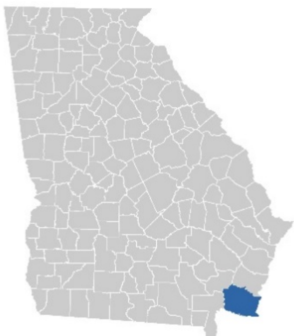
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 4



CAMDEN COUNTY, GEORGIA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CAMDEN COUNTY, UNINCORPORATED AREAS	130262
KINGSLAND, CITY OF	130238
ST. MARYS, CITY OF	130027
WOODBINE, CITY OF	130241

FEMA

REVISED:

PRELIMINARY
12/15/2015

FLOOD INSURANCE STUDY NUMBER
13039CV001B

Version Number 2.3.2.1

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Volume 1

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FLOOD INSURANCE STUDY REPORT
CAMDEN COUNTY, GEORGIA

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 60.3, *Criteria for Land Management and Use*.

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

1.2 Purpose of this Flood Insurance Study Report

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

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

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Camden County, Georgia.

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

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

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
Camden County, Unincorporated Areas	130262	03070201 03070203 03070204	13039C0025G 13039C0050G 13039C0075G 13039C0100G 13039C0105G 13039C0110G 13039C0115G 13039C0120G 13039C0130G 13039C0135G 13039C0140G 13039C0145G 13039C0155G 13039C0160G 13039C0165G 13039C0166G 13039C0167G 13039C0168G 13039C0169G 13039C0190G 13039C0200G[1,2] 13039C0225G 13039C0230G 13039C0235G 13039C0240G 13039C0245G 13039C0251G 13039C0252G	

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
Camden County, Unincorporated Areas	130262	03070201 03070203 03070204	13039C0253G 13039C0254G 13039C0260G 13039C0265G 13039C0270G 13039C0280G 13039C0285G 13039C0290G 13039C0295G 13039C0315G 13039C0320G 13039C0325G 13039C0334G 13039C0335G 13039C0345G 13039C0355G 13039C0360G 13039C0365G 13039C0370G 13039C0379G 13039C0380G 13039C0383G 13039C0385G 13039C0387G 13039C0390G 13039C0391G 13039C0395G 13039C0402G 13039C0405G 13039C0410G 13039C0414G 13039C0415G 13039C0418G 13039C0420G 13039C0430G 13039C0435G 13039C0440G 13039C0455G 13039C0460G 13039C0480G 13039C0485G 13039C0505G	

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
Kingsland, City of	130238	03070201 03070203 03070204	13039C0265G 13039C0355G 13039C0360G 13039C0365G 13039C0370G 13039C0379G 13039C0380G 13039C0383G 13039C0385G 13039C0387G 13039C0390G 13039C0391G 13039C0395G 13039C0405G 13039C0415G	
St. Marys, City of	130027	03070203 03070204	13039C0395G 13039C0405G 13039C0414G 13039C0415G 13039C0418G 13039C0420G 13039C0460G 13039C0480G 13039C0485G	
Woodbine, City of	130241	03070201	13039C0251G 13039C0252G 13039C0253G 13039C0254G 13039C0260G 13039C0265G 13039C0270G	

[1] No Special Flood Hazard Areas Identified

[2] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

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

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

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

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

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

  The initial Countywide FIS Report for Camden County became effective on September 30, 1988. Refer to Table 28 for information about subsequent revisions to the FIRMs.

- Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels. In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

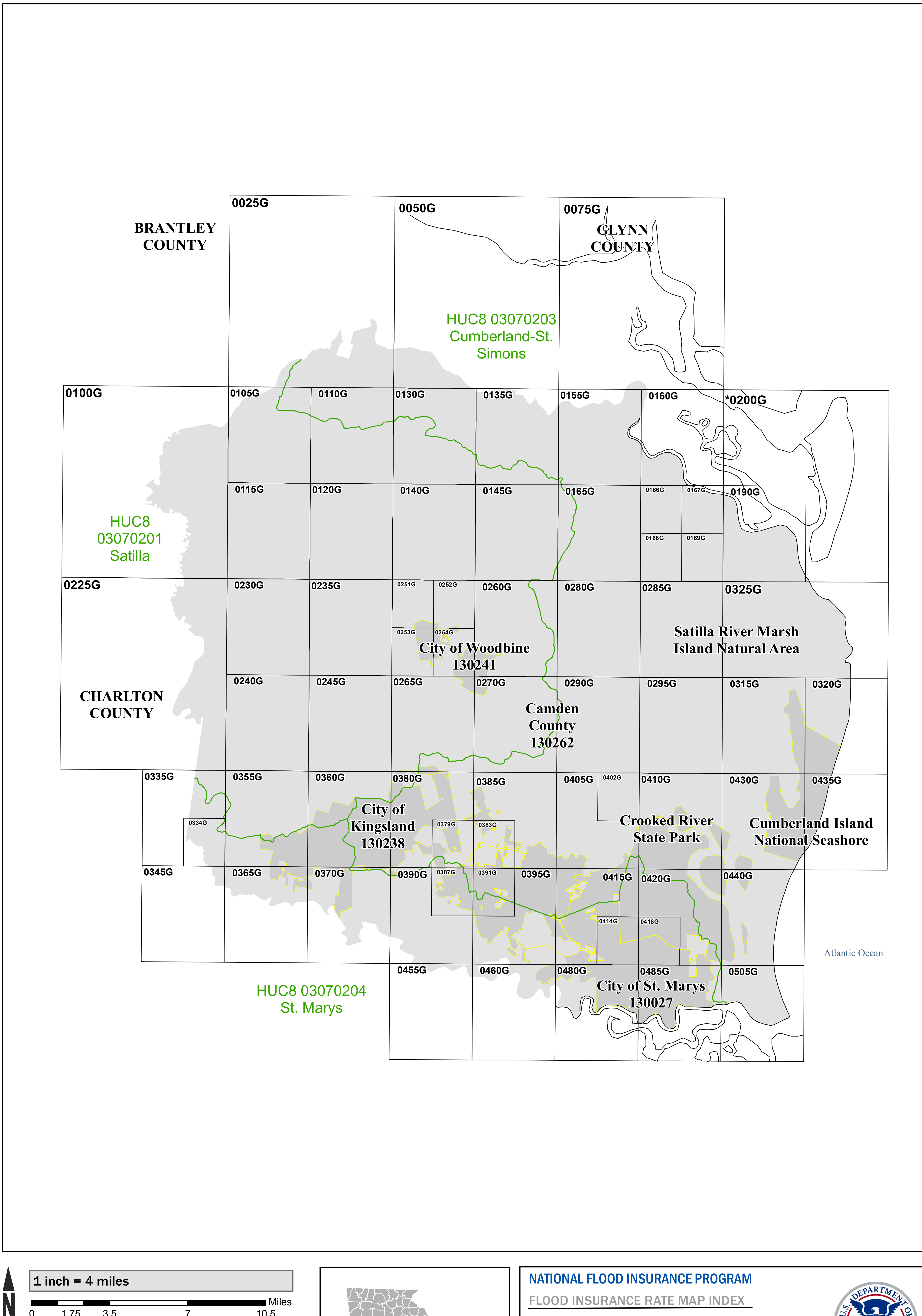
- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the

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/national-flood-insurance-program-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/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Camden 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, flooding sources.



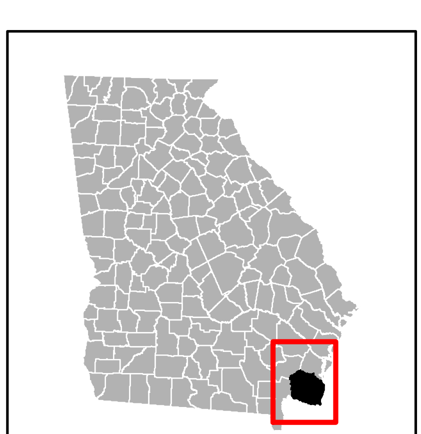
Map Projection:
Universal Transverse Mercator Zone 17 North
North American Datum 1983

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

HTTP://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

CAMDEN COUNTY, GEORGIA and Incorporated Areas

PANELS PRINTED:
0025G, 0050G, 0075G, 0100G, 0105G, 0110G, 0115G, 0120G, 0130G, 0135G, 0140G, 0145G, 0155G, 0160G, 0165G, 0166G, 0167G, 0168G, 0169G, 0190G, 0225G, 0230G, 0235G, 0240G, 0245G, 0251G, 0252G, 0253G, 0254G, 0260G, 0265G, 0270G, 0280G, 0285G, 0290G, 0295G, 0315G, 0320G, 0325G, 0334G, 0335G, 0345G, 0355G, 0360G, 0365G, 0370G, 0379G, 0380G, 0383G, 0385G, 0387G, 0390G, 0391G, 0395G, 0402G, 0405G, 0410G, 0414G, 0415G, 0418G, 0420G, 0430G, 0435G, 0440G, 0455G, 0460G, 0480G, 0485G, 0505G

PRELIMINARY
12/15/2015

FEMA

MAP NUMBER
13039CIND0G

MAP REVISED

Figure 1: FIRM Index Panel

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 map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA 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 Map Information eXchange.

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

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

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

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

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 - continued

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 be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION The projection used in the preparation of the map was State Plane Coordinate System, Georgia East FIPS 1001. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

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

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

BASE MAP INFORMATION: Base map information shown on the FIRM was derived from USGS (panel layout 1998), Oconee County (political areas dated 2007), Georgia DOT (political areas dated 1997, transportation data dated 2011, hydrographic features dated 1996), US National Atlas (political areas dated 2005), and USDA NAIP (orthophotography dated 2013) digital data. 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

Figure 2. FIRM Notes to Users - continued

current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Camden County, Georgia, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Camden County, Georgia, effective December 15, 2015.

COASTAL BARRIER RESOURCES SYSTEM (CBRS): This map includes approximate boundaries of the CBRS for informational purposes only. Flood insurance is not available within CBRS areas for structures that are newly built or substantially improved on or after the date(s) indicated on the map. For more information see www.fws.gov/cbra/, the FIS Report, or call the U.S. Fish and Wildlife Service Customer Service Center at 1-800-344-WILD.

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.

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 Camden 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.

Figure 3: Map Legend for FIRM - continued

	Regulatory Floodway determined in Zone AE.
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood.
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 - continued

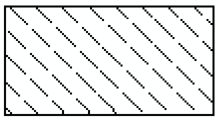
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.*	
 **CBRS AREA 09/30/2009**	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 **O THERWISE PROTECTED AREA 09/30/2009**	Otherwise Protected Area
REFERENCE MARKERS	
22.0 ●	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
⟨B⟩—20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
⟨5280⟩—21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
(8) - - - - - - -	Coastal Transect
—— - ———— -	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 - continued

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

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

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

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

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

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

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

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Atlantic Ocean (Flooding Controlled by Atlantic Ocean)	Camden County, Unincorporated Areas; Kingsland, City of; City of St. Marys	Entire Coastline within Camden County	Entire Coastline within Camden County	03070201 03070203 03070204	33.79		N	AE VE	2015
Crooked River (and tributaries)	Camden County, Unincorporated Areas	Approximately 2,070 feet downstream of U.S. Highway 17/State Road 25	Just downstream of Duck Pond Road	03070203	9.60		N	AE	2011
Horsepen Creek	Camden County, Unincorporated Areas; Kingsland, City of	Confluence with the St. Mary's River	Springhill Road North	03070204	3.69		N	AE	05/31/2012
Kingsland Pond No. 1	Kingsland, City of	Approximately 980 feet south and 100 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	03070203		0.01	N	AE	2010
Kingsland Pond No. 2	Kingsland, City of	Approximately 2,040 feet south and 420 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	03070203		0.01	N	AE	2010

