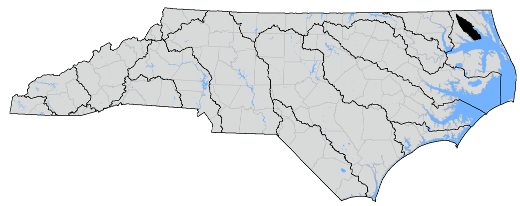
PRELIMINARY FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

A Report of Flood Hazards in

PASQUOTANK COUNTY, NORTH CAROLINA AND INCORPORATED AREAS



Community Name	Community Number
CITY OF ELIZABETH CITY	370185
PASQUOTANK COUNTY	370184

NORTH CAROLINA Cooperating Technical State

FEMA'S COOPERATING TECHNICAL PARTNER

PRELIMINARY: 11/30/2015

REVISED: 9/9/9999

Federal Emergency Management Agency

State of North Carolina

Flood Insurance Study Number

37139CV000

www.fema.gov and www.ncfloodmaps.com

FOREWORD

This countywide Flood Insurance Study (FIS) Report was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long-term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the state level. As a part of this effort, the State of North Carolina has joined with FEMA in a Cooperating Technical State (CTS) agreement to produce and maintain this FIS Report and the accompanying digital Flood Insurance Rate Map (FIRM) for North Carolina.

NOTICE TO FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

The following is a list of the publication dates of this Countywide FIS Report starting with the initial Report accompanying the North Carolina Statewide FIRM:

Date	Reason
10/5/2004	Initial Countywide FIS Report Effective Date

This FIS has been produced as part of the North Carolina Floodplain Mapping Program. Pasquotank County, North Carolina, falls under the administrative jurisdiction of Region IV of the Federal Emergency Management Agency (FEMA). Questions concerning this FIS may be directed to the North Carolina Floodplain Mapping Program at www.ncfloodmaps.com, the FEMA Map Assistance Center by calling the toll-free information line at 1-877-FEMA MAP (1-877-336-2627), or by contacting the FEMA Regional Office at the following address:

FEMA, Federal Insurance and Mitigation Administration

Koger Center - Rutgers Building

3003 Chamblee Tucker Road

Atlanta, Georgia 30341

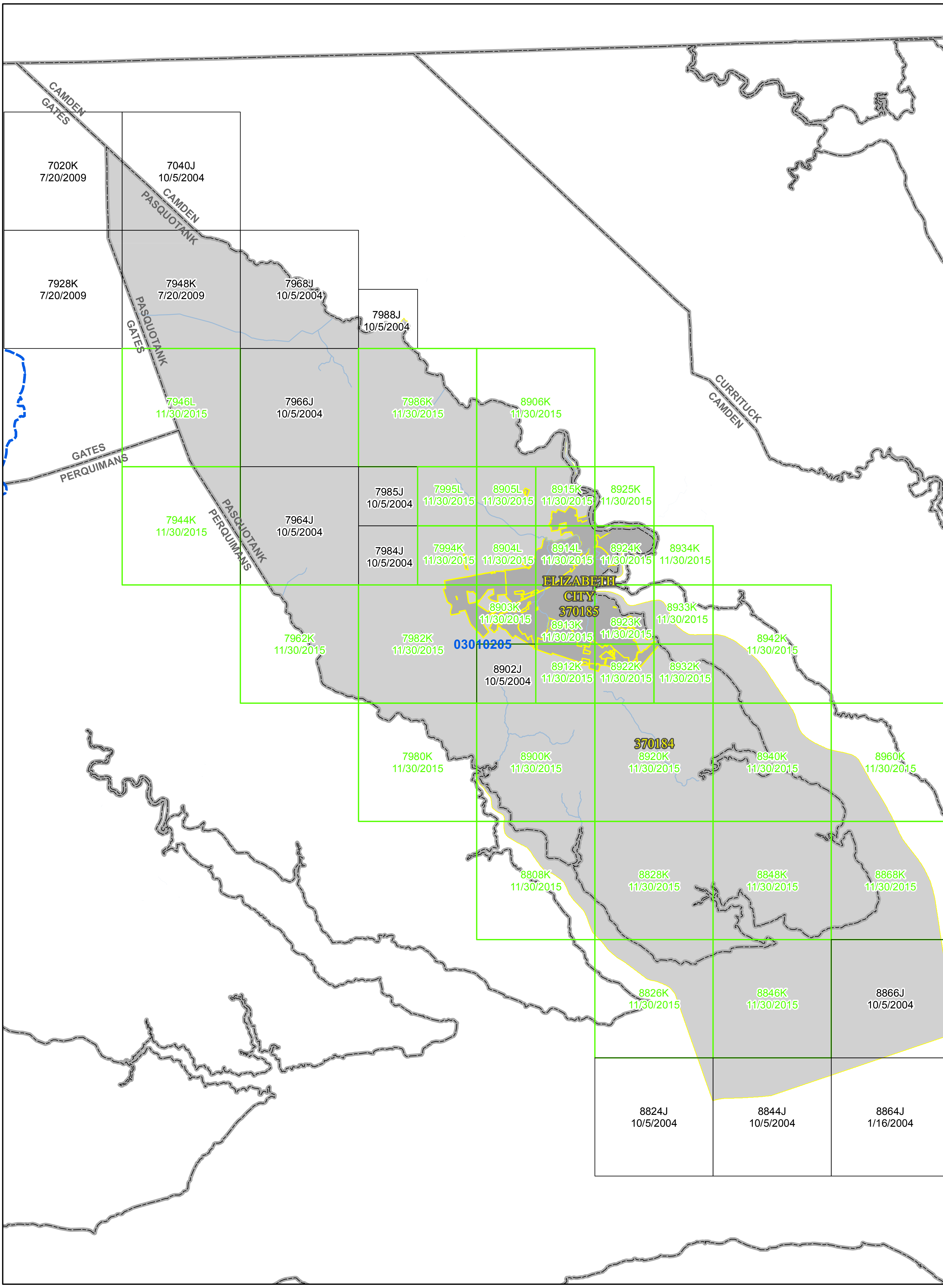
(770) 220-5400

Table of Contents

Sections	Page

Tables	Page

Figures **Page**



N

1 in = 3 miles

0 0.5 1 2 3 Miles

Map Projection:
Lambert Conformal Conic
North American Datum 1983

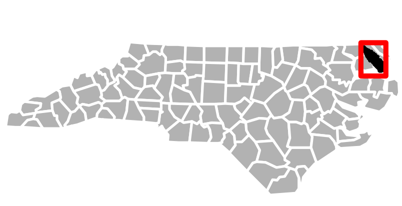
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://FRIS.NC.GOV/FRIS

