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 26, "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 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 16.)

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Bayshore Creek	At mouth	3.00	622	840	*	1,171	1,542
Bayshore Creek	At Bayshore Road	2.58	551	734	*	1,020	1,332
Bedman Creek / Dog Canal	At mouth	16.10	2,945	4,228	*	5,731	2,289
Billy Creek	At mouth	12.88	2,522	3,186	*	4,227	5,374
Billy Creek	At Marsh Avenue	6.87	1,175	1,536	*	2,156	2,868
Carrell Canal	At mouth	1.68	359	441	*	564	704
Carrell Canal	Cleveland Avenue	0.997	212	260	*	331	413
Chapel Branch Creek	At mouth	1.88	386	532	*	883	984
Chapel Branch Creek	At Bayshore Road	1.22	288	386	*	524	657
Cypress Creek	At mouth	20.97	1,517	2,124	*	3,123	4,141
Daughtrey Creek	At mouth	34.26	1,582	2,001	*	2,607	3,232
Daughtrey Creek	At Bayshore Road	33.61	1,078	1,368	*	1,726	2,073
Daughtrey Creek	At I-75	30.82	836	1,100	*	1,552	2,044
East Branch Daughtrey Creek	At mouth	4.79	538	783	*	807	2,041
East Branch Daughtrey Creek	At I-75	3.45	392	518	*	709	952
East Branch Daughtrey Creek	At Nalle Grade Road	2.06	337	444	*	606	799

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
East Branch Yellow Fever Creek	At Pine Island Road	3.91	747	968	*	1,197	1,555
East Branch Yellow Fever Creek	At US 41	1.35	266	349	*	473	617
Estero River	At mouth	61.54	3,152	4,435	*	6,185	8,419
Estero River	At South Tamiami Trail	58.17	3,070	4,314	*	6,073	8,254
Estero River	At I-75	41.19	2,351	3,258	*	4,698	6,395
Fichter Creek	At mouth	5.65	712	947	*	1,310	1,716
Ford Street Canal	At mouth	1.36	376	439	*	660	853
Ford Street Canal	At Dr. Martin Luther King Jr. Boulevard	0.99	305	387	*	510	651
Halfway Creek	At mouth	6.45	545	638	*	761	897
Halls Creek	At mouth	1.07	209	280	*	391	519
Hancock Creek	At Hancock Bridge Parkway	10.31	1,653	2,076	*	2,645	3,349
Hancock Creek	At Pondella Road	8.84	1,415	1,800	*	2,298	3,000
Hancock Creek	At Pine Island Road	0.48	108	144	*	200	264
Hendry Creek	At mouth	5.51	842	1,043	*	1,336	1,670
Hendry Creek	At Gladiolus Drive	2.42	195	245	*	320	406
Hendry Creek West	At Summerline Road	1.25	416	527	*	695	885
Hickey Creek / Hickey Creek Drainageway	At mouth	25.38	3,159	4,310	*	5,716	7,459

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Imperial River	At mouth	105.00	*	*	*	4,950	*
Imperial River	At Seaboard Coast Line Railroad	65.40	*	*	*	3,073	*
Imperial River	Above Bonita Grande Road	21.00	*	*	*	2,833	*
Kickapoo Creek	At mouth	1.80	706	924	*	1,259	1,639
L-3 Canal	At mouth	1.70	339	416	*	531	658
L-3 Canal	At Cleveland Avenue	0.80	172	211	*	269	335
Leitner Creek	At mouth	1.76	430	554	*	742	957
Leitner Creek	At I-75	0.93	228	301	*	413	543
Manuels Branch	At mouth	1.38	264	330	*	429	541
Manuels Branch	Just downstream of Cleveland Avenue	0.889	170	212	*	275	346
Marsh Point Creek	At mouth	2.53	768	975	*	1,286	1,642
Marsh Point Creek	At Bayshore Road	1.42	420	535	*	707	903
Mullock Creek	Steam Station 0; 1069 (41,15)[1]	**	887	1,056	*	1,270	1,599
Mullock Creek	Steam Station 8,206; 1055 (41,29)[1]	**	855	1,034	*	1,258	1,595
Mullock Creek	Steam Station 9,500; 1053 (41,31)[1]	**	641	777	*	943	1,203
Mullock Creek	Steam Station 10,250; 1051 (41,33)[1]	**	619	746	*	908	1,194