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
Kingsland Pond No. 3	Kingsland, City of	Approximately 1,550 feet north and 2,020 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	03070203		0.03	N	AE	2010
Lower North Fork Crooked River	Camden County, Unincorporated Areas	Confluence with North Fork Crooked River	Approximately 10,180 feet upstream	03070203	1.93		N	AE	2011
North Crooked River	Camden County, Unincorporated Areas	Confluence with Crooked River	Approximately730 feet upstream of Higginbotham Road	03070203	1.34		N	AE	2011
North Fork Crooked River (and tributaries)	Camden County, Unincorporated Areas	Confluence with Crooked River	Approximately 21,020 feet upstream of U.S. Highway 17/State Road 25	03070203	1.18		N	AE	2011
North Fork Swamp	Camden County, Unincorporated Areas; Kingsland, City of	Approximately 3,460 feet downstream of Roberts Path	Approximately 560 feet upstream	03070203		0.06	N	AE	2010
Temple Creek	Camden County, Unincorporated Areas; Kingsland, City of	Confluence with Horsepen Creek	9,600 feet upstream of confluence with Horsepen Creek	03070204	1.83		N	AE	05/31/2012
Bailey Swamp	Camden County, Unincorporated Areas	Haynor Road	2,100 feet Upstream of Box Cup Road	03070203	4.21		N	A	05/31/2012

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
Bullhead Creek	Camden County, Unincorporated	Confluence with Satilla River	Approximately2,600 feet Upstream of the Confluence of Satilla River and Bullhead Creek	03070201	0.49		N	A	2008 (redelineated 2012)
Bullhead Creek	Camden County, Unincorporated Areas	2,600 feet Upstream of the Confluence of Satilla River and Bullhead Creek	5,300 feet Upstream of the Confluence of Bullhead Creek and Bullhead Creek Trib. 1	03070201	4.65		N	A	05/31/2012
Bullhead Creek Trib. 1	Camden County, Unincorporated Areas	Confluence of Bullhead Creek and Bullhead Creek Trib. 1	9,000 feet Upstream of the Confluence of Bullhead Creek and Bullhead Creek Trib. 1	03070201	1.76		N	A	05/31/2012
Catfish Creek (a)	Camden County, Unincorporated Areas; Kingsland, City of	1,500 feet Upstream of the Confluence of Catfish Creek and St. Mary's River	13,700 feet Upstream of the Confluence of Catfish Creek and St. Mary's River	03070204	2.50		N	A	05/31/2012
Catfish Creek (b)	Camden County, Unincorporated Areas; Kingsland, City of	Ocean Highway	3,600 feet Upstream of Oak Well Road	03070204	5.27		N	A	05/31/2012

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
Cow Creek	Camden County, Unincorporated Areas	Confluence with Satilla River	2,000 feet Upstream of State Road 259	03070201	4.61		N	A	05/31/2012
Glencoe Swamp	Camden County, Unincorporated Areas	11,000 feet Downstream of Haynor Road	State Road 110	03070203	7.14		N	A	05/31/2012
Little Satilla River Swamp	Camden County, Unincorporated Areas	Haynor Road	8,800 feet Upstream of Haynor Road	03070203	1.69		N	A	05/31/2012
Riley Creek	Camden County, Unincorporated Areas	Confluence of Riley Creek and Satilla River	13,000 feet Upstream of the Confluence of Riley Creek and Riley Creek Trib. 1	03070201	3.89		N	A	05/31/2012
Riley Creek Trib. 1	Camden County, Unincorporated Areas	Confluence of Riley Creek and Riley Creek Trib. 1	12,500 feet Upstream of the Confluence of Riley Creek and Riley Creek Trib. 1	03070201	2.57		N	A	05/31/2012
Shingle Swamp	Camden County, Unincorporated Areas; Kingsland, City of	Approximately 5,900 feet downstream of Interstate 95	Approximately 800 feet upstream	03070203		0.05	N	A	2010
St. Mary's Cut	Camden County, Unincorporated Areas	6,000 feet Downstream of State Road 40-W	7,000 feet Upstream of State Road 110	03070204	3.59		N	A	05/31/2012

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
St. Mary's River	Camden County, Unincorporated Areas	Ocean Highway	8,500 feet Upstream of Confluence of St. Mary's Cut and St. Mary's River	03070204	12.48		N	A	05/31/2012
Satilla River	Camden County, Unincorporated Areas; Woodbine, City of	Ocean Highway	28,000 feet Upstream of Confluence of Riley Creek and Satilla River	03070201 03070203	19.61		N	A	05/31/2012
Satilla River	Camden County, Unincorporated Areas; Woodbine, City of	28,000 feet Upstream of Confluence of Riley Creek and Satilla River	County boundary	03070201	26.41		N	A	2008
Temple Creek	Camden County, Unincorporated Areas; Kingsland, City of	10,950 feet downstream of Springhill Road North	Springhill Road North	03070204	2.07		N	A	05/31/2012
Waverly Creek	Camden County, Unincorporated Areas	Matthews Launch	28,000 feet Upstream of Ocean Highway	03070201	6.94		N	A	05/31/2012
White Oak Creek	Camden County, Unincorporated Areas	Ocean Highway	6,500 feet Upstream of State Road 259	03070201	8.09		N	A	05/31/2012

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
White Oak Creek Trib. 1	Camden County, Unincorporated Areas	Confluence of White Oak Creek and White Oak Creek Trib. 1	3,200 feet Upstream of New Post Road	03070201	2.52		N	A	05/31/2012
White Oak Creek Trib. 1.1	Camden County, Unincorporated Areas	Confluence of White Oak Creek Trib. 1 and White Oak Creek Trib. 1.1	New Post Road	03070201	1.43		N	A	05/31/2012

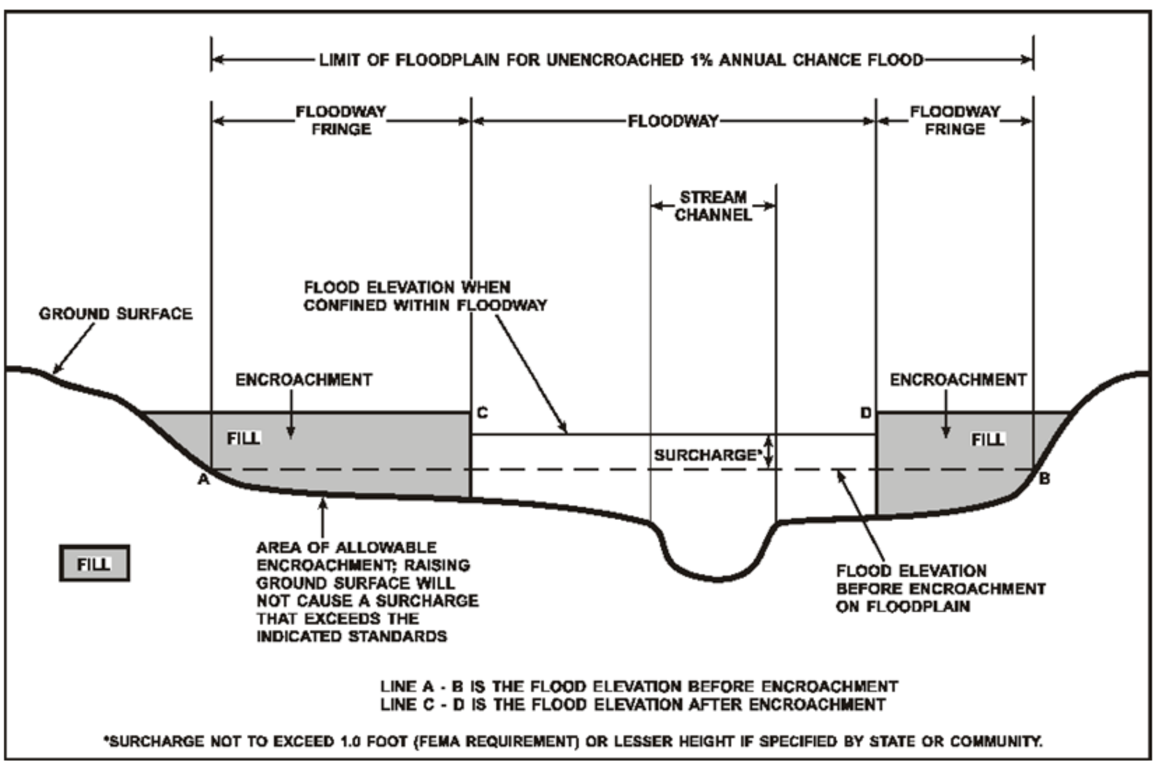
2.2 Floodways

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

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

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

Figure 4: Floodway Schematic



2.3 Base Flood Elevations

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

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

2.4 Non-Encroachment Zones

Some States and communities use non-encroachment zones to manage floodplain development. For flooding sources with medium flood risk, field surveys are often not collected and surveyed bridge and culvert geometry is not developed. Standard hydrologic and hydraulic analyses are still performed to determine BFEs in these areas. However, floodways are not typically determined, since specific channel profiles are not developed. To assist communities with managing floodplain development in these areas, a “non-encroachment zone” may be provided. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event. As with a floodway, all surcharges must fall within the acceptable range in the non-encroachment zone.

General setbacks can be used in areas of lower risk (e.g. unnumbered Zone A), but these are not considered sufficient where unnumbered Zone A is replaced by Zone AE. The NFIP requires communities to ensure that any development in a non-encroachment area causes no increase in BFEs. Communities must generally prohibit development within the area defined by the non-encroachment width to meet the NFIP requirement.

2.5 Coastal Flood Hazard Areas

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

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

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

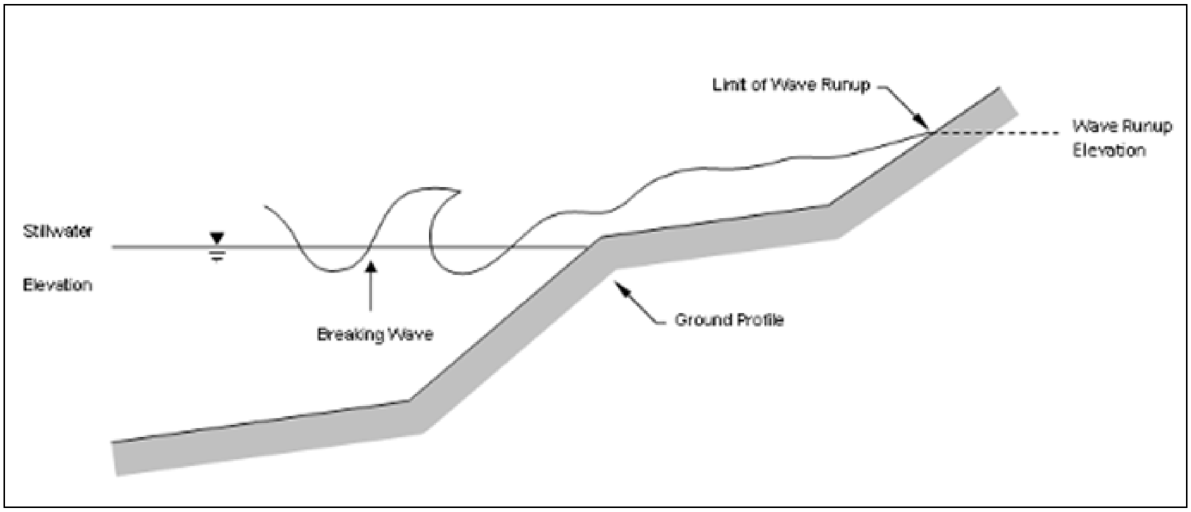
- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

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

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

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

Figure 5: Wave Runup Transect Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

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

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

Floodplain Boundaries

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

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

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

Coastal BFEs

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

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

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

2.5.3 Coastal High Hazard Areas

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

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

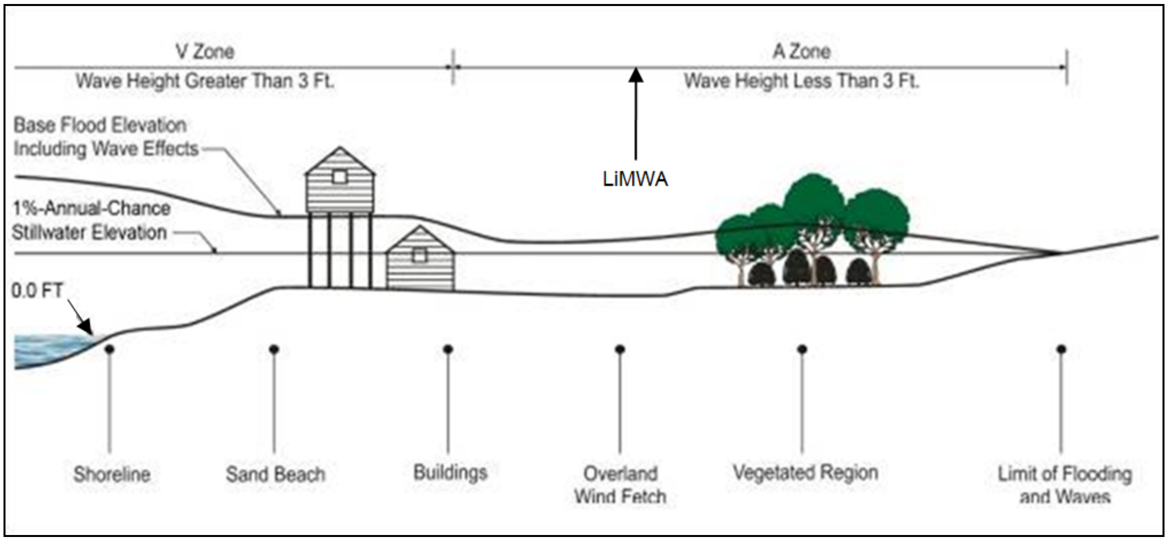
CHHAs are designated as "V" zones (for "velocity wave zones") and are subject to more stringent regulatory requirements and a different flood insurance rate structure. The areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the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

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

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

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

Figure 6: Coastal Transect Schematic



Methods used in coastal analyses in this 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 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 Camden County.
Figure 3, "Map Legend for FIRM." In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

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% 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.