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

PRELIMINARY
11/30/2015

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

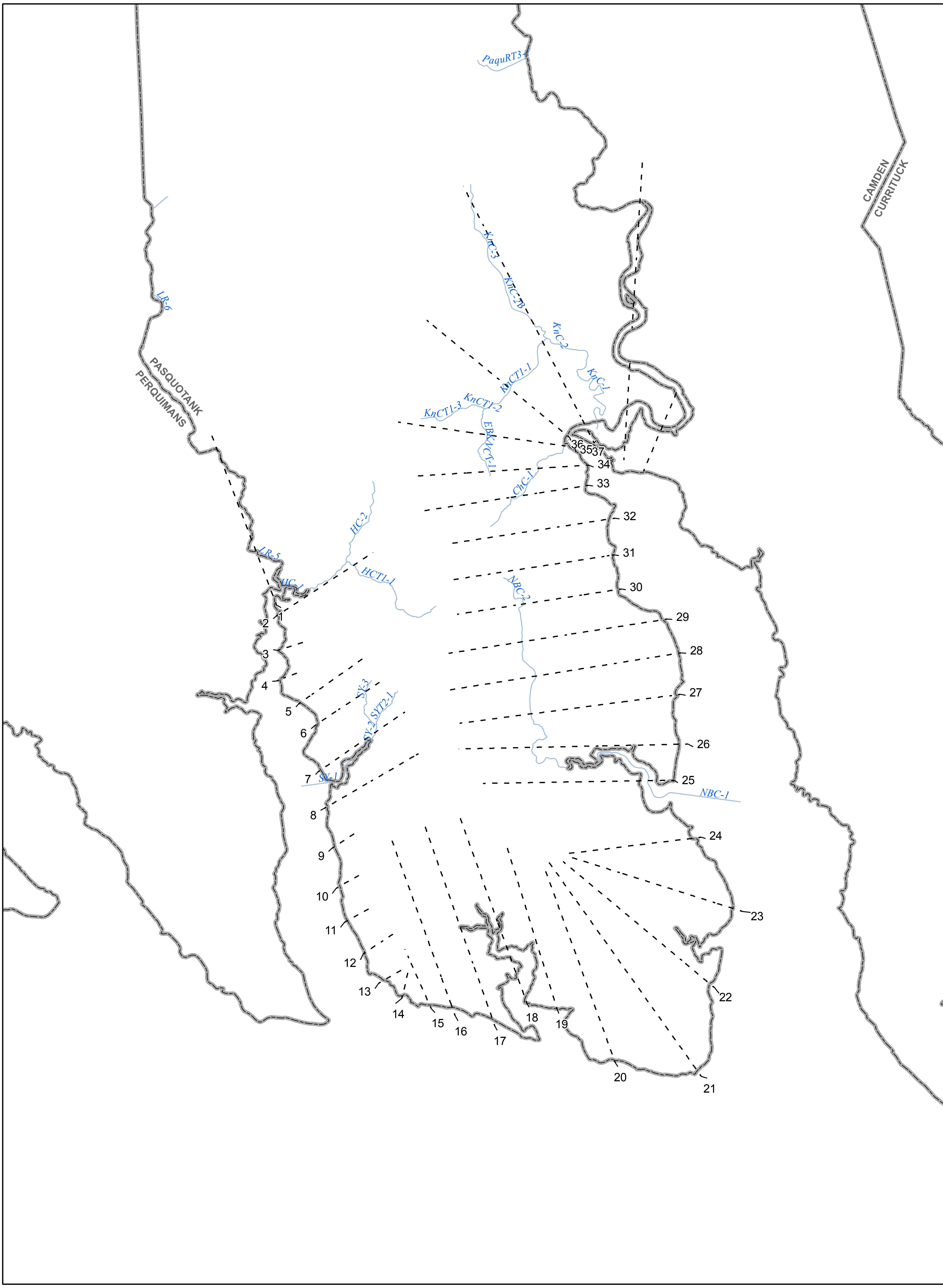
FLOOD INSURANCE RATE MAP INDEX

PASQUOTANK COUNTY, NORTH CAROLINA And Incorporated Areas

PANELS PRINTED:
7020, 7040, 7928, 7948, 7968, 8808, 8828, 8848, 8868, 7988, 7946, 7966, 7986, 8906, 7944, 7964, 7985, 7995, 8905, 8915, 8925, 7984, 7994, 8904, 8914, 8924, 8934, 7962, 7982, 8903, 8913, 8923, 8933, 8942, 8902, 8912, 8922, 8932, 7980, 8900, 8920, 8940, 8960, 8826, 8846, 8866

FEMA

MAP NUMBER
37139CIND0D



1 in = 2 miles

0 0.5 1 2 3 Miles

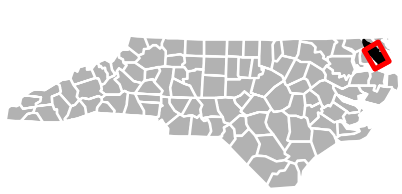
Map Projection:
Lambert Conformal Conic
North American Datum 1983

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

HTTP://FRIS.NC.GOV/FRIS

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

TRANSECT LOCATOR MAP

PASQUOTANK COUNTY, NORTH CAROLINA

PANELS WITH TRANSECTS:

8808, 8828, 8848, 8868, 8906, 7995, 8905, 8915, 8925, 7994, 8904, 8914, 8924, 8934, 7962, 8903, 8913, 8923, 8933, 8942, 8902, 8912, 8922, 8932, 7980, 8900, 8920, 8940, 8960, 8826, 8846

FEMA

1.0 Introduction

1.1 The National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. The NFIP makes federally backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage. Federally backed flood insurance is available in more than 19,000 communities across the United States and its territories.

The NFIP is managed by the Federal Insurance and Mitigation Administration of the Federal Emergency Management Agency (FEMA). The Federal Insurance and Mitigation Administration manages the insurance component of the NFIP and oversees the flood hazard mapping and the floodplain management aspects of the program.