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Mullock Creek	Steam Station 10,353; 1051 (41,33)[1]	**	619	746	*	908	1,194
Mullock Creek	Steam Station 11,506; 1049 (41,35)[1]	**	578	706	*	874	1,194
Mullock Creek	Steam Station 13,306; 1045 (41,39)[1]	**	535	648	*	756	1,096
Mullock Creek	Steam Station 14,537; 1042 (39,19)[1]	**	254	310	*	357	491
Mullock Creek	Steam Station 16,980; 1038 (39,23)[1]	**	179	202	*	229	304
Mullock Creek	Steam Station 20,842; 1030 (39,31)[1]	**	153	164	*	193	236
Mullock Creek	Steam Station 22,489; 1027 (39,34)[1]	**	122	133	*	169	207
Mullock Creek	Steam Station 22,713; 1026 (39,35)[1]	**	117	126	*	174	208
Mullock Creek	Steam Station 23,936; 1024 (39,37)[1]	**	67	77	*	119	175
Mullock Creek Tributary	Steam Station 0; 1108 (45,9)[1]	**	386	490	*	700	1,163
Mullock Creek Tributary	Steam Station 1,545; 1106-1105 (45,11-45,12)[1]	**	335	429	*	690	1,074
Mullock Creek Tributary	Steam Station 3,945; 1101 (45,16)[1]	**	323	416	*	578	835
Mullock Creek Tributary	Steam Station 6,230; 1096 (45,21)[1]	**	332	409	*	522	714

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Mullock Creek Tributary	Steam Station 7,158; 1095 (45,22)[1]	**	288	361	*	477	656
Mullock Creek Tributary	Steam Station 8,711; 1092 (45,25)[1]	**	289	342	*	430	539
Mullock Creek Tributary	Steam Station 8,857; 1092 (45,25)[1]	**	243	318	*	399	534
Mullock Creek Tributary	Steam Station 10,858; 1088 (45,29)[1]	**	136	154	*	190	241
North Colonial Waterway	Downstream of Metro Parkway	3.60	330	350	*	335	360
Oak Creek	At mouth	2.36	650	846	*	1,161	1,539
Oak Creek	At Old US 41 Road	1.43	440	574	*	793	1,061
Oak Creek	At Bonita Beach Road	1.17	292	379	*	517	681
Oak Creek	At Imperial Street	0.44	274	360	*	498	653
Orange River	At Palm Beach Boulevard	86.00	6,520	8,048	*	10,427	13,116
Orange River	At Buckingham Road	65.30	4,476	5,607	*	7,607	10,154
Owl Creek	At mouth	2.44	632	858	*	1,193	1,565
Owl Creek	At State Highway 31	1.39	393	513	*	694	904
Palm Creek	At mouth	3.17	563	770	*	1,081	1,421
Palm Creek	At Bayshore Road	3.08	682	877	*	1,162	1,551
Palm Creek	At Deal Road	1.65	363	474	*	644	837
Popash Creek	At mouth	17.37	709	936	*	1,274	1,781
Popash Creek	At State Highway 78	16.94	711	939	*	1,276	1,799

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Popash Creek	At county boundary	13.5	687	912	*	1,258	1,663
Powell Bypass	At mouth	6.06	1,200	1,430	*	1,981	2,612
Powell Creek	At mouth	10.09	1,887	2,368	*	3,226	4,313
Powell Creek Tributary No. 1	At mouth	3.12	376	7,501	*	999	1,499
Six Mile Cypress Slough	At mouth	34.4	2,578	3,588	*	5,026	6,521
Six Mile Cypress Slough	At Daniels Parkway	26.47	2,086	2,880	*	4,079	5,420
Six Mile Cypress Slough	At I-75	5.14	993	1,334	*	1,834	2,384
South Branch	At mouth	14.24	356	421	*	586	698
South Branch	At I-75	11.85	252	337	*	468	560
Spanish Canal	At mouth	0.56	123	167	*	235	314
Spanish Creek	At mouth	7.44	1,124	1,603	*	2,243	2,669
Spanish Creek	At River Road	7.15	1,018	1,438	*	2,018	2,620
Spring Creek	At mouth	11.70	1,692	2,143	*	2,872	3,746
Spring Creek	At South Tamiami Trail	5.34	1,303	1,646	*	2,178	2,861
Stricklin Gully	At mouth	2.62	625	839	*	1,167	1,549
Stroud Creek	At mouth	8.35	975	1,254	*	1,584	2,044
Stroud Creek	At Bayshore Road	7.94	999	1,308	*	1,771	2,307
Telegraph Creek	At mouth	81.17	5,117	7,125	*	10,637	14,778
Ten Mile Canal	At mouth	70.4	2,260	3,290	*	4,190	5,205

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Ten Mile Canal	At Daniels Parkway	11.00	1,410	1,700	*	1,990	2,270
Ten Mile Canal	At Colonial Boulevard	3.90	495	545	*	615	620
Trout Creek / Curry Lake Canal	At mouth	29.42	2,469	3,788	*	5,475	7,273
Trout Creek / Curry Lake Canal	At River Road	28.08	3,023	4,223	*	6,000	7,731
Trout Creek / Curry Lake Canal	Just upstream of Stricklin Gully	16.36	1,107	1,317	*	1,605	2,142
Winkler Canal	At mouth	1.34	325	365	*	463	574
Winkler Canal	Just downstream of Cleveland Avenue	0.56	141	168	*	209	245
Yellow Fever Creek	At Pine Island Road	1.51	365	476	*	675	967
Yellow Fever Creek	At Littleton Road	0.95	183	252	*	358	483
Tributary L-1 (Yellow Fever Creek Tributary)	At mouth	0.84	550	761	*	856	1,056
Tributary L-2 (Yellow Fever Creek Tributary)	At mouth	0.36	122	1,791	*	200	252