Where wave runup elevations dominate over wave heights, there is no evidence to date of significant damage to residential structures by runup depths less than 3 feet. Examples of these areas include areas with steeply sloped beaches, bluffs, or flood protection structures that lie parallel to the shore. In these areas, the FIRM shows the LiMWA immediately landward of the VE/AE boundary. Similarly, in areas where the zone VE designation is based on the presence of a primary frontal dune or wave overtopping, the LiMWA is delineated immediately landward of the Zone VE/AE boundary.

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

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

Table 3 lists the flood insurance zones in Camden County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Camden County, Unincorporated Areas	A, AE, VE, X
Kingsland, City of	A, AE, VE, X
St. Marys, City of	A, AE, VE, X
Woodbine, City of	A, AE, X

3.2 Coastal Barrier Resources System

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

Table 4: Coastal Barrier Resources System Information

Primary Flooding Source	CBRS/OPA Type	Date CBRS Area Established	FIRM Panel Number(s)
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0315F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0315F 13039C0320F 13039C0325F 13039C0430F 13039C0435F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0430F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0430F 13039C0435F 13039C0440F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0440F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	OPA	11/16/1991	13039C0440F 13039C0505F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	11/16/1990	13039C0285F 13039C0295F 13039C0315F 13039C0320F 13039C0325F 13039C0410F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	11/16/1990	13039C0410F 13039C0420F 13039C0430F 13039C0440F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0295F 13039C0315F 13039C0410F 13039C0430F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0315F 13039C0320F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0320F 13039C0325F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0325F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0430F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0430F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0430F 13039C0435F
Atlantic Ocean (flooding controlled by Atlantic Ocean)	CBRS	10/1/1983	13039C0440F 13039C0505F

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

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

Table 5: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Cumberland-St. Simons	03070203	Brickhill, Crooked, Cumberland, Little Satilla, and Satilla Rivers, Atlantic Ocean (flooding controlled by Atlantic Ocean)	Coastal watershed within Camden County, encompassing most of the eastern portion of the county	N/A
Satilla	03070201	Satilla River, White Oak Creek, Atlantic Ocean (flooding controlled by Atlantic Ocean)	Westernmost watershed within Camden County, affecting a portion of the coastal influence and the inland portion of the county	N/A
St. Marys	03070204	North and St. Marys Rivers, Atlantic Ocean (flooding controlled by Atlantic Ocean)	Affecting the southern portion within Camden County	N/A

4.2 Principal Flood Problems

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

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
Atlantic Ocean (Flooding controlled by Atlantic Ocean)	Coastal storm surge tides that are augmented by wind induced waves. Camden County may also be subjected to flooding due to rains induced by hurricanes, tropical storms, and other storms. Hurricanes and tropical storms normally occur in the summer and early fall months of the year.

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

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Miscellaneous	Camden County Unincorporated Areas; Kingsland, City of; St. Marys, City of; Woodbine, City of	N/A	N/A	N/A	N/A

4.3 Non-Levee Flood Protection Measures

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

Table 8: Non-Levee Flood Protection Measures

[Not Applicable to this Flood Risk Project]

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 9: Levees

[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% annual chance, respectively, of being equaled or exceeded during any year.

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

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

5.1 Hydrologic Analyses

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

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For streams restudied by approximate methods, peak discharges were calculated using a regression equation (Stamey and Hess, 1993). For the portion of the Satilla River that was restudied by approximate methods, peak discharges were extrapolated from data collected at the USGS Gage No. 02228000, Satilla River at Atkinson, Georgia (Stamey and Hess, 1993).

<u>Countywide Revision</u>

For this revision, Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by limited detailed, detailed leverage, and approximate methods. These reaches were studied using the U.S. Army Corps of Engineers' (USACE) Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) (version

3.5). The 10-, 4-, 2-, 1-, and 0.2% annual chance flood events were determined as part of this analysis.

Precipitation values for the five recurrent intervals studied were obtained from Appendix A, Georgia Stormwater Management Manual, Volume 2, August 2001 (AMEC 2001). The study analyzed rainfall data from 16 locations across Georgia. Precipitation totals for the Brunswick, GA area was used in this study. Total precipitation values were available for the 24-hour duration for four of the recurrence intervals studied. The 0.2% annual chance rainfall was extrapolated from the 10-, 4-, 2-, 1- and 0.2% annual chance rainfall events.

The watersheds for each of the studied streams were delineated by two processes. First, the HUC-8 coverage was evaluated. The HUC-8 was a larger scale delineation and was used as an outer boundary of the watersheds. ArcHydro was then used for more detailed watershed delineation. ArcHydro is a web-based GIS application that delineates watersheds based on a 4-ft Digital Elevation Model (DEM) and points defined by the user based denoting subbasin divides. Subbasin divides for all hydrologic analyses were typically placed at large structure crossings, confluences with significant tributaries, and at other locations where the discharge is expected to differ from the previous value by more than 15%.

After the initial delineation was obtained from ArcHydro, a review of each of the watersheds was completed. The review used the 4-foot digital elevation models, provided to CDM Smith by the County and flown by Optimal Geomatics, and made any necessary revisions to follow the more detailed topography.

The Natural Resources Conservation Service (NRCS) curve number method was used to determine losses and runoff. Curve numbers were produced by using the most current soils data from the United States Department of Agriculture (USDA) and land use data from the USGS National Land Cover Dataset (NLCD). Spatial data was available for both and was brought into ArcGIS and intersected with the subbasins to produce a composite curve number.

In order to produce hydrographs for the watersheds, the Snyder Synthetic Unit Hydrograph method was used. The SCS Unit Hydrograph was also considered due to its popularity. However, the Snyder method allows more control to define the time to peak and peak flow, two of the most important characteristics in defining a unit hydrograph. Conversely, the SCS method uses a fixed peak rate factor and a sharp triangular shape as its unit hydrograph. Snyder's method uses two dimensionless parameters to control the time to peak and peak flow. These parameters can be calibrated around gauged streams. Additionally, the method implies that these factors are similar for nearby watersheds; therefore, the parameters entered for ungauged streams are similar to those used for gauged streams.

Muskingum-Cunge method with an 8-point cross section was used for hydrologic routing. This routing method, which is most appropriate for reaches with small slope, calculates routing parameters at every time step based on channel properties and flow depth. The 8-point cross section allows an accurate channel shape to be used by cutting the cross section from Light Detection and Ranging (LiDAR). Manning's n roughness values were entered for the channel and the left and right overbanks.

Peak flow values found from the Regression Analysis were used to verify the model. The peak flow rates from HEC-HMS were verified against these values. Subbasin areas were inserted into a regression equation developed for rural, unregulated streams in Georgia to determine peak flow rates for the 10-, 4-, 2-, 1- and 0.2% annual chance rainfall events. The USGS Regression equation coefficients used were:

$$Q = C * Ab$$

where

	Q10	Q25	Q50	Q100	Q500
C	176	237	287	340	474
b	0.621	0.623	0.625	0.627	0.632

From the Rural Equation in the Georgia Stormwater Management Manual Table 2.1.6-3
Notes: C = Runoff coefficient; b = regression exponent corresponding to flood frequency

For a detailed discussion on the development of the regression constants, refer to the USGS publication “Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins of Georgia, Water-Resources Investigations Report 93-4016” (USGS 1993). The regression equation uses a constant, dependent on where the study reach is in the state. This area of Georgia is determined to be Region 3. Peak flow rates were found for each of the subbasins and verified by comparison to the Regression Analysis values.

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

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Crooked River	At Yankee Road	*	*	*	*	547	*	*
Crooked River	At McKendree Road	*	*	*	*	1,865	*	*
Crooked River	At U.S. Highway 17/State Road 25	*	*	*	*	5,913	*	*
Crooked River	At approximately 2,070 feet downstream of U.S. Highway 17/State Road 25	*	*	*	*	8,271	*	*
North Fork Swamp	At approximately 4,000 feet downstream of Harriets Bluff Road	0.8	*	*	*	385	*	*
Shingle Swamp	At approximately 5,500 feet downstream of Interstate Highway 95	1.2	*	*	*	507	*	*
St. Marys River	At county boundary	*	8,095	*	11,490	12,945	*	16,270

*Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves

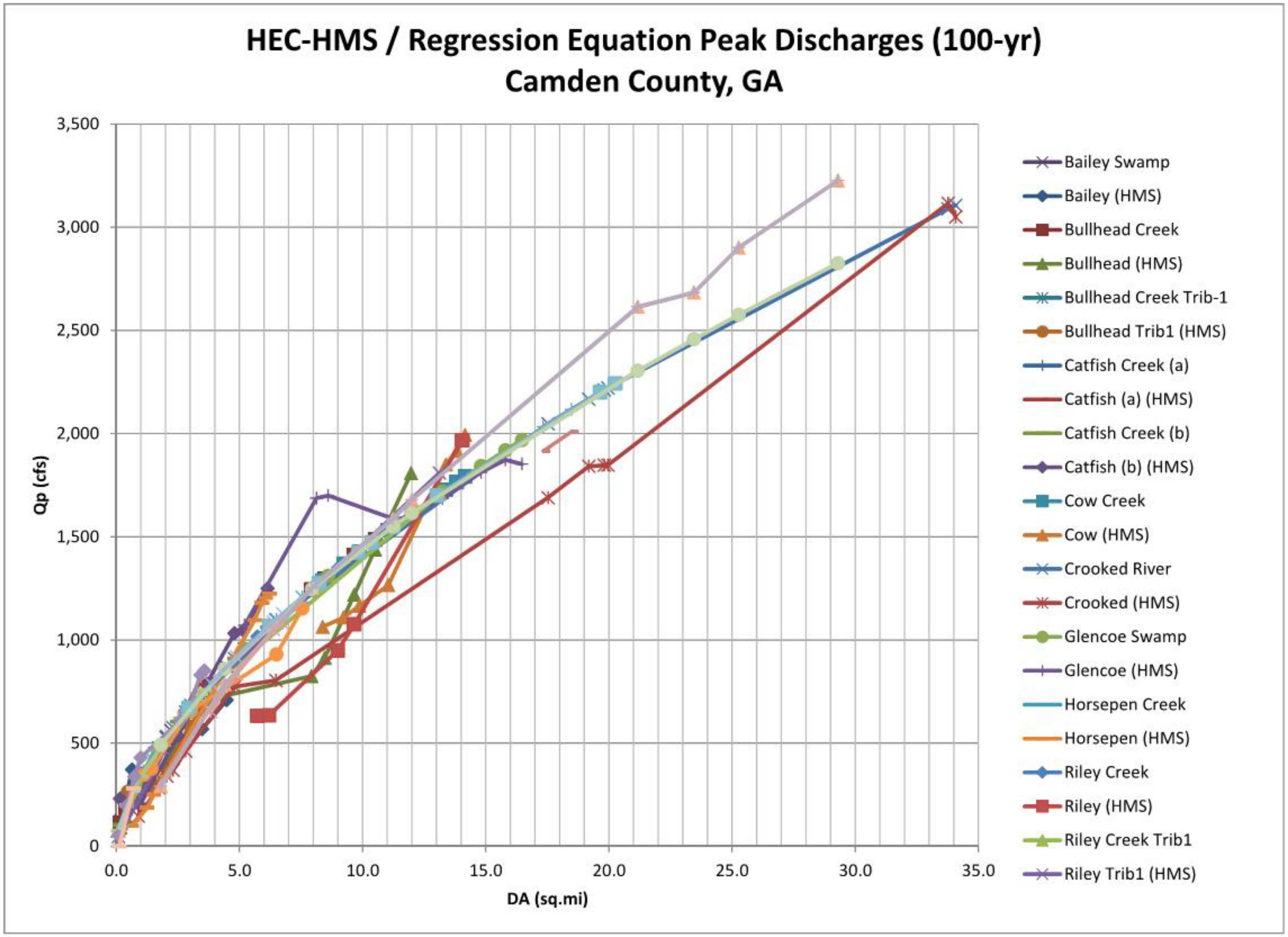

Table 11: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Kingsland Pond No. 1	Kingsland, City of	*	*	*	16.6	*
Kingsland Pond No. 2	Kingsland, City of	*	*	*	19.2	*
Kingsland Pond No. 3	Kingsland, City of	*	*	*	15.4	*

*Not calculated for this Flood Risk Project

Table 12: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Satilla River	02228000	USGS	Satilla River at Atkinson	*	N/A	N/A

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).