The NFIP, through involvement with communities, the insurance industry, and the lending industry, helps reduce flood damage by nearly $800 million a year. Further, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those not built in compliance. In addition, every $3 paid in flood insurance claims saves $1 in disaster assistance payments. The NFIP is self-supporting for the average historical loss year, which means that operating expenses and flood insurance claims are not paid by the taxpayer, but through premiums collected for flood insurance policies.

Additional information of interest to homeowners, community officials, insurance companies, lenders, and study contractors is available in Section 9.0 of this FIS Report and on the NFIP Internet homepage at http://www.fema.gov/business/nfip/.

1.2 Purpose of this Flood Insurance Study

Flood Insurance Studies (FISs) are one of the primary means by which the NFIP administers the National Flood Insurance Act of 1968, the Flood Disaster Protection Act of 1973, and the National Flood Insurance Reform Act of 1994. FISs develop flood risk data that are used to establish actuarial flood insurance rates. The information in this FIS Report will also be used by Pasquotank County and the jurisdictions therein (hereinafter referred to collectively as Pasquotank County) to facilitate the adoption and maintenance of floodplain management ordinances, which form the basis of communities' continued participation in the NFIP. Minimum requirements for participation in the NFIP are set forth in Title 44, Part 60, Section 3 of the Code of Federal Regulations (44 CFR 60.3). In some States and/or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. In such cases, the more restrictive criteria will take precedence, and the State and/or community (or other jurisdictional agency) will be able to explain them.

This FIS investigates the existence and severity of flood hazards in, or revises and updates previous FISs for, the geographic area of Pasquotank County, North Carolina, including the jurisdictions listed in Table 1.

Table 1 - Jurisdictions in Pasquotank County

Community	Included in this FIS	If Not Included, Location of Flood Hazard/Flood Insurance Rate Data
CITY OF ELIZABETH CITY	Yes	*
PASQUOTANK COUNTY	Yes	*

1.3 FIS Components

A Flood Insurance Study (FIS) is an analysis of flood hazards, typically presented as a set of Flood Insurance Rate Map (FIRM) panels and the FIS Report, which includes a set of Flood Profiles and/or Water-surface elevation rasters.

Flood Insurance Study Report

The FIS Report provides a context for the information shown on the FIRM, as well as a summary of the data upon which the analyses are based. It also includes an index of sources of additional information on the NFIP.

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).

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 27, "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 Pasquotank became Effective on 10/5/2004. Refer to Table XX for information about subsequent revisions to 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 http://www.fema.gov or contact your appropriate FEMA Regional Office for more information about this program.

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

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

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

2.0 Floodplain Management Applications

Flood events of a magnitude expected to occur with a 10%, 2%, 1%, or 0.2% annual chance have been selected as having special significance for developing sound floodplain management programs. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10%, 2%, 1%, and 0.2% chance, respectively, of being equaled in any given year. Therefore, FIS Reports typically determine water-surface elevations for floods with these probabilities. The FIRM delineates 1% and 0.2% annual chance floodplains and 1% annual chance floodway boundaries, and depicts 1% annual chance flood elevations, rounded to the nearest foot, to assist in developing floodplain management measures.

2.1 Floodplains

To provide a national standard without regional discrimination, the 1% annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. A 1% annual chance flood, or base flood, is defined as that having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance floodplains shown on the FIRM identify areas that are expected to be inundated by the 1% annual chance flood. This 1% annual chance floodplain is also called a Special Flood Hazard Area (SFHA), where the NFIP's floodplain management regulations must be enforced by the community as a condition of participation in the NFIP. The 0.2% annual chance floodplain is employed to indicate additional areas of flood risk associated with exceptionally severe floods.

2.2 Floodways

Encroachment on floodplains such as that caused by placement of 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, floodways are provided as a tool to assist local communities in this aspect of floodplain management. Under this concept, the 1% annual chance riverine floodplain is divided into a floodway and a floodway fringe. 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. Figure 1, "Floodway Schematic," illustrates this principle. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional encroachment studies.