* Not calculated for this Flood Risk Project

** Data not available

[1] S2DMM Grid ID MBR (I,J)

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

Table 11: Stream Gage Information used to Determine Discharges

[Not Applicable to this Flood Risk Project]

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 in Table 23, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. 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 12: 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
Bayshore Creek	Mouth at Caloosahatchee River	Approximately 975 feet upstream of Jamestown Circle	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Bayshore Creek	Approximately 975 feet upstream of Jamestown Circle	Nalle Grade Road	AdiCPR	HEC-RAS 2.2 and 3.1.3	2002	AE w/ Floodway	Banks Engineering imported the HEC-RAS 2.2 model into HEC-RAS 3.1.3 (USACE 2005). Cross sections 17 through 22 were updated based on detailed certified survey data (Banks Engineering 2007). PBS&J revised the floodway encroachment stations to better reflect expansion and contraction of the floodway conveyance.
Bedman Creek / Dog Canal	Mouth at Caloosahatchee River	Approximately 1.3 mile upstream of State Route 80/ Palm Beach Boulevard	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Bedman Creek / Dog Canal	Approximately 1.3 mile upstream of State Route 80/ Palm Beach Boulevard	Approximately 8.3 miles upstream of Palm Beach Boulevard	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Billy Creek	Mouth at Caloosahatchee River	Approximately 35 feet upstream of Ortiz Avenue	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Billy Creek	Approximately 35 feet upstream of Ortiz Avenue	Approximately 0.4 mile upstream of Ortiz Circle	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Carrell Canal	Mouth at Caloosahatchee River	Approximately 150 feet upstream of McGregor Boulevard	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Carrell Canal	Approximately 150 feet upstream of McGregor Boulevard	Approximately 375 feet upstream of Evans Avenue	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.

Table 12: 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
Chapel Branch Creek	Mouth at Caloosahatchee River	Approximately 1,924 feet upstream of Bayshore Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Chapel Branch Creek	Approximately 1,924 feet upstream of Bayshore Road	Approximately 740 feet upstream of Rich Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Cypress Creek	Mouth at Caloosahatchee River	Approximately 0.8 mile upstream of River Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Cypress Creek	Approximately 0.8 mile upstream of River Road	Approximately 3.0 miles upstream of River Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Daughtrey Creek	Mouth at Caloosahatchee River	Approximately 1.3 mile upstream of Bayshore Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Daughtrey Creek	Approximately 1.3 mile upstream of Bayshore Road	Approximately 0.9 mile upstream of Nalle Grade Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
East Branch Daughtrey Creek	Mouth at Daughtrey Creek	Approximately 270 feet upstream of Samville Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
East Branch Daughtrey Creek	Approximately 270 feet upstream of Samville Road	Nalle Grade Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
East Branch Yellow Fever Creek	Mouth at Yellow Fever Creek	Approximately 130 feet upstream of Pine Island Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
East Branch Yellow Fever Creek	Approximately 130 feet upstream of Pine Island Road	Approximately 75 feet upstream of U.S. 41	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	

Table 12: 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
Estero River	Mouth at Caloosahatchee River	Approximately 890 feet upstream of Rivers Ford	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Estero River	Approximately 890 feet upstream of Rivers Ford	Approximately 400 feet upstream of Estero Parkway	S2DMM	HEC-RAS 2.2 and 3.1.3	2002	AE w/ Floodway	Greenhorne & O'Mara updated cross sections 20.1–24.4 based on detailed certified survey data (Barraco 2007; WilsonMiller 2007a, WilsonMiller 2007b). PBS&J revised the floodway encroachment stations to better reflect expansion and contraction of the floodway conveyance and adjusted the ineffective flow stations at the I-75 crossing.
Fichter Creek	Mouth at Caloosahatchee River	Approximately 20 feet upstream of Fichters Creek Lane	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Fichter Creek	Approximately 20 feet upstream of Fichters Creek Lane	Approximately 60 feet upstream of Fichters Creek Lane	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Ford Street Canal	Mouth at Caloosahatchee River	Approximately 0.4 mile upstream of Michigan Avenue	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Ford Street Canal	Approximately 0.4 mile upstream of Michigan Avenue	Approximately 1,125 feet upstream of Canal Street	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Halfway Creek	Mouth at Estero River	U.S. 41	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Halfway Creek	U.S. 41	Approximately 100 feet upstream of Railroad	S2DMM	S2DMM & HEC-RAS 4.1.0	2012	AE w/ Floodway	