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For the approximate study streams, cross section data was obtained from the topography. Low flow channels were added to the cross section data, based on the estimated depth of the 50-percent-annual-chance flow. Roads appearing on the topographic maps were modeled as weirs; top of road elevations were estimated from the topography. The studied streams were modeled using HECRASversion 3.1.3 (HEC, 2004).

<u>Countywide Revision</u>

For this revision, hydraulic analyses were carried out by developing a steady state one-dimensional numeric hydraulic model for each riverine flooding source studied. The modeling results simulate flooding concerns during FEMA chosen synthetic rainfall events. All existing features of Camden County were incorporated in the model. Peak outflows were generated from HEC-HMS and entered into this model to be routed through the system.

A series of hypothetical storm events were routed through the hydraulic models and the results compared to previously developed FIRM maps or other watershed models developed, if available. The model results were used to determine the extents of the floodplain.

Horsepen Creek and Temple Creek were studied by limited detailed methods using the Army Corps of Engineers' (USACE) HEC-RAS (version 4.1.0). The 10-, 4-, 2-, 1-, and 0.2% annual chance flood elevations were determined as part of this analysis.

A detailed hydrologic analysis, which was completed in a separate task, determined the stillwater elevations for the 10-, 4-, 2-, 1-, and 0.2% annual chance flood events. The elevations for the 1- and 0.2% annual chance events were mapped in the floodplain mapping task.

Preprocessing utilized HEC-GeoRAS (version 10 for ArcGIS 10.0), which is a set of tools designed to process geospatial data to use with HEC-RAS. The extension is used to create a HEC-RAS import file containing geometric attribute data from an existing DEM as well as other data sets. The stream centerlines, cross section cutlines, flowpaths, bank stations, and bridge/culvert locations were developed in HEC-GeoRAS and attributed. Elevation data was extracted from the four-foot digital elevation models (DEM) provided by PhotoScience and Furgo EarthData. The HEC-GeoRAS output could then be imported into a geometry file to be used in the HEC-RAS software program.

Stream Centerline

The stream centerline was developed using the 2-foot contours and the aerial photographs. The stream was digitized at a scale of 1 inch = 6,000 feet. Stream centerline data was attributed using HEC-GeoRAS.

Cross Sections

Model cross sections for Horsepen Creek and Temple Creek were developed using the 2-foot contour information. Cross sections were cut left to right looking downstream, and were placed approximately 500-feet apart. Cross sections were oriented perpendicular to the main channel and perpendicular to the edge of floodplain contours as much as possible. Four cross sections were included at all structures, assuming approximately 1:1 contraction and 2:1 expansion. For the cross sections representing structures, care was taken when placing the cross sections to not capture the road embankment. Model cross sections were placed at all survey locations.

To define the low flow channel for the cross sections, Excel was used to combine the contour information with the survey data. The following approach was used to define the low flow channels.

- Moving from upstream to downstream, the river was divided into sections based on surveyed cross sections. Each section division was defined by a surveyed cross section on either end.

- The thalweg elevation was calculated by interpolation. The slope was calculated by using the distance between surveyed cross sections. This slope was then assumed to be constant between the two surveyed cross sections. The low flow channel thalweg elevations were then simply interpolated based on the distance to the surveyed cross section.

- The shape of the channel bottom was held constant from the upstream bounding surveyed cross section until the next downstream surveyed cross section.

Flowpaths and Bank Stations

The stream centerline was assigned as the center flowpath using HEC-GeoRAS. Flowpaths were drawn on the left and right overbanks by approximating a path halfway between the top of bank and the edge of the floodplain. The edge of the floodplain was estimated using the 2-contours and the aerial photographs.

Bank stations were selected in GIS based on the contour and aerial information. They were then refined in HEC-RAS to match individual cross section information.

Bridge/Culvert Data

Road centerlines were drawn in GIS using aerial photographs and exported to HEC-RAS. Survey information describing actual centerline elevations were inserted at the appropriate location.

Roughness Coefficients

Manning's "n" values were developed at each cross section using survey and aerial photographs. The coefficients were manually inputted into the HEC-RAS model and are summarized in Table 14.

Starting Water Surface Elevation

Starting water surface elevation used was normal depth.

Bridge/Culvert Modeling

Survey information was used in HEC-RAS to accurately portray the bridge opening, including high and low chords, abutments, and piers. Culvert shape, material, and entrance and exit conditions were also taken from survey data.

Low flow and high flow conditions at a bridge were simulated utilizing appropriate modeling approaches including energy equations, Yarnell's equations, and pressure/weir flow equations, accordingly.

The expansion/contraction coefficients used in the modeling process are listed below:

Expansion/Contraction Coefficients

Stream	Contraction	Expansion
Gradual Transitions	0.1	0.3
Typical Bridge/Culvert	0.3	0.5

Ineffective Flow Areas

For this study, the ineffective flow feature was utilized for modeling depressions that do not actively convey flow, near bridges and culverts where areas of stillwater are expected, and at other locations where impediments to flow likely produce areas with a velocity at or near zero.

For streams studied by approximate methods, only the 1% annual chance flood elevation was determined. These reaches were primarily studied using the same methodology as the detailed reaches. However, there were some differences, which are discussed below:

Cross Sections

Model cross sections were placed, oriented, and cut in the same fashion as detailed reaches. However, accurate channel invert information was not available. Therefore, for the approximate reaches the channel invert was only defined by the 4-foot DEM; a channel bottom was typically not defined. It should be noted that the DEM can define elevations down to the water surface of the stream.

There were a few cases in which the HEC-RAS model was producing an erroneous water surface profile due to a lack of channel invert information. In these cases, engineering judgment was used to estimate and manually insert an appropriate channel into the model. In most cases, this involved examining the top surface width (as determined from the aerial photograph) and the expected 100-year discharge.

Flowpaths

Only the center flowpath was defined for the approximate reaches. The left and right flowpaths were set equal to the centerline value in HEC-RAS.

Bridge/Culvert Data

Bridge and culvert openings were modeled by placing a model cross-section down the center of the road by examining the aerial photograph. Therefore, a structure was not modeled in HEC-RAS for the approximate reaches. A bridge/culvert opening was manually inserted between the bank stations of the cross section. The bridge/culvert opening was estimated based on the aerial photograph and the invert was estimated based on the inverts of the surrounding cross sections.

Roughness Coefficients

Manning's "n" values were developed at each cross section using survey and aerial photographs. The coefficients were manually inputted into the HEC-RAS model.

Starting Water Surface Elevation

The starting water surface elevation for all detailed reaches was obtained by determining the normal depth.

Bridge/Culvert Modeling

Bridges and culverts were not modeled as structures. However, expansion and contraction coefficients were still used as described previously.

The 1% annual chance floodplain boundaries were delineated using an automated process. This process compares a ground surface DEM to a water surface DEM using standard ESRI ArcGIS functionality to determine where the 1% annual chance floodplains lie. The digital terrain data provided by PhotoScience and Furgo EarthData was used in this calculation.

Input data for the water surface model consisted of newly created cross sections developed during the hydraulic analysis task using HEC-RAS and HEC-GeoRAS. This data provided the water surface elevation from which a water surface TIN and DEM was generated. This process was performed to provide both the 1% annual chance flood hazard TINs and DEMs.

Standard ArcGIS "Map Algebra" calculations were then performed to compare the ground surface
DEM to the water surface DEM to find the location where the two DEMs intersect. The location of the resulting flood boundary lines were then visually verified for accuracy using 2-foot contours generated from the terrain data.

An intermediate QC review of the delineated flood boundaries involved a visual inspection of floodplain boundaries, as well an automated check that verified that the 1% annual chance flood boundaries were in compliance with the Floodplain Boundary Standard (FBS) outlined in FEMA Procedure Memorandum 38.

The 1% annual chance floodplain boundaries were compared to the 2-foot contours to verify boundaries were consistent with contour elevations. Tie-ins with the effective upstream and downstream boundaries were resolved based on the profiles.

Base Flood Elevations

Base flood elevations were calculated by contouring the existing water surface TIN from the HEC-GeoRAS output at 1-foot intervals. BFEs were placed at all major inflection points according to the profile and were adjusted, as necessary, to conform to FEMA's G&S.

No floodways were delineated as part of this task.

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

Table 13: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Crooked River (and tributaries)	Approximately 2,070 feet downstream of U.S. Highway 17/State Road 25	Just downstream of Duck Pond Road	HEC-HMS	HEC-RAS	2011	AE	LOMR 6725P
Horsepen Creek	Confluence with the St. Mary's River	Springhill Road North	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	AE	Effects of hydraulic structures were considered in the model.
Kingsland Pond No. 1	Approximately 980 feet south and 100 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	Not Available	Not Available	2010	AE	LOMR 3775P
Kingsland Pond No. 2	Approximately 2,040 feet south and 420 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	Not Available	Not Available	2010	AE	LOMR 3775P
Kingsland Pond No. 3	Approximately 1,550 feet north and 2,020 feet west of the intersection of Shingle Swamp and Interstate 95	entire shoreline	Not Available	Not Available	2010	AE	LOMR 3775P
Lower North Fork Crooked River	Confluence with North Fork Crooked River	Approximately 10,180 feet upstream	HEC-HMS	HEC-RAS	2011	AE	LOMR 6725P

Table 13: Summary of Hydrologic and Hydraulic Analyses - continued

Flooding Source	Study Limits Downstream Limit	Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
North Crooked River	Confluence with Crooked River	Approximately730 feet upstream of Higginbotham Road	HEC-HMS	HEC-RAS	2011	AE	LOMR 6725P
North Fork Crooked River (and tributaries)	Confluence with Crooked River	Approximately 21,020 feet upstream of U.S. Highway 17/State Road 25	HEC-HMS	HEC-RAS	2011	AE	LOMR 6725P
North Fork Swamp	Approximately 3,460 feet downstream of Roberts Path	Approximately 560 feet upstream	Not Available	Not Available	2010	AE	LOMR 3775P
Temple Creek	Confluence with Horsepen Creek	9,600 feet upstream of confluence with Horsepen Creek	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	AE	Effects of hydraulic structures were considered in the model.
Bailey Swamp	Haynor Road	2,100 feet Upstream of Box Cup Road	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Bullhead Creek	Confluence with Satilla River	Approximately 2,600 feet Upstream of the Confluence of Satilla River and Bullhead Creek	Regression Equations	HEC-RAS 3.1.3	2008 (redelineated 2012)	A	
Bullhead Creek	2,600 feet Upstream of the Confluence of Satilla River and Bullhead Creek	5,300 feet Upstream of the Confluence of Bullhead Creek and Bullhead Creek Trib. 1	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Bullhead Creek Trib. 1	Confluence of Bullhead Creek and Bullhead Creek Trib. 1	9,000 feet Upstream of the Confluence of Bullhead Creek and Bullhead Creek Trib. 1	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.