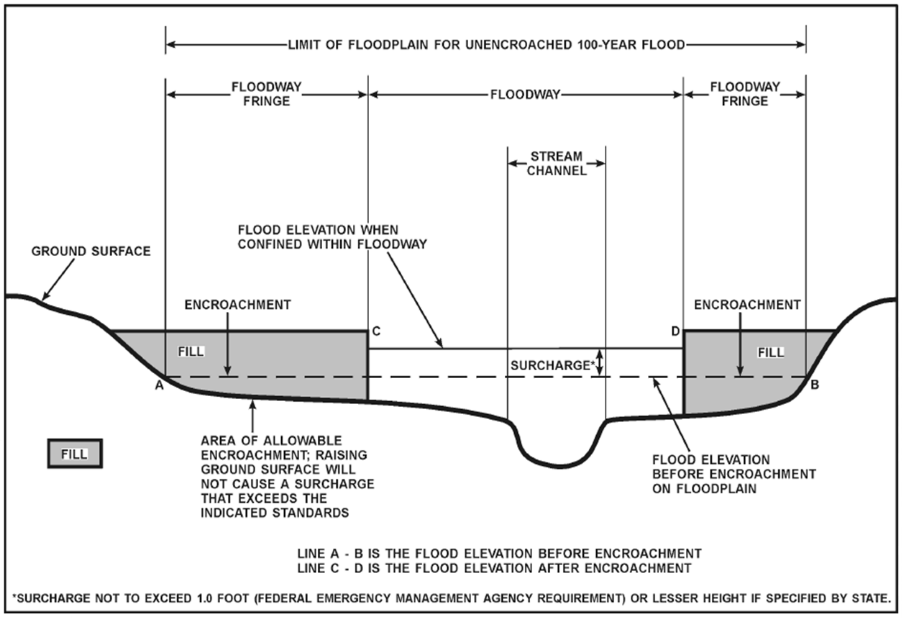


Figure 1- Floodway Schematic

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.

Coastal flood elevations are provided in the Summary of Coastal Stillwater Elevations table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

2.4 Watershed Characteristics

Because a FIS is a probability analysis that may not account for some of the factors listed below, communities are strongly encouraged to consider adopting more restrictive or higher floodplain management criteria or ordinances than the minimum Federal requirements. Communities may also increase the validity of their flood hazard data by investing in continuous maintenance of river gages (see the Data Validity and Reliability paragraph below). If the U.S. Geological Survey (USGS) or other agencies do not maintain gages on the flooding sources of interest, partnerships with the USGS may be pursued, or local gages may be installed. For more information, see Section 9.0 of this report.

This flood hazard study represents an analysis of certain watershed characteristics, some of which are summarized as follows:

Drainage Area
In general, streams that drain larger areas have greater flood hazards. FISs, in North Carolina, do not typically analyze flood hazards in places with rural drainage areas of less than one square mile and within urban drainage areas of less than ½ square mile.

Soil Permeability and Infiltration
Differences in the types of soil and the amount of vegetation in a watershed have a significant effect on the amount of water that the soil can absorb; soils with a high sand content absorb much more water than soils with a high clay content. The presence of vegetation

increases infiltration; the presence of pavement decreases infiltration and also speeds runoff to receiving waters. As soil permeability and infiltration decrease, the volume and rate of overland flow increases.

Soil Moisture Conditions

In addition to soil permeability and infiltration, the level of the water table helps determine the saturation point, beyond which no water is absorbed. As rainfall duration increases, the height of the water table increases.

Channel and Floodplain Geometry

The geometric contour of a streambed, termed channel geometry, and the geometric contour of a floodplain determine the volume of water that a channel can hold and partially determine the rate at which water flows through it.

Channel and Floodplain Roughness

The roughness of a surface affects the characteristics of runoff whether the water is on the surface of the watershed or in the channel.

FIS Reports include analyses of how these factors will combine to produce overland flow patterns during floods that have a certain probability of occurring in any given year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at shorter intervals or even within the same year. The risk of experiencing a rare flood increases when longer periods are considered. For example, the risk of having a flood which equals or exceeds the 1% annual chance flood (1% chance of annual exceedence) in any 50-year period is approximately 40% (4 in 10), but for any 90-year period, the risk increases to approximately 60% (6 in 10).