Table 12: 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
Halls Creek	Mouth at Cypress Creek	Approximately 0.6 mile upstream of River Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Hancock Creek	Mouth at Caloosahatchee River	Approximately 75 feet upstream of Commerce Creek Boulevard	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Hancock Creek	Approximately 75 feet upstream of Commerce Creek Boulevard	Approximately 100 feet upstream of Diplomat Parkway	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Hendry Creek	Mouth at Caloosahatchee River	U.S. 41	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	Hendry Creek is completely inundated by coastal flooding effects, and therefore does not have an applicable riverine Flood Profile.
Hendry Creek West	Mouth at Hendry Creek	Just upstream of Winkler Road	*	*	2018	AE	Hendry Creek is completely inundated by coastal flooding effects, and therefore does not have an applicable riverine Flood Profile.
Hickey Creek	Mouth at Caloosahatchee River	Hickey Creek Drainageway	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Hickey Creek Drainageway	Mouth at Hickey Creek	Approximately 0.4 mile upstream of confluence with Hickey Creek	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Hickey Creek Drainageway	Approximately 0.4 mile upstream of confluence with Hickey Creek	Approximately 1.1 miles upstream of 17th Street	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
Imperial River	Mouth at Fish Trap Bay	Just upstream of Bonita Grade Road	HEC-1	HEC-2	1995	AE w/ Floodway	
Kickapoo Creek	Mouth at Caloosahatchee River	Approximately 1,300 feet upstream of Old Bayshore Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	Kickapoo Creek is completely inundated by coastal flooding effects, and therefore does not have an applicable riverine Flood Profile.

Table 12: 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
L-3 Canal	Confluence at L Canal	Approximately 0.4 mile upstream of Fowler Street	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance. Revised computation method was used for the bridge at cross section 11.25.
Leitner Creek	Mouth at Imperial River	Approximately 835 feet upstream of East Terry Street	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Leitner Creek	Approximately 835 feet upstream of East Terry Street	Approximately 1,525 feet upstream of I-75 North Bound	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Manuels Branch	Mouth at Caloosahatchee River	Cleveland Avenue	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Manuels Branch	Cleveland Avenue	Approximately 970 feet upstream of Evans Avenue	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
Marsh Point Creek	Mouth at Caloosahatchee River	Just upstream of Laurel Lane	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Marsh Point Creek	Just upstream of Laurel Lane	Tucker Lane	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance. Channel bank stations were adjusted at cross section 18.1.

Table 12: 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
Mullock Creek	Mouth at Caloosahatchee River	Just upstream of Oriole Road	S2DMM	S2DMM & HEC-RAS 4.1.0	2023	AE w/ Floodway	S2DMM is a FEMA approved model that has been used in numerous South Florida flood studies where sheet-flow, channel flow, and water management facilities coexist. The documentation includes the setup, calibration and validation , and design storm simulations for the S2DMM model to the Mullock Creek and Mullock Creek Tributary. The S2DMM model was applied to design storms to determine corresponding stages and flows required for the FEMA FIRM development. The S2DMM computed stages in uplands and in channels were applied to define floodplains and base flood elevations (BFE) on the FIRMs. The S2DMM computed design flows (1% annual chance) were applied to HECRAS step backwater analyses to determine floodways for the Mullock Creek and Tributary for FEMA FIRM Map.
Mullock Creek Tributary	Confluence at Mullock Creek	Approximately 100 feet upstream of South Tamiami Trail	S2DMM	S2DMM & HEC-RAS 4.1.0	2023	AE w/ Floodway	S2DMM is a FEMA approved model that has been used in numerous South Florida flood studies where sheet-flow, channel flow, and water management facilities coexist. The documentation includes the setup, calibration and validation , and design storm simulations for the S2DMM model to the Mullock Creek and Mullock Creek Tributary. The S2DMM model was applied to design storms to determine corresponding stages and flows required for the FEMA FIRM development. The S2DMM computed stages in uplands and in channels were applied to define floodplains and base flood elevations (BFE) on the FIRMs. The S2DMM computed design flows (1% annual chance) were applied to HECRAS step backwater analyses to determine floodways for the Mullock Creek and Tributary for FEMA FIRM Map.
North Colonial Waterway	Confluence with Ten Mile Canal	Approximately 600 feet upstream of Province Park Boulevard	S2DMM	S2DMM & HEC-RAS 4.1.0	2012	AE w/ Floodway	