Table 13: Summary of Hydrologic and Hydraulic Analyses - continued

Flooding Source	Study Limits Downstream Limit	Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Catfish Creek (a)	1,500 feet Upstream of the Confluence of Catfish Creek and St. Mary's River	13,700 feet Upstream of the Confluence of Catfish Creek and St. Mary's River	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Catfish Creek (b)	Ocean Highway	3,600 feet Upstream of Oak Well Road	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Cow Creek	Confluence with Satilla River	2,000 feet Upstream of State Road 259	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Glencoe Swamp	11,000 feet Downstream of Haynor Road	State Road 110	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Riley Creek	Confluence of Riley Creek and Satilla River	13,000 feet Upstream of the Confluence of Riley Creek and Riley Creek Trib. 1	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Riley Creek Trib. 1	Confluence of Riley Creek and Riley Creek Trib. 1	12,500 feet Upstream of the Confluence of Riley Creek and Riley Creek Trib. 1	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Shingle Swamp	Approximately 5,900 feet downstream of Interstate 95	Approximately 800 feet upstream	Not Available	Not Available	2010	A	LOMR 3775P

Table 13: Summary of Hydrologic and Hydraulic Analyses - continued

Flooding Source	Study Limits Downstream Limit	Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
St. Mary's Cut	6,000 feet Downstream of State Road 40-W	7,000 feet Upstream of State Road 110	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
St. Mary's River	Ocean Highway	8,500 feet Upstream of Confluence of St. Mary's Cut and St. Mary's River	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Little Satilla River Swamp	Haynor Road	8,800 feet Upstream of Haynor Road	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Satilla River	Ocean Highway	28,000 feet Upstream of Confluence of Riley Creek and Satilla River	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Satilla River	28,000 feet Upstream of Confluence of Riley Creek and Satilla River	County boundary	Regression Equations	HEC-RAS 3.1.3	2008	A	
Temple Creek	10,950 feet downstream of Springhill Road North	Springhill Road North	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
Waverly Creek	Matthews Launch	28,000 feet Upstream of Ocean Highway	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
White Oak Creek	Ocean Highway	6,500 feet Upstream of State Road 259	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.
White Oak Creek Trib. 1	Confluence of White Oak Creek and White Oak Creek Trib. 1	3,200 feet Upstream of New Post Road	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.

Table 13: Summary of Hydrologic and Hydraulic Analyses - continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
White Oak Creek Trib. 1.1	Confluence of White Oak Creek Trib. 1 and White Oak Creek Trib. 1.1	New Post Road	HEC-HMS 3.5	HEC-RAS 4.1	05/31/2012	A	Effects of hydraulic structures were not considered in the model.

Table 14: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Bailey Swamp	0.050-0.080	0.060-0.150
Bullhead Creek	0.070	0.130
Bullhead Creek Trib. 1	0.070	0.130
Catfish Creek (a)	0.070	0.130
Catfish Creek (b)	0.070	0.130
Cow Creek	0.080	0.060-0.150
Glencoe Swamp	0.060-0.080	0.095-0.120
Horsepen Creek	0.060-0.0950	0.080-0.120
Riley Creek	0.060-0.080	0.010-0.140
Riley Creek Trib. 1	0.060-0.080	0.010-0.140
St. Mary's Cut	0.080	0.130
St. Mary's River	0.070-0.080	0.10-0.120
Little Satilla River Swamp	0.060-0.070	0.120
Satilla River	0.0350-0.080	0.0950-0.120
Temple Creek	0.060-0.080	0.095-0.120
Waverly Creek	0.060-0.10	0.110-0.140
White Oak Creek	0.0450-0.080	0.120
White Oak Creek Trib. 1	0.060-0.10	0.10-0.120
White Oak Creek Trib. 1.1	0.080-0.10	0.120

5.3 Coastal Analyses

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

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

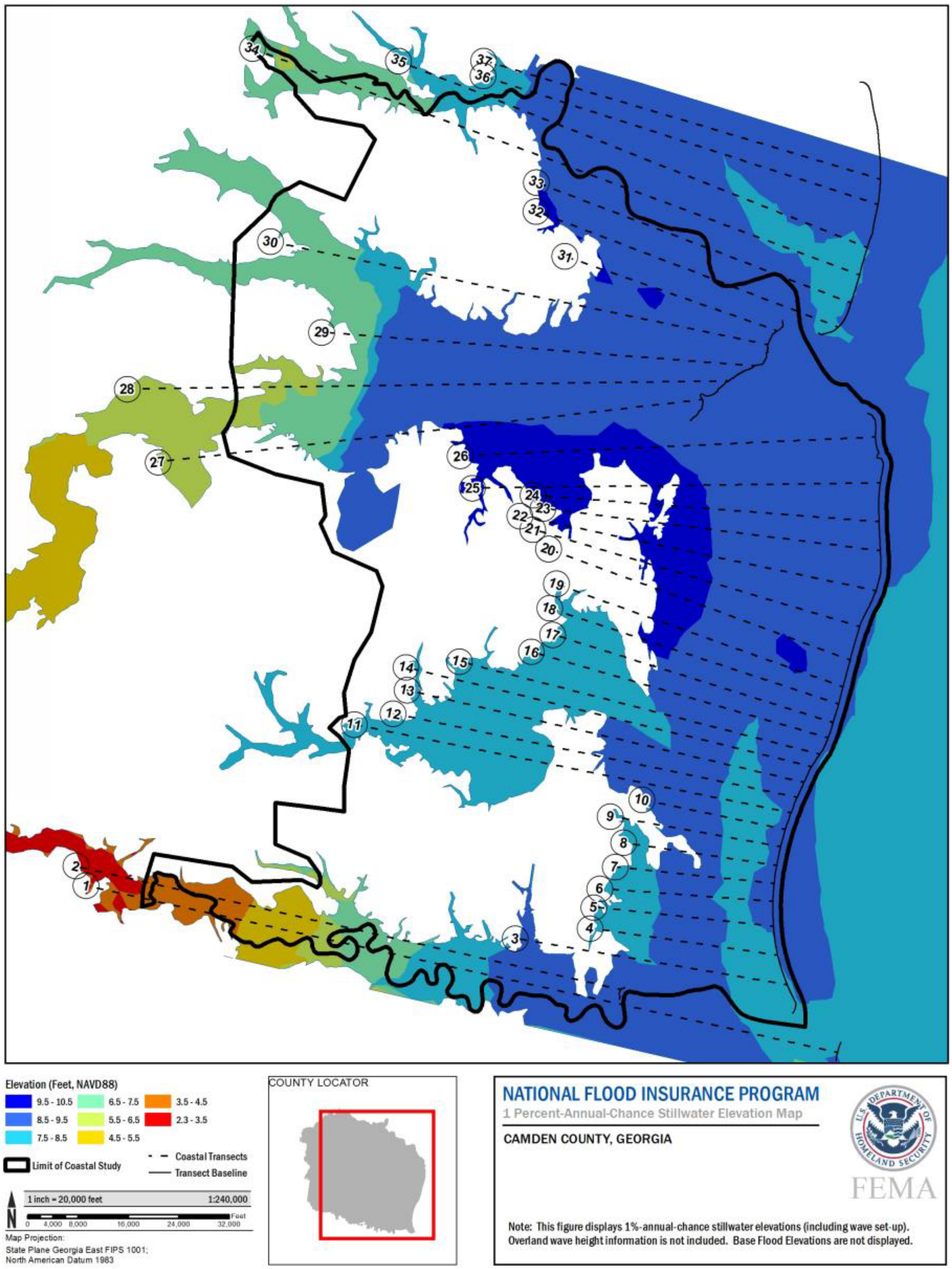
Table 15: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Storm Climatology Statistical Analysis	JPM-OS	11/1/2013
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Storm Surge including Regional Wave Setup	SWAN+ADCIRC (fully coupled model)	10/7/2013
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Stillwater Frequency Analysis	SURGESTAT (low frequency); Tidal Frequency Analysis (high frequency)	11/21/2013
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Overland Wave Propagation	WHAFIS 4.0	3/5/2015
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Wave Runup	Runup 2.0	3/5/2015
Atlantic Ocean	Entire Coastline of Camden County	Entire Coastline of Camden County	Erosion	FEMA 540 SF Rule	3/5/2015

5.3.1 Total Stillwater Elevations

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

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



Astronomical Tide

Astronomical tidal statistics were generated directly from 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.

When historic records are used to calculate storm surge, characteristics such as the strength, size, track, etc., of storms are identified by site. Storm data was used with hydrodynamic models to determine storm surge levels.

Statistical analyses were performed to determine the annual chance flood elevations for the GANEFL study. The study considered both high frequency (i.e., 50-, 25-, 10-, and 4-percent-annual-chance) events as well as low frequency (i.e., 2-, 1-, and 0.2-percent-annual-chance) events.

Flood estimates for the low frequency events were derived by simulating a large number of storm events using a coupling of hydrodynamic and wave models (i.e., the ADCIRC-ADvanced CIRCulation model and the SWAN-Simulating Waves Nearshore model). Key storm parameters (central pressure deficit, radius to maximum winds, forward speed, track heading, and the Holland's B parameter) were used to represent a population of historic and synthetic storm events. The Joint Probability Method with Optimal Sampling (JPM-OS), developed by Resio (2007) and Toro et. al. (2010), was applied to compute Stillwater Elevations (SWELs), which include the storm surge component and the wave setup component.

High frequency events were computed based on the approach described in the report "Tide Gage Analysis for the Atlantic and Gulf Open Coast" dated December 2, 2008 (Federal Emergency Management Agency, 2008). The methods from this previous study were applied to updated tide records, through the end of 2012, which added six years of additional data to the analysis. In addition, the regionalization of the tide gages from the previous study was re-evaluated and revised using the additional data and observations of revised statistical parameters. Table 16 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the high frequency stillwater elevations.

Table 16: Tide Gage Analysis Specifics

Gage Name	Managing Agency of Tide Gage Record	Gage Type	Start Date		End Date	Statistical Methodology
Charleston - 8665530	NOAA	Tide	1899		Present	L-moments, GEV
Fort Pulaski - 8670870	NOAA	Tide	1935		Present	L-moments, GEV

Table 16: Tide Gage Analysis Specifics - continued

Gage Name	Managing Agency of Tide Gage Record	Gage Type	Start Date		End Date	Statistical Methodology
Fernandina Beach - 8720030	NOAA	Tide	1898		Present	L-moments, GEV
Mayport Ferry Depot - 8720220	NOAA	Tide	1928		2008	L-moments, GEV
St Augustine - 8720587	NOAA	Tide	1992		2004	L-moments, GEV
Daytona Beach Shores - 8721120	NOAA	Tide	1966		1984	L-moments, GEV
Trident Pier - 8721604	NOAA	Tide	1994		Present	L-moments, GEV
Lake Worth Pier - 8722670	NOAA	Tide	1970		Present	L-moments, GEV
Miami Beach - 8723170	NOAA	Tide	1931		1981	L-moments, GEV
Virginaia Key - 8713214	NOAA	Tide	1994		Present	L-moments, GEV

Wave Setup Analysis

Wave setup was computed during the storm surge modeling through the methods and models listed in Table 15 and included in the frequency analysis for the determination of the total stillwater elevations.

5.3.2 Waves

Offshore wave conditions were modeled as part of the regional hydrodynamic and wave modeling (ADCIRC + SWAN). The regional model results provided valuable information on the wave conditions that could be expected to occur during the types of extreme storm events that would produce storm surge elevations with 1- and 0.2-percent-annual-chance probabilities of occurrence. Wave heights and periods derived from the SWAN model results were used as inputs to the wave hazard analyses described in Section 5.4.3.