It is important to note that the 1% annual chance flood is used as the national standard to allow a consistent approach to floodplain management, flood hazard assessment, and flood hazard mapping. In any given community, a number of factors may result in flooding characteristics that do not conform to predicted conditions. Therefore, the determination that an area is not shown on the FIRM as being within a Special Flood Hazard Area is no guarantee that it will not flood during a 1% annual chance flood. Examples of these factors include Data Validity and Reliability; Developmental and Topographic Changes Over Time; Erosion, Deposition, and Debris Flow; and Meandering and Lateral Migration.

Data Validity and Reliability

Certain types of analysis methods yield more justifiable characterizations of flood hazards. For example, a gage analysis, to determine peak discharges, is based on actual measurements of watershed conditions over time and, therefore, is typically considered the most accurate method of hydrologic analysis. However, it is not feasible to install enough gages to gather data on every stream. In addition, for many of the gage sites that do exist, there are interruptions in the period of record. The usefulness of gage data for the purpose of predicting flooding behavior decreases with interruptions in the period of record; predicted flooding conditions over a 100-year period based on 20 years of measurements spread over a 35-year period are less valid than those based on 30 years of continuous measurements. A regression analysis is typically considered the best method in the absence of gage data, as it uses gage data from watersheds with similar characteristics to estimate flood frequency and magnitude in an ungaged watershed. Regression equations reflect average conditions for a region; therefore, the results will not exactly match the results of a gage analysis at a particular location. The standard errors of the North Carolina rural regression equations range from 44 to 51 percent for estimates of the 1% annual chance flood. That means the difference between the results of the regression equation and the gage analysis for approximately two-thirds of the locations that gage data exists are within 44 to 51 percent of the gage analysis results. A rainfall-runoff hydrologic analysis may be used for gaged or ungaged watersheds, and can estimate the effects of storage areas and flood control structures and measures. This method is most valid when calibrated against historical data.

Developmental and Topographic Changes Over Time

A FIRM is based on the best topographic and planimetric information available to FEMA and the State of North Carolina at the time the study is produced. In time, however, development and/or natural phenomena can alter the physical characteristics of a watershed and its drainage channels, resulting in changes in the flood hazards in those areas. For example, constructing a housing subdivision reduces the amount of soil that is available to absorb water; this in turn causes an increase in the volume of surface water that flows into the channel.

Erosion, Deposition, and Debris Flow

The flood hazards shown on a FIRM are based on the assumption of unobstructed flow. The FIRM does not reflect an analysis of areas that are subject to erosion caused by the increased water-surface elevations and velocities that occur during flooding. In addition to the risks of landslides or a weakening of the ground underneath roads or structures, any sediment that is removed from one location will be deposited in another; accumulated deposits may have a pronounced effect on flood hazards in those areas. Similarly, debris such as fallen trees or branches, litter, or other items may obstruct stream channels or hydraulic structures, increasing water-surface elevations, velocities, and floodplain width.

Meandering and Lateral Migration

FISs are based on the assumption that channel geometry will remain stable during normal drainage and during flood events. This assumption is valid for most streams, which flow over bedrock or between bedrock outcroppings that form non-alluvial channels. However, alluvial streams change the channel geometry with time, significantly so during flood events. Alluvial streams are subject to erosion and deposition, which may result in braided or meandering channels. Streams of this type may be characterized by lateral migration, or channel shifting, in which the stream may change course entirely during a flood. Whenever clear evidence is available, a FIRM will identify the alluvial nature of a studied flooding source and designate wider floodways to allow for potential migration. However, these floodways are based on qualitative assessments and not on quantitative geomorphic and engineering analyses.

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 XX.

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.

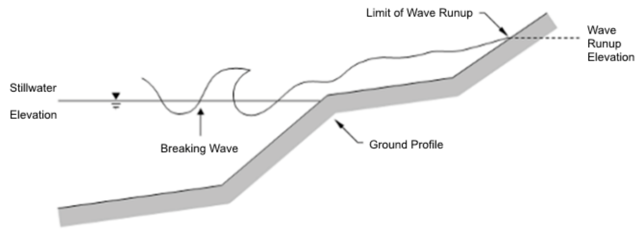


Figure 5: Wave Runup Transect Schematic

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 18 and 18P presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

CWhere 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 20, “Coastal Transect Parameters.” The locations of transects are shown in Figure 9, “Transect Location Map.” More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