Table 12: 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
Oak Creek	Mouth at Imperial River	Imperial Parkway	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Oak Creek	Imperial Parkway	Approximately 1,200 feet upstream of Imperial Parkway	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
Orange River	Mouth at Caloosahatchee River	Approximately 1.3 miles upstream of Buckingham Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Orange River	Approximately 1.3 miles upstream of Buckingham Road	Approximately 2.5 miles upstream of Buckingham Road	AdiCPR	HEC-RAS 2.2 and 3.1.3	2002	AE w/ Floodway	ADA Engineering imported the HEC-RAS 2.2 model into HEC-RAS 3.1.3 (USACE 2005). Cross section 47 was removed from the model and replaced with cross section 47.1 based on certified survey data (AIM 2007).
Owl Creek	Confluence at Trout Creek	Approximately 30 feet upstream of SR 31	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Owl Creek	Approximately 30 feet upstream of SR 31	Approximately 1,200 feet upstream of Shirly Lane	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance and adjusted stationing of cross sections 14.2 and 14.25.
Palm Creek	Mouth at Caloosahatchee River	Approximately 0.4 mile upstream of Bayshore Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Palm Creek	Approximately 0.4 mile upstream of Bayshore Road	Approximately 0.6 mile upstream of Reuben Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance and adjusted ineffective flow stations at Bayshore Road.
Popash Creek	Mouth at Caloosahatchee River	Approximately 1.5 miles upstream of Leetana Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 12: 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
Popash Creek	Approximately 1.5 miles upstream of Leetana Road	Charlotte County boundary	AdiCPR	HEC RAS 2.2 and 3.1.3	2002	AE w/ Floodway	Banks Engineering imported the HEC-RAS 2.2 model into HEC-RAS 3.1.3 (USACE 2005). Cross sections 10.1 through 22.4 were updated based on detailed certified survey data (Banks Engineering 2007). PBS&J revised the floodway encroachment stations to better reflect expansion and contraction of the floodway conveyance.
Powell Creek / Powell Bypass	Mouth at Caloosahatchee River	Approximately 0.5 mile upstream of North Evalena Lane	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Powell Creek / Powell Bypass	Approximately 0.5 mile upstream of North Evalena Lane	Approximately 2.0 miles upstream of Mellow Drive	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance and adjusted manning's n value for the left overbank from cross sections 1 through 5.4.
Powell Creek (Upstream of Confluence of Powell Bypass)	Approximately 2.7 miles upstream of mouth	Tucker Lane	SCS TR-20	HEC-2	*	AE	The hydrologic and hydraulic analyses were taken from a report prepared by the U.S. Department of Agriculture Natural Resources Conservation Service (USDA 1984). The flood hazard information was redelineated based on newly developed topographic data in the 2008 revision. No new flood hazard analysis was performed.
Powell Creek Tributary No. 1	Mouth at Powell Creek	Approximately 650 feet upstream of Arrowhead Boulevard	SCS TR-20	HEC-2	*	AE	The hydrologic and hydraulic analyses were taken from a report prepared by the U.S. Department of Agriculture Natural Resources Conservation Service (USDA 1984). The flood hazard information was redelineated based on newly developed topographic data in the 2008 revision. No new flood hazard analysis was performed.
Six Mile Cypress Slough	Mouth at Ten Mile Canal	Approximately 1.7 miles upstream of confluence at Ten Mile Canal	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 12: 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
Six Mile Cypress Slough	Approximately 1.7 miles upstream of confluence at Ten Mile Canal	Approximately 1.3 miles upstream of Colonial Boulevard	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance and adjusted channel bank station at cross section 32.
South Branch	Confluence with Estero River	Approximately 0.9 miles upstream of Sanctuary Drive	S2DMM	S2DMM & HEC-RAS 4.1.0	2012	AE w/ Floodway	
Spanish Canal	Mouth at Spanish Creek	Approximately 0.8 miles upstream of mouth at Spanish Creek	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Spanish Creek	Mouth at Caloosahatchee River	Approximately 1,800 feet upstream of confluence of Spanish Canal	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Spanish Creek	Approximately 1,800 feet upstream of confluence of Spanish Canal	Approximately 1,120 feet upstream of Persimmon Ridge Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance and revised computation method for bridge at cross section 5.25.
Spring Creek	Mouth at Caloosahatchee River	Approximately 1,000 feet upstream of Old 41 Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Stricklin Gully	Confluence at Trout Creek	Approximately 1.4 miles upstream of confluence at Trout Creek	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
Stroud Creek	Mouth at Caloosahatchee River	Approximately 1,300 feet upstream of St. Paul Road	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Telegraph Creek	Mouth at Caloosahatchee River	Just upstream of Telegraph Creek Lane	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.

Table 12: 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
Telegraph Creek	Just upstream of Telegraph Creek Lane	Approximately 1.5 miles upstream of Telegraph Creek Lane	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	PBS&J revised the HEC-RAS 2.2 to better reflect expansion and contraction of the floodway conveyance.
Ten Mile Canal	Mouth at Mullock Creek	Approximately 0.9 mile upstream of confluence of North Colonial Waterway	S2DMM	S2DMM & HEC-RAS 4.1.0	2012	AE w/ Floodway	
Tributary L-1 (Yellow Fever Creek Tributary)	Cleveland Avenue/ U.S. Route 41	Pine Island Road	*	Combined probability calculation spreadsheet	2018	AE	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Tributary L-2 (Yellow Fever Creek Tributary)	Cleveland Avenue/ U.S. Route 41	Pine Island Road	*	Combined probability calculation spreadsheet	2018	AE	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Trout Creek / Curry Lake Canal	Mouth at Caloosahatchee River	Approximately 1.1 miles upstream of River Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Trout Creek / Curry Lake Canal	Approximately 1.1 miles upstream of River Road	Charlotte County boundary	AdiCPR	HEC-RAS 2.2	2002	AE w/ Floodway	
Winkler Canal	Mouth at Caloosahatchee River	Approximately 150 feet upstream of Evans Avenue	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Yellow Fever Creek	Confluence at Hancock Creek	Approximately 0.5 mile upstream of Littleton Road	*	Combined probability calculation spreadsheet	2018	AE w/ Floodway	Combined probability analysis was calculated for each riverine cross section that intersected the coastal surge.
Zone A Ponding Areas	All within Lee County	All within Lee County	*	*	*	A	The flood hazard information was redelineated based on newly developed topographic data in the 2008 revision. No new flood hazard analysis was performed.