5.3.3 Coastal Erosion

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

5.3.4 Wave Hazard Analyses

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

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

Wave Height Analysis

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

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

Wave Runup Analysis

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

Table 17: Coastal Transect Parameters

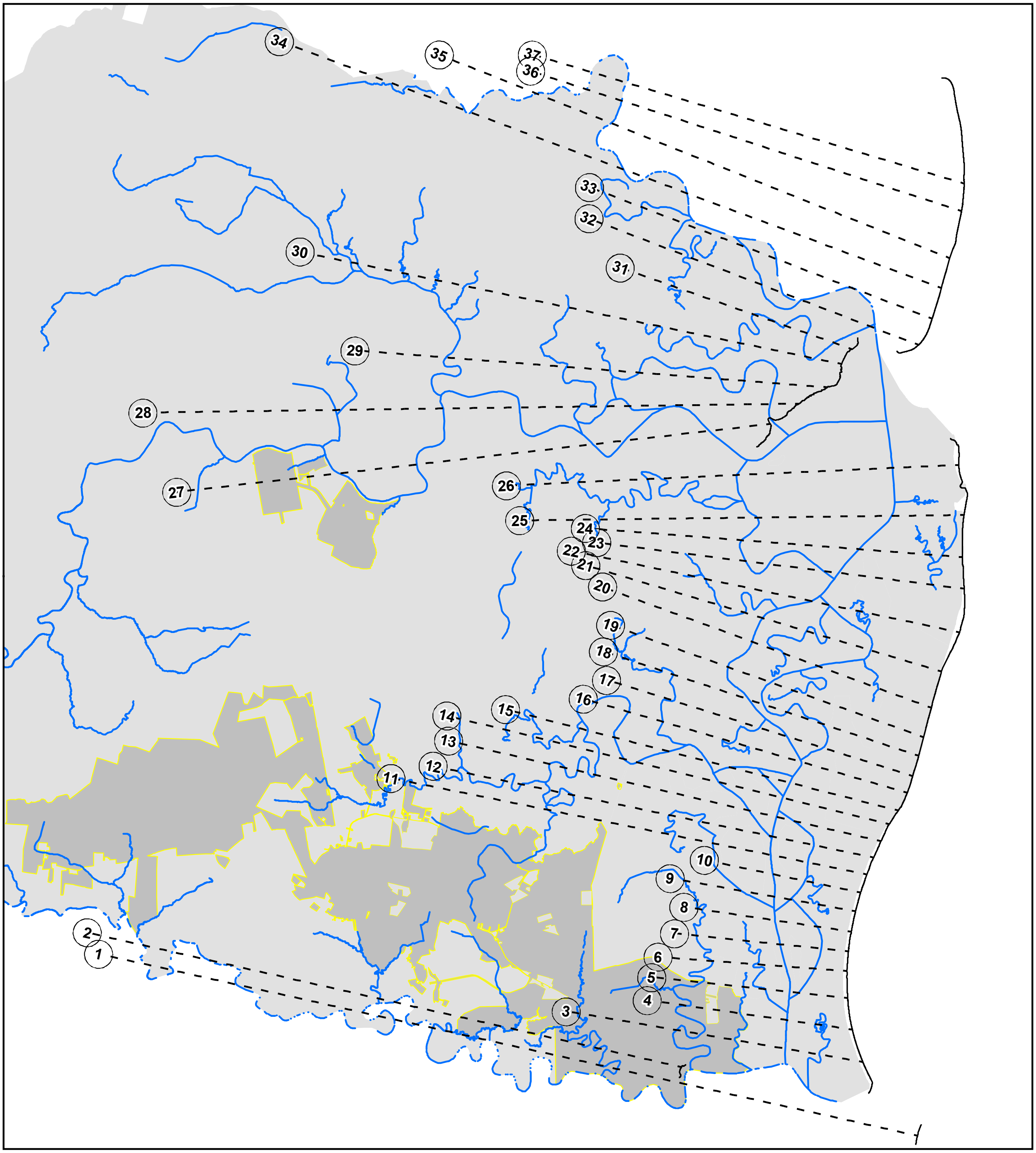
Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Atlantic Ocean	1	17.4	12.2	5.6 1.8 - 5.6	6 1.9 - 6.0	7.4 2.5 - 7.4	8.7 3.5-9.0	11.4 5.0-11.7
St. Marys River	2	4.2	3.3	5.5 1.9 - 5.6	5.9 2.0 - 6.0	7.3 2.5 - 7.4	8.9 3.4-9.0	11.6 4.9-11.8
Atlantic Ocean	3	17.6	11.7	5.7 4.7 - 5.9	6.1 5.1 - 6.3	7.6 6.3 - 7.8	9.1 8.1-9.3	12.2 10.7-12.3
Atlantic Ocean	4	17.4	11.1	5.8 5.2 - 5.9	6.2 5.3 - 6.3	7.7 6.5 - 7.8	9.2 8.1-9.3	12.3 10.5-12.4
Atlantic Ocean	5	17	11.5	5.7 5.0 - 5.9	6.1 5.3 - 6.3	7.6 6.1 - 7.8	9.1 8.0-9.3	12.2 10.6-12.4
Atlantic Ocean	6	17.2	12	5.7 4.6 - 5.9	6.2 4.9 - 6.3	7.6 6.1 - 7.8	9.1 7.8-9.3	12.1 10.5-12.3
Atlantic Ocean	7	17.4	12.3	5.7 4.7 - 5.9	6.1 5.0 - 6.3	7.6 6.0 - 7.8	9.1 7.7-9.3	12.1 10.4-12.3
Atlantic Ocean	8	17.5	12.4	5.7 4.6 - 5.9	6.1 4.9 - 6.3	7.6 6.0 - 7.8	9.0 7.8-9.3	12.0 10.4-12.3
Atlantic Ocean	9	18	12.7	5.7 4.2 - 5.7	6.1 4.5 - 6.1	7.6 5.6 - 7.8	9.0 7.8-9.2	12.0 10.6-12.2
Atlantic Ocean	10	17.7	12.8	5.7 5.4 - 5.7	6.2 5.7 - 6.1	7.6 7.1 - 7.8	8.9 8.4-9.2	11.9 10.8-12.1
Atlantic Ocean	11	17.9	12.9	5.7 4.3 - 5.9	6.2 4.6 - 6.3	7.6 5.7 - 7.8	8.9 7.8-9.1	11.9 10.7-12.1
Atlantic Ocean	12	17.9	12.7	5.7 4.7 - 5.7	6.1 5.1 - 6.1	7.6 5.6 - 7.6	8.9 7.8-9.1	11.8 10.7-12.0
Atlantic Ocean	13	17.7	12.8	5.7 4.9 - 5.7	6.1 5.3 - 6.1	7.5 6.4 - 7.7	8.8 8.0-9.0	11.7 10.8-11.9

Table 17: Coastal Transect Parameters - continued

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Atlantic Ocean	14	17.9	12.3	5.6 4.9 - 5.7	6.1 5.3 - 6.1	7.5 6.4 - 7.5	8.8 8.0-8.8	11.7 10.8-11.8
Atlantic Ocean	15	17.3	11.8	5.6 5.0 - 5.7	6.1 5.3 - 6.1	7.4 6.3 - 7.5	8.8 8.0-8.8	11.6 10.8-11.7
Atlantic Ocean	16	17.4	11.8	5.6 5.3 - 5.9	6.1 5.7 - 6.3	7.5 6.8 - 7.8	8.8 8.3-9.3	11.6 10.7-12.0
Atlantic Ocean	17	17.2	11.7	5.7 5.7 - 6.0	6.1 5.5 - 6.4	7.5 6.3 - 7.9	8.8 8.2-9.6	11.8 10.7-12.5
Atlantic Ocean	18	17.3	11.7	5.7 5.2 - 6.1	6.1 5.6 - 6.5	7.5 6.7 - 8.1	8.8 8.2-9.9	11.9 10.7-13.2
Atlantic Ocean	19	17.4	11.7	5.6 5.7 - 6.1	6.1 6.1 - 6.5	7.5 7.0 - 8.1	8.8 8.3-9.9	11.9 11.9-13.4
Atlantic Ocean	20	17.6	11.7	5.6 5.7 - 6.2	6.1 6.1 - 6.6	7.5 7.2 - 8.2	8.8 8.8-10.0	11.9 11.9-13.7
Atlantic Ocean	21	17.4	12.1	5.7 5.7 - 6.3	6.1 6.1 - 6.7	7.5 7.1 - 8.3	8.8 8.8-10.1	11.9 11.9-13.7
Atlantic Ocean	22	17.4	12.2	5.6 5.6 - 6.2	6 6.0 - 6.6	7.4 7.4 - 8.2	8.6 8.6-10.1	11.7 11.7-13.7
Atlantic Ocean	23	17.5	11.9	5.7 5.7 - 6.1	6.1 6.1 - 6.5	7.6 7.5 - 8.2	8.9 8.9-10.0	12.4 12.4-13.6
Atlantic Ocean	24	17.4	11.5	5.8 5.7 - 6.1	6.2 6.1 - 6.5	7.7 7.3 - 8.1	9.0 9.0-10.1	12.6 12.5-13.8
Atlantic Ocean	25	17.3	11.5	5.8 5.4 - 6.2	6.2 5.8 - 6.6	7.7 7.0 - 8.2	9.0 8.9-10.0	12.6 12.3-13.8
Atlantic Ocean	26	17.4	11.8	5.7 5.7 - 6.0	6.1 6.1 - 6.5	7.5 7.2 - 8.0	8.9 8.7-9.9	12.6 12.0-13.4

Table 17: Coastal Transect Parameters - continued

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
St. Andrews Sound	27	5.4	4.4	5.9 3.5 - 6.0	6.3 3.8 - 6.4	7.8 4.3 - 7.9	9.3 5.5-9.6	12.9 7.5-12.9
St. Andrews Sound	28	5.7	4.6	5.8 3.6 - 5.8	6.2 3.9 - 6.2	7.7 4.8 - 7.7	9.1 5.8-9.5	12.8 7.5-12.8
St. Andrews Sound	29	5.6	4.4	5.7 4.0 - 5.8	6.1 4.3 - 6.2	7.6 5.0 - 7.7	9.0 7.0-9.4	12.6 9.8-12.7
St. Andrews Sound	30	5.3	4.6	5.7 4.8 - 5.8	6.1 5.2 - 6.2	7.6 6.0 - 7.7	8.9 7.3-9.3	12.5 10.0-12.8
Atlantic Ocean	31	5.2	4.4	5.6 5.6 - 6.0	6.1 6.0 - 6.4	7.5 7.2 - 7.9	8.8 8.8-9.6	12.2 12.2-13.2
Atlantic Ocean	32	17.4	11.6	5.6 5.0 - 5.9	6 5.3 - 6.3	7.4 6.6 - 7.8	8.6 8.4-9.7	11.7 11.7-13.4
Atlantic Ocean	33	17.2	11.6	5.7 5.4 - 5.9	6.1 5.8 - 6.3	7.6 7.2 - 7.8	8.8 8.4-9.6	12.5 11.5-13.4
Atlantic Ocean	34	17.4	11.7	5.8 3.9 - 5.8	6.2 4.2 - 6.2	7.7 5.2 - 7.7	8.9 6.5-9.5	12.9 8.7-13.2
Atlantic Ocean	35	17.6	11.6	5.9 4.4 - 6.0	6.3 4.7 - 6.4	7.8 5.8 - 7.9	9.1 7.6-9.3	13.2 10.3-13.2
Atlantic Ocean	36	17.8	11.6	5.9 5.0 - 6.0	6.3 5.3 - 6.5	7.8 6.3 - 8.0	9.1 8.1-9.4	13.4 11.3-13.4
Atlantic Ocean	37	17.3	12.1	5.9 5.0 - 6.0	6.4 5.3 - 6.5	7.9 6.1 - 8.0	9.2 8.0-9.4	13.5 11.4-13.5

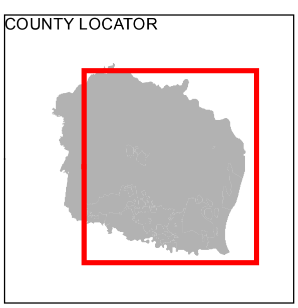


N

1 inch = 20,000 feet 1:240,000

0 4,000 8,000 16,000 24,000 32,000 Feet

Map Projection:
State Plane Georgia East FIPS 1001;
North American Datum 1983



NATIONAL FLOOD INSURANCE PROGRAM

Transect Locator Map **CAMDEN COUNTY, GEORGIA**

U.S. DEPARTMENT OF HOMELAND SECURITY

FEMA

Figure 9: Transect Location Map

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 18: Summary of Alluvial Fan Analyses

[Not applicable to this FIS project]

Table 19: Results of Alluvial Fan Analyses

[Not applicable to this FIS project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

All FIS Reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS Reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS Reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey (NGS) at the following address:

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

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please contact the information services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Camden County are provided in Table 20.