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

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

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

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

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

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

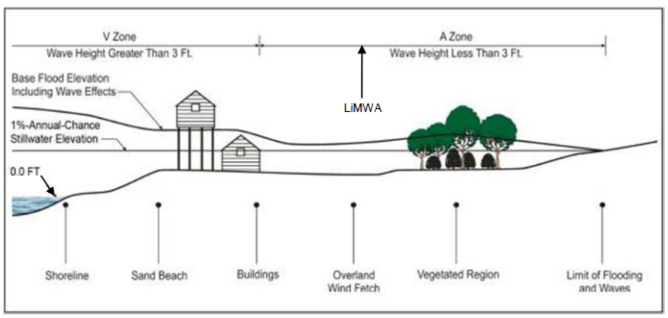


Figure 6: Coastal Transect Schematic

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

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, "Map Legend for FIRM." In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 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.

3.0 Insurance Applications

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones and, in 1% annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies. Table 2, “Flood Zone Designations,” includes a description of each type of flood hazard zone.

Table 2 - Flood Designations

Zone	Description
A	Zone A is the flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined in the FIS Report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone.
AE	Zone AE is the flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined in the FIS Report by detailed methods. In most instances, whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
AH	Zone AH is 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 Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
AO	Zone AO is 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 detailed hydraulic analyses are shown within this zone.
AR	Zone AR is 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.
A99	Zone A99 is 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 depths are shown within this zone.
V	Zone V is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no Base Flood Elevations are shown within this 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. Whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
X	Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2% annual chance floodplain, areas within the 0.2% annual chance floodplain, and to areas of 1% annual chance flooding where average depths are less than 1 foot, areas of 1% annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone.
X (Future)	Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.
D	Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

3.2 Coastal Barrier Resources System

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" is not applicable in Pasquotank County.

4.0 Area Studied

Pasquotank County is found in the Coastal Plain region of North Carolina. It is surrounded by Camden County to the east, Tyrrell County to the south, and Perquimans and Gates Counties to the west.

4.1 Basin Description

Table 3, "Basin Description" 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 area.

Table 3 - Basin Description

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description	HUC Area (square miles)
Albemarle	03010205	Albemarle Sound	The Albemarle Basin covers the Albemarle Sound and surrounding drainage areas along the northeast North Carolina coast and into southeastern Virginia. The Albemarle Sound begins where Roanoke River and Chowan River join in eastern Bertie County.	4,323

4.2 Principal Flood Problems

Table 4, "Principal Flood Problems" is not applicable in Pasquotank County.

4.3 Historic Flood Elevations

Hurricane Floyd
(9/16/1999)

Hurricane Floyd made landfall near Wilmington with category two winds of 105 to 110 mph. Rainfall totals from Floyd were as high as 15 to 20 inches over portions of eastern North Carolina; with a record of 23.45 inches of rain falling in the month of September at Wilmington, NC. This breaks the previous record of 21.12 inches set in July 1886. These rains combined with saturated ground from previous rain events, including Hurricane Dennis, to produce an inland flood disaster. There were 74 deaths in the United States, including 52 in North Carolina, due to drowning from flood waters. This makes Floyd the deadliest U.S. hurricane since Agnes in 1972. Data from the USGS indicate that eleven of their stream gage monitoring sites in North Carolina (Ahoskie, Rocky Mount, Hilliardston, White Oak, Enfield, Tarboro, Lucama, Hookerton, Trenton, Chinquapin, and Freeland) exceeded 0.2% annual chance flood levels due to Floyd. Total losses in North Carolina approach $5 billion with an estimated $3.5 billion in damages to North Carolina homes, businesses, roads, and infrastructure. Floyd passed relatively close to the entire U.S. east coast, justifying hurricane warnings from Florida to Massachusetts and requiring an estimated two million people to evacuate. The last hurricane to require warnings for as large a stretch of coastline was Hurricane Donna in 1960.

Hurricane Bonnie
(8/26/1998)

The landfall location of Bonnie was in southern North Carolina near Cape Fear very close to landfall of both Hurricanes Bertha and Fran in 1996. Even though a powerful storm, damage from Bonnie was much less than Fran, which was also Category 3. Winds gusted