*Data not available

Table 13: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Bayshore Creek	0.030-0.060	0.080-0.180
Bedman Creek / Dog Canal	0.030-0.060	0.080-0.180
Billy Creek	0.030-0.060	0.080-0.180
Caloosahatchee River	0.030-0.060	0.080-0.180
Carrell Canal	0.030-0.060	0.080-0.180
Chapel Branch Creek	0.030-0.060	0.080-0.180
Cypress Creek	0.030-0.060	0.080-0.180
Daughtrey Creek	0.030-0.060	0.080-0.180
East Branch Daughtrey Creek	0.030-0.060	0.080-0.180
East Branch Yellow Fever Creek	0.030-0.060	0.080-0.180
Estero River	0.030-0.060	0.080-0.180
Fichter Creek	0.030-0.060	0.080-0.180
Ford Street Canal	0.030-0.060	0.080-0.180
Halfway Creek	0.030-0.060	0.080-0.180
Halls Creek	0.030-0.060	0.080-0.180
Hancock Creek	0.030-0.060	0.080-0.180
Hendry Creek	0.030-0.060	0.080-0.180
Hendry Creek West	0.030-0.060	0.080-0.180
Hickey Creek	0.030-0.060	0.080-0.180
Hickey Creek Drainageway	0.030-0.060	0.080-0.180
Imperial River	0.025-0.200	0.040-0.250
Kickapoo Creek	0.030-0.060	0.080-0.180
L-3 Canal	0.030-0.060	0.080-0.180
Leitner Creek	0.030-0.060	0.080-0.180
Manuels Branch	0.030-0.060	0.080-0.180
Marsh Point Creek	0.030-0.060	0.080-0.180
Mullock Creek	0.035-0.400	0.100-1.200
Mullock Creek Tributary	0.040	0.100
North Colonial Waterway	0.030-0.060	0.080-0.180
Oak Creek	0.030-0.060	0.080-0.180
Orange River	0.030-0.060	0.080-0.180

Table 13: Roughness Coefficients (continued)

Flooding Source	Channel "n"	Overbank "n"
Owl Creek	0.030-0.060	0.080-0.180
Palm Creek	0.030-0.060	0.080-0.180
Popash Creek	0.030-0.060	0.080-0.180
Powell Creek / Powell Bypass	0.030-0.060	0.080-0.180
Powell Creek (Upstream of Confluence of Powell Bypass)	0.035-0.100	0.010-0.050
Powell Creek Tributary No. 1	0.035-0.100	0.010-0.050
Six Mile Cypress Slough	0.030-0.060	0.080-0.180
South Branch	0.030-0.060	0.080-0.180
Spanish Canal	0.030-0.060	0.080-0.180
Spanish Creek	0.030-0.060	0.080-0.180
Spring Creek	0.030-0.060	0.080-0.180
Stricklin Gully	0.030-0.060	0.080-0.180
Stroud Creek	0.030-0.060	0.080-0.180
Telegraph Creek	0.030-0.060	0.080-0.180
Ten Mile Canal	0.030-0.060	0.080-0.180
Tributary L-1 (Yellow Fever Creek Tributary)	0.035-0.100	0.010-0.050
Tributary L-2 (Yellow Fever Creek Tributary)	0.035-0.100	0.010-0.050
Trout Creek / Curry Lake Canal	0.030-0.060	0.080-0.180
Winkler Canal	0.030-0.060	0.080-0.180
Yellow Fever Creek	0.030-0.060	0.080-0.180

5.3 Coastal Analyses

For the areas of Lee 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 14 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 14: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Caloosahatchee River	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Caloosahatchee River	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Caloosahatchee River	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Caloosahatchee River	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Caloosahatchee River	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Charlotte Harbor	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Charlotte Harbor	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Charlotte Harbor	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Charlotte Harbor	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Charlotte Harbor	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Estero Bay	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Estero Bay	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Estero Bay	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Estero Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017

Table 14: Summary of Coastal Analyses (continued)

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Estero Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Gasparilla Sound	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Gasparilla Sound	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Gasparilla Sound	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Gasparilla Sound	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Gasparilla Sound	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Wave Runup	CSHORE/ Runup 2.0/ TAW	08/31/2018
Gulf of America	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Little Bokeelia Bay	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018