.

Table 20: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Tarboro	NW	31.125	-81.875	-1.096
Tarboro	NE	31.125	-81.750	-1.093
Dover Bluff	NW	31.125	-81.625	-1.083

Table 20: Countywide Vertical Datum Conversion - continued

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Jerusalem	NW	31.000	-81.875	-1.099
Jerusalem	NE	31.000	-81.750	-1.125
Kingsland NE	NW	31.000	-81.625	-1.125
Kingsland NE	NE	31.000	-81.500	-1.083
Cumberland Island North	NE	31.000	-81.375	-1.050
Jerusalem	SW	30.875	-81.875	-1.050
Kingsland	NW	30.875	-81.750	-1.142
Kingsland	NE	30.875	-81.625	-1.161
Cumberland Island South	NW	30.875	-81.500	-1.155
Cumberland Island South	NE	30.875	-81.375	-1.109
Kingsland	SW	30.750	-81.750	-1.152
Kingsland	SE	30.750	-81.625	-1.155
Cumberland Island South	SW	30.750	-81.500	-1.181
Average Conversion from NGVD29 to NAVD88 = -1.116 feet				

Table 21: Stream-Based Vertical Datum Conversion

[Not applicable to this FIS project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping.

Base map information shown on the FIRM was derived from the sources described in Table 22.

Table 22: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
Digital Orthophoto	USDA NAIP	2010	1:1,200	Digital Orthophotography
Political boundaries	Georgia Department of Transportation	2007	1:100,000	Municipal and county boundaries
Transportation Features	Georgia Department of Transportation	2011	1:100,000	Roads
Hydrography	Georgia Department of Transportation	1996	1:100,000	Water bodies
Stream Centerlines	GA DNR	February 2008 or later	1"=6,000'	Developed using 2-foot contours and aerial photographs

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23. For each coastal flooding source studied as part of this FIS Report, the mapped floodplain boundaries on the FIRM have been delineated using the flood and wave elevations determined at each transect; between transects, boundaries were delineated using land use and land cover data, the topographic elevation data described in Table 23, and knowledge of coastal flood processes. In ponding areas, flood elevations were determined at each junction of the model; between junctions, boundaries were interpolated using the topographic elevation data described in Table 23.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary has been shown. 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 floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data."

Certain flooding sources may have been studied that do not have published BFEs on the FIRMs, or for which there is a need to report the 1% annual chance flood elevations at selected cross sections because a published Flood Profile does not exist in this FIS Report. These streams may have also been studied using methods to determine non-encroachment zones rather than floodways. For these flooding sources, the 1% annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23. All topographic data used for modeling or mapping has been converted as necessary to NAVD88. The 1% annual chance elevations for selected cross sections along these flooding sources, along with their non-encroachment widths, if calculated, are shown in Table 25, "Flood Hazard and Non-Encroachment Data for Selected Streams."

Table 23: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data					
		Description	Scale	Contour Interval	$RMSE_z$	$Accuracy_z$	Citation
Entire Coastline of Camden County	Atlantic Ocean	LiDAR	N/A	N/A	10 cm	19.6 cm	NOAA 2010
Camden County, Unincorporated Areas	Bailey Swamp	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated	Bullhead Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Bullhead Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Bullhead Creek Trib. 1	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas; Kingsland, City of	Catfish Creek (a)	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas; Kingsland, City of	Catfish Creek (b)	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Cow Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData

Table 23: Summary of Topographic Elevation Data used in Mapping - continued

Community	Flooding Source	Source for Topographic Elevation Data					
		Description	Scale	Contour Interval	$RMSE_z$	$Accuracy_z$	Citation
Camden County, Unincorporated Areas; Kingsland, City of	Crooked River (and tributaries)	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Glencoe Swamp	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas; Kingsland, City of	Horsepen Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Kingsland, City of	Kingsland Pond No. 1	Field Survey	N/A	N/A	N/A	N/A	N/A
Kingsland, City of	Kingsland Pond No. 2	Field Survey	N/A	N/A	N/A	N/A	N/A
Kingsland, City of	Kingsland Pond No. 3	Field Survey	N/A	N/A	N/A	N/A	N/A
Camden County, Unincorporated Areas	Little Satilla River Swamp	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Lower North Fork Crooked River	Digital Elevation Model (DEM) based on LiDAR	Field Survey	N/A	N/A	N/A	N/A
Camden County, Unincorporated Areas	North Crooked River	Digital Elevation Model (DEM) based on LiDAR	Field Survey	N/A	N/A	N/A	N/A
Camden County, Unincorporated Areas	North Fork Crooked River (and tributaries)	Digital Elevation Model (DEM) based on LiDAR	Field Survey	N/A	N/A	N/A	N/A

Table 23: Summary of Topographic Elevation Data used in Mapping - continued

Community	Flooding Source	Source for Topographic Elevation Data					
		Description	Scale	Contour Interval	$RMSE_z$	$Accuracy_z$	Citation
Camden County, Unincorporated Areas; Kingsland, City of	North Fork Swamp	Digital Elevation Model (DEM) based on LiDAR	Field Survey	N/A	N/A	N/A	N/A
Camden County, Unincorporated Areas	Riley Creek	Digital Elevation Model (DEM) based on LiDAR	1”=6,000’	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Riley Creek Trib. 1	Digital Elevation Model (DEM) based on LiDAR	1”=6,000’	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas; Woodbine, City of	Satilla River	Digital Elevation Model (DEM) based on LiDAR	1”=6,000’	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas; Woodbine, City of	Satilla River	NED	N/A	N/A	N/A	N/A	USGS
Camden County, Unincorporated Areas; Kingsland, City of	Shingle Swamp	Field Survey	N/A	N/A	N/A	N/A	N/A
Camden County, Unincorporated Areas	St. Mary’s Cut	Digital Elevation Model (DEM) based on LiDAR	1”=6,000’	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	St. Mary’s River	Digital Elevation Model (DEM) based on LiDAR	1”=6,000’	2 ft	N/A	N/A	PhotoScience & Furgo EarthData

Table 23: Summary of Topographic Elevation Data used in Mapping - continued

Community	Flooding Source	Source for Topographic Elevation Data					
		Description	Scale	Contour Interval	$RMSE_z$	$Accuracy_z$	Citation
Camden County, Unincorporated Areas; Kingsland, City of	Temple Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	Waverly Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	White Oak Creek	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	White Oak Creek Trib. 1	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData
Camden County, Unincorporated Areas	White Oak Creek Trib. 1.1	Digital Elevation Model (DEM) based on LiDAR	1"=6,000'	2 ft	N/A	N/A	PhotoScience & Furgo EarthData

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface 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.

Table 24: Floodway Data

[Not applicable to this Flood Risk project]

Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams

[Not applicable to this Flood Risk project]

6.4 Coastal Flood Hazard Mapping

Flood insurance zones and BFEs including the wave effects were identified on each transect based on the results from the onshore wave hazard analyses. Between transects, elevations were interpolated using topographic maps, land-use and land-cover data, and knowledge of coastal flood processes to determine the aerial extent of flooding. Sources for topographic data are shown in Table 23.

Zone VE is subdivided into elevation zones and BFEs are provided on the FIRM.

The limit of Zone VE shown on the FIRM is defined as the farthest inland extent of any of these criteria (determined for the 1% annual chance flood condition):

- The *primary frontal dune zone* is defined in 44 CFR Section 59.1 of the NFIP regulations. The primary frontal dune represents a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes that occur immediately landward and adjacent to the beach. The primary frontal dune zone is subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune zone occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

- The *wave runup zone* occurs where the (eroded) ground profile is 3.0 feet or more below the 2-percent wave runup elevation.

- The *wave overtopping splash zone* is the area landward of the crest of an overtopped barrier, in cases where the potential 2-percent wave runup exceeds the barrier crest elevation by 3.0 feet or more.

- The *breaking wave height zone* occurs where 3-foot or greater wave heights could occur (this is the area where the wave crest profile is 2.1 feet or more above the total stillwater elevation).

- The *high-velocity flow zone* is landward of the overtopping splash zone (or area on a sloping beach or other shore type), where the product of depth of flow times the flow velocity squared (hv^2) is greater than or equal to 200 ft^3/sec^2. This zone may only be used on the Pacific Coast.

The SFHA boundary indicates the limit of SFHAs shown on the FIRM as either "V" zones or "A" zones.

Table 26 indicates the coastal analyses used for floodplain mapping and the criteria used to determine the inland limit of the open-coast Zone VE and the SFHA boundary at each transect.

Table 26: Summary of Coastal Transect Mapping Considerations

Coastal Transect	Primary Frontal Dune (PFD) Identified	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
		Zone Designation and BFE (ft NAVD 88)	Zone Designation and BFE (ft NAVD 88)		
1[1]	--[1]	--[1]	VE 11, 12 AE 4-6, 8-11	--[1]	--[1]
2[2]	--	--	VE 11-13 AE 4-11	Wave Height	SWEL
3	✓	VE[3] 10	VE 11-14 AE 8-10	PFD	SWEL
4	✓	VE[3] 12	VE 11, 12, 14 AE 9-11	PFD	SWEL
5	✓	VE[3] 12	VE 11, 12, 14 AE 8-11	PFD	SWEL
6	✓	VE[3] 12	VE 11, 13, 14 AE 8-10	PFD	SWEL
7	✓	VE 13	VE 11, 14 AE 8-10	PFD	SWEL
8	✓	VE 12	VE 11-14 AE 8-10	PFD	SWEL
9	✓	VE[3] 12	VE 11-14 AE 8-10	PFD	SWEL
10	✓	VE 13	VE 11-14 AE 8-11	PFD	SWEL
11	✓	VE 13	VE 10-12, 14 AE 8-11	Runup	SWEL
12	✓	VE 13	VE 10-12, 14 AE 8-11	Runup	SWEL
13	✓	VE 12[4]	VE 10-14 AE 8-11	Overtopping	SWEL
14	✓	--	VE 11-14 AE 8-11	PFD	SWEL
15	✓	--	VE 10-13 AE 8-11	PFD	SWEL
16	✓	VE[3] 11 AE 11	VE 11-13 AE 9-11	PFD	Runup

Table 26: Summary of Coastal Transect Mapping Considerations - continued

Coastal Transect	Primary Frontal Dune (PFD)	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
17	✓	VE[3] 11 AE 11	VE 11-13 AE 8-11	PFD	SWEL
18	✓	VE[3] 11 AE 11	VE 11-13 8-10	PFD	Runup
19	✓	AE 11	VE 11-13 AE 8-11	Wave Height	Runup
20	✓	VE[3] 11 AE 11	VE 12, 13 AE 9-11	PFD	Erosion/Runup
21	✓	VE 12 AE 12	VE 12, 13 AE 9-11	PFD	Erosion/Runup
22	✓	VE[3] 10	VE 12, 13 AE 9-12	PFD	SWEL
23	✓	VE 13	VE 12, 13 AE 9-12	PFD	SWEL
24	✓	VE[3] 11	VE 12-14 9-12	PFD	Runup
25	✓	VE[3] 10	VE 12-14 AE 9-11	PFD	SWEL
26	✓	--	VE 11-15 AE 9, 10, 12	PFD	PFD
27[2]	--	--	VE 12-14 AE 7-12	Wave Height	SWEL
28[2]	--	--	VE 11-14 AE 7, 8, 10, 11	Wave Height	SWEL
29[2]	--	--	VE 11, 12 AE 7, 10, 11	Wave Height	SWEL
30[2]	--	--	VE 11-13 AE 7-10	Wave Height	SWEL
31[2]	--	--	VE 11-13 AE 9-11	Wave Height	SWEL
32[5]	--[5]	--[5]	VE 11-14 AE 9-11	--[5]	--[5]
33[5]	--[5]	--[5]	VE 12, 13 AE 10, 11	--[5]	--[5]
34[5]	--[5]	--[5]	VE 12 AE 7-10	--[5]	--[5]

Table 26: Summary of Coastal Transect Mapping Considerations - continued

Coastal Transect	Primary Frontal Dune (PFD)	Wave Runup Analysis	Wave Height Analysis	Zone VE Limit	SFHA Boundary
35[5]	--[5]	--[5]	VE 11, 12 AE 8-11	--[5]	--[5]
36[5]	--[5]	--[5]	VE 11 AE 10, 11	--[5]	--[5]
37[5]	--[5]	--[5]	VE 11	--[5]	--[5]

[1]Transect originates in Nassau County, Florida. See Nassau County FIS Report.
[2] Transect originates inland, not on open coast
[3]Mapped as VE due to PFD designation
[4]Runup capped at 3 feet above crest elevation
[5] Transect originates in Glynn County, Georgia. See Glynn County FIS Report.

A LiMWA boundary has also been added in coastal areas subject to wave action for use by local communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave.

6.5 FIRM Revisions

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 31, "Map Repositories").

6.5.1 Letters of Map Amendment

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in an SFHA. A LOMA cannot be issued for properties located on the PFD (primary frontal dune).

To obtain an application for a LOMA, visit www.fema.gov/floodplain-management/letter-map-amendment-loma and download the form "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill".

Visit the "Flood Map-Related Fees" section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at www.fema.gov/online-tutorials.

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA's determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting www.fema.gov/floodplain-management/letter-map-amendment-loma for the "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill" or by calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the "Flood Map-Related Fees" section.

A tutorial for LOMR-F is available at www.fema.gov/online-tutorials.

6.5.3 Letters of Map Revision

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/mt-2-application-forms-and-instructions and download the form "MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision". Visit the "Flood Map-Related Fees" section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Camden County FIRM are listed in Table 27. Please note that this table only includes LOMCs that have been issued on the FIRM panels updated by this map revision. For all other areas within this county, users should be aware that revisions to the FIS Report made by prior LOMRs may not be reflected herein and users will need to continue to use the previously issued LOMRs to obtain the most current data.

Table 27: Incorporated Letters of Map Change

Case Number	Effective Date	Flooding Source	FIRM Panel(s)
10-04-6725P	08/18/2011	Crooked River, Lower North Fork Crooked River, North Crooked River, North Fork Crooked River	13039C0245F 13039C0265F 13039C0360F 13039C0370F 13039C0379F 13039C0380F 13039C0390F
10-04-3775P	04/29/2010	Kingsland Pond No. 1, Kingland Pond No. 2, Kingsland Pond No. 3, North Fork Swamp, Shingle Swamp	13039C0380F 13039C0385F

6.5.4 Physical Map Revisions

Physical Map Revisions (PMRs) are an official republication of a community's NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community's chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit www.fema.gov and visit the "Flood Map Revision Processes" section.

6.5.5 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards within a given community. FEMA accomplishes this through a national watershed-based mapping needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS). The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit www.fema.gov to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Camden County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 28, "Community Map History." A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.

- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or "pending" (for Preliminary FIS Reports) is shown. If the community is listed in Table 28 but not identified on the map, the community is treated as if it were unmapped.

- *Initial FHBM Effective Date* is the effective date of the first Flood Hazard Boundary Map (FHBM). This date may be the same date as the Initial NFIP Map Date.

- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.

- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community.

- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised date that is shown on the FIRM panel, if applicable. As countywide studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as Physical Map Revisions (PMR) of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

The initial effective date for the Camden County FIRMs in countywide format was 09/30/1988.

Table 28: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Camden County, Unincorporated Areas	04/02/1976	04/02/1976	10/01/1983	06/01/1984	12/16/2008 07/03/1995 09/03/1992 09/30/1988
Kingsland, City of	02/20/1976	02/20/1976	N/A	06/01/1984	12/16/2008 07/03/1995 09/30/1988
St. Marys, City of	05/17/1974	05/17/1974	09/03/1976	06/01/1984	12/16/2008 07/03/1995 09/30/1988
Woodbine, City of	06/14/1974	06/14/1974	03/26/1976	06/01/1984	12/16/2008 09/30/1988

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 29: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Atlantic Ocean		BakerAECOM, LLC	HSFEHQ-09-D-0368 Task Order: HSFE04-10-J-0075	2015	Entire Coastline of Camden County
Bailey Swamp		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Bullhead Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated
Bullhead Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas

Table 29: Summary of Contracted Studies Included in this FIS Report - continued

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Bullhead Creek Trib. 1		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Bullhead Creek Trib. 1		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Catfish Creek (a)		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Kingsland, City of
Catfish Creek (b)		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Kingsland, City of
Cow Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Crooked River (and tributaries)		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Kingsland, City of
Crooked River (and tributaries)		LOMR 6725P	N/A	2011	Camden County, Unincorporated Areas; Kingsland, City of
Glencoe Swamp		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Horsepen Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Kingsland, City of
Kingsland Pond No. 1		LOMR 3775P	N/A	2010	Kingsland, City of
Kingsland Pond No. 2		LOMR 3775P	N/A	2010	Kingsland, City of
Kingsland Pond No. 3		LOMR 3775P	N/A	2010	Kingsland, City of
Little Satilla River Swamp		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas

Table 29: Summary of Contracted Studies Included in this FIS Report - continued

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Lower North Fork Crooked River		LOMR 6725P	N/A	2011	Camden County, Unincorporated Areas
North Crooked River		LOMR 6725P	N/A	2011	Camden County, Unincorporated Areas
North Fork Crooked River (and tributaries)		LOMR 6725P	N/A	2011	Camden County, Unincorporated Areas
North Fork Swamp		LOMR 3775P	N/A	2010	Camden County, Unincorporated Areas; Kingsland, City of
Riley Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Riley Creek Trib. 1		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Satilla River		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Woodbine, City of
Shingle Swamp		LOMR 3775P	N/A	2010	Camden County, Unincorporated Areas; Kingsland, City of
St. Mary's Cut		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
St. Mary's River		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
Temple Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas; Kingsland, City of
Waverly Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas

Table 29: Summary of Contracted Studies Included in this FIS Report - continued

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
White Oak Creek		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
White Oak Creek Trib. 1		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas
White Oak Creek Trib. 1.1		GA DNR	EMA-2011-CA-5144	2012	Camden County, Unincorporated Areas

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and previous Flood Risk Projects are shown in Table 30. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Camden County and Incorporated Areas		08/19/2015	Work Map	FEMA, Georgia DNR, CDM Smith, BakerAECOM, LLC, and community officials
		TBD	CCO Meeting	FEMA, Georgia DNR, CDM Smith, BakerAECOM, LLC, and community officials
Camden County and Incorporated Areas	12/16/2008	12/08/2005	CCO Meeting	FEMA, Georgia DNR, PBS&J, and community officials
		12/17/2007	CCO Meeting	FEMA, Georgia DNR, PBS&J, and representatives of the City of Kingsland, City of St. Marys, and Camden County
Camden County and Incorporated Areas	09/30/1988	05/1987	CCO Meeting	FEMA and community officials
		11/03/1987	CCO Meeting	FEMA and community officials
Camden County Unincorporated Areas	12/01/1983	1978	CCO Meeting	FEMA and community officials
		06/28/1983	CCO Meeting	FEMA and community officials
Kingsland, City of	12/01/1983	1978	CCO Meeting	FEMA and community officials
		06/30/1983	CCO Meeting	FEMA and community officials
St. Marys, City of	12/01/1983	1978	CCO Meeting	FEMA and community officials
		06/28/1983	CCO Meeting	FEMA and community officials
Woodbine, City of	12/01/1983	1978	CCO Meeting	FEMA and community officials
		06/28/1983	CCO Meeting	FEMA and community officials

SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see www.fema.gov.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for Camden County (FEMA 2008).

Table 31 is a list of the locations where FIRMs for Camden County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 31: Map Repositories

Community	Address	City	State	Zip Code
Camden County, Unincorporated Areas	Planning and Building Department 107 Gross Road, Suite 3	Kingsland	GA	31548
Kingsland, City of	City Hall 107 South Lee Street	Kingsland	GA	31548
St. Marys, City of	Community Development Department 418 Osborne Street	St. Marys	GA	31558
Woodbine, City of	City Hall 310 Bedell Avenue	Woodbine	GA	31569

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 32.

Table 32 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

Table 32: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/engineering-library
NFIP website	www.fema.gov/national-flood-insurance-program
NFHL Dataset	msc.fema.gov
FEMA Region IV	Federal Emergency Management Agency, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341
Other Federal Agencies	
USGS website	www.usgs.gov
Hydraulic Engineering Center website	www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Tom Shillock, CFM Dept. of Natural Resources Environmental Protection Division 2 Martin Luther King Jr. Drive Atlanta, Georgia 30334
State GIS Coordinator	Not Applicable

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 33 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

Table 33: Bibliography and References

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
AMEC 2001	AMEC Earth and Environmental Center for Watershed Protection	*Georgia Stormwater Management Manual, Volume 2: Technical Handbook, First Edition*	Debo and Associates, Jordan Jones and Goulding, and Atlanta Regional Commission		August 2001	
BakerAECOM 2012	BakerAECOM	*Task Order 75: Georgia-Northeast Florida Flood Insurance Study, IDS1*	BakerAECOM		2012	
BakerAECOM 2013	BakerAECOM	*Task Order 75: Georgia-Northeast Florida Flood Insurance Study, IDS2*	BakerAECOM		2013	
BakerAECOM 2014	BakerAECOM	*Task Order 75: Georgia-Northeast Florida Flood Insurance Study, IDS3*	BakerAECOM		2014	
BakerAECOM 2015	BakerAECOM	*Task Order 75: Georgia-Northeast Florida Flood Insurance Study, IDS 4 & 5: Camden County, Georgia, Coastal Hazard Analysis and Floodplain Mapping Report*	BakerAECOM		2015	
BakerAECOM 2015	BakerAECOM	*FEMA Region IV, Coastal Hazard Analysis and Mapping TSDN*	BakerAECOM		October 2015	
CDM Smith 2012	CDM Smith Inc	*Hydrology Deliverable, Glynn County, GA*	CDM Smith Inc		February 2012	
CDM Smith 2012a	CDM Smith Inc	*Hydraulics Deliverable, Glynn County, GA*	CDM Smith Inc		May 2012	

Table 33: Bibliography and References - continued

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 2003	Federal Emergency Management Agency	*Guidelines and Specifications for Flood Hazard mapping Partners, Appendix D: Guidance for Coastal Flooding Analyses and Mapping*	Federal Emergency Management Agency	Washington, D.C.	2003	
FEMA 2007	Federal Emergency Management Agency	*Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update.*	Federal Emergency Management Agency	Washington, D.C.	2007	
FEMA 2008	Federal Emergency Management Agency	*Technical Memorandum: Guidance for Coastal Flood Hazard Analyses and Mapping in Sheltered Waters*	Federal Emergency Management Agency	Washington, D.C.	2008	
USACE 2010	U.S. Army Corps of Engineers	*HEC-RAS: River Analysis System User's Manual*	Hydrologic Engineering Center		January 2010	
Thomas and Hutton 2011	Thomas and Hutton Engineering, Co.	*City of Kingsland LOMR 6725P*	Thomas and Hutton Engineering, Co.		2011	
BakerAECOM 2010	BakerAECOM	*Camden County: Kingsland Tract LOMR 3775P*	BakerAECOM		2010	
USACE 2010	U.S. Army Corps of Engineers	*HEC-RAS: River Analysis System Hydraulic Reference Manual, Version 4.1*	Hydrologic Engineering Center		January 2010	

Table 33: Bibliography and References - continued

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USGS 1993	AMEC Earth and Environmental Center for Watershed Protection	*Georgia Stormwater Management Manual, Volume 2: Technical Handbook, First Edition*	Debo and Associates, Jordan Jones and Goulding, and Atlanta Regional Commission		August 2001	