Table 14: Summary of Coastal Analyses (continued)

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Little Bokeelia Bay	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Little Bokeelia Bay	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Little Bokeelia Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Little Bokeelia Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Matlacha Pass	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Matlacha Pass	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Matlacha Pass	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Matlacha Pass	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Matlacha Pass	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017
Pine Island Sound	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
Pine Island Sound	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
Pine Island Sound	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
Pine Island Sound	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
Pine Island Sound	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017

Table 14: Summary of Coastal Analyses (continued)

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
San Carlos Bay	Entire coastline of Lee County	Entire coastline of Lee County	Overland Wave Propagation	WHAFIS	08/31/2018
San Carlos Bay	Entire coastline of Lee County	Entire coastline of Lee County	Statistical Analysis	JPM	01/01/2017
San Carlos Bay	Entire coastline of Lee County	Entire coastline of Lee County	Storm Surge	ADCIRC	01/01/2017
San Carlos Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Generation	SWAN	01/01/2017
San Carlos Bay	Entire coastline of Lee County	Entire coastline of Lee County	Wave Setup	SWAN	01/01/2017

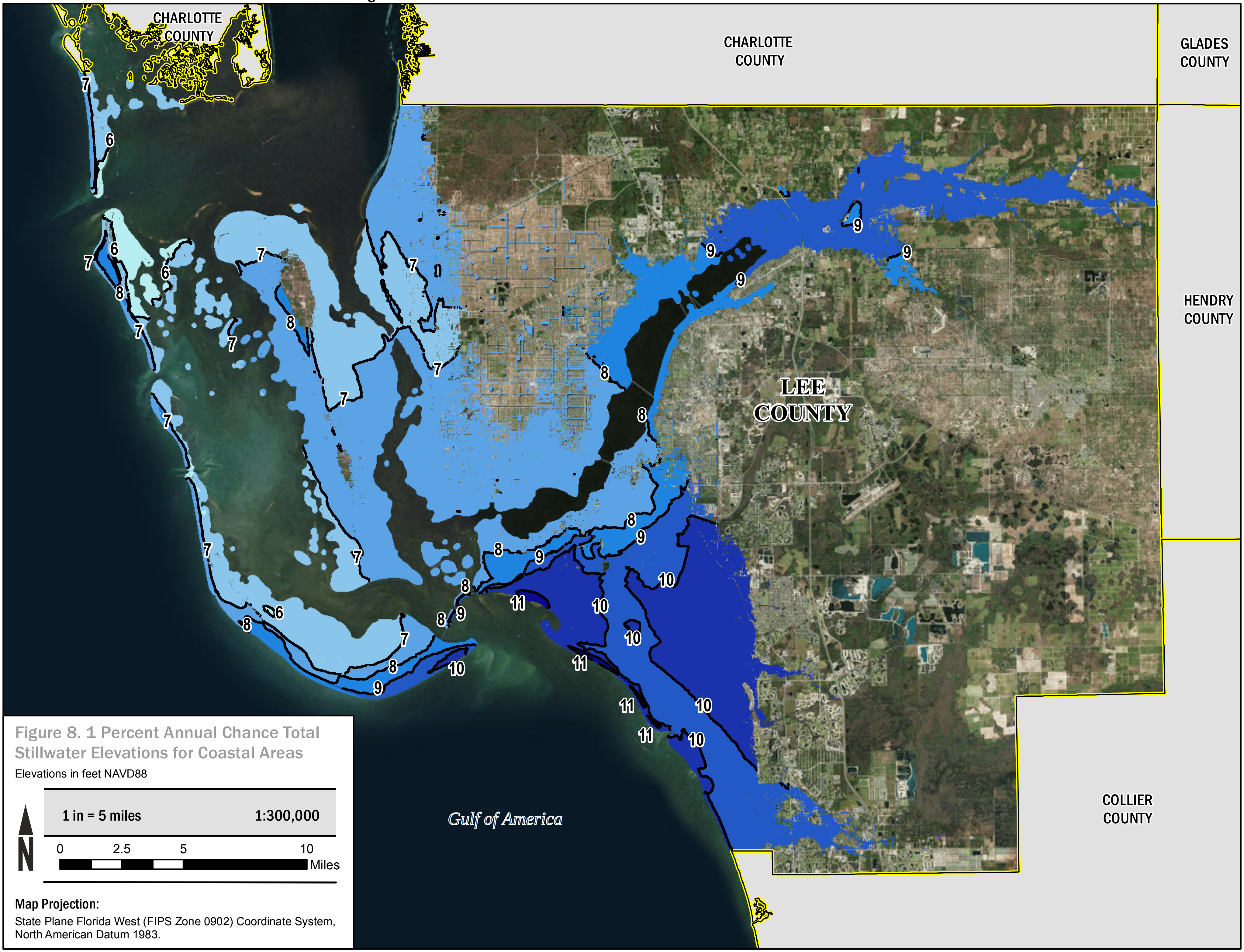
5.3.1 Total Stillwater Elevations

The total stillwater elevations (stillwater including storm surge plus wave setup) for the 1-percent-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 14. The stillwater elevation that was used for each transect in coastal analyses is shown in Table 16, “Coastal Transect Parameters.” Figure 8 shows the total stillwater elevations for the 1-percent-annual-chance flood that was determined for this coastal analysis.

The region wide storm surge modeling was performed using the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC), as described in Table 14. The ADCIRC model was coupled with the unstructured numerical wave model Simulating Waves Nearshore (SWAN) to calculate the contribution of waves to coastal flooding. The resulting model system is typically referred to as SWAN+ADCIRC. A seamless modeling grid was developed to support the storm surge modeling efforts. The modeling system validation consisted of a comprehensive tidal calibration followed by a validation using carefully reconstructed wind and pressure fields for three major flood events affecting the region: Hurricane Charley, Tropical Storm Gabrielle, and Hurricane Donna.

Model skill was assessed by quantitative comparison of model output to wind, wave, and high water mark observations. The model was then used to re-create 395 synthetic storms to create a synthetic water elevation record from which the 10-, 4-, 2-, 1-, and 0.2- percent annual chance of exceedance elevations were determined.

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



Astronomical Tide
Astronomical tidal statistics were generated directly from local tidal constituents by sampling the predicted tide at random times throughout the tidal epoch.

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.

Characteristics such as the strength, size, and track were used in the Joint Probability Method (JPM) to define tropical storm behavior for the Southwest Florida Study Region. Storm data was used in conjunction with numerical hydrodynamic models to determine the corresponding storm surge levels. An extreme value analysis was performed on the storm surge modeling results to determine a stillwater elevation for the 1-percent-annual-chance flood.

Table 15: Tide Gage Analysis Specifics

[Not Applicable to this Flood Risk Project]

Combined Riverine and Tidal Effects
A combined rate or occurrence analysis was conducted to compute a 1-percent-annual-chance BFE for areas subject to flooding by both coastal and riverine flooding mechanism. Since riverine and coastal analyses were based on independent events, the resulting combined BFE would be higher than that of their individual occurrence. In other words, at the location where the computed 1-percent-annual-chance coastal flood level equals the computed 1-percent-annual-chance riverine flood level, there was a greater than 1-percent-annual-chance of this flood level being equaled or exceeded.

In Lee County, combined probability calculations were performed for Bayshore Creek, Bedman Creek/Dog Canal, Billy Creek, Carrell Canal, Chapel Branch Creek, Cypress Creek, Daughtrey Creek, East Branch Daughtrey Creek, East Branch Yellow Fever Creek, Estero River, Fichter Creek, Ford Street Canal, Halfway Creek, Hancock Creek, Hickey Creek Drainageway, Leitner Creek, Manuels Branch, Marsh Point Creek, Mullock Creek, Mullock Creek Tributary, Oak Creek, Orange River, Owl Creek, Palm Creek, Popash Creek, Powell Creek/Powell Bypass, Six Mile Cypress Slough, Spanish Canal, Spanish Creek, Telegraph Creek, Tributary L-1 (Yellow Fever Creek Tributary), Tributary L-2 (Yellow Fever Creek Tributary), Trout Creek/Curry Lake Canal, Winkler Canal, and Yellow Fever Creek.

Wave Setup Analysis
Wave setup was computed during the storm surge modeling through the methods and models listed in Table 14 and included in the frequency analysis for the determination of the total stillwater elevations.

5.3.2 Waves

The SWAN coastal wave model was used to calculate the nearshore wave field required for the addition of wave setup effects. The SWAN model is tightly coupled to the ADCIRC hydrodynamic model so that forces are passed between models as they run. This results in the wave setup from breaking waves being part of the computed water elevations.

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 14. 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-percent-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 16 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 14, “Summary of Coastal Analyses”. For the 0.2-percent-annual chance event, wave profiles were created to indicate the results of the wave height analysis at each transect. Such wave profiles may show greater detail than the mapping product, due to limitations of the map scale and smoothing tolerances applied during boundary cleanup. Wave runup analysis for the 0.2-percent-annual-chance event was not performed for this study and is not included in the profiles.

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-percent-annual-chance event. Wave runup is defined as the maximum vertical extent of wave uprush on a beach or structure. FEMA’s 2007 Guidelines and Specifications require the 2-percent wave runup level be computed for the coastal feature being evaluated (cliff, coastal bluff, dune, or

structure) (FEMA, February 2007). The 2-percent runup level is the highest 2 percent of wave runup affecting the shoreline during the 1-percent-annual-chance flood event. Each transect defined within the study area was evaluated for the applicability of wave runup, and if necessary, the appropriate runup methodology was selected and applied to each transect. Runup elevations were then compared to WHAFIS results to determine the dominant process affecting BFEs and associated flood hazard levels. Based on wave runup rates, wave overtopping was computed following the FEMA 2007 Guidelines and Specifications. Wave runup elevations were modeled using the methods and models listed in Table 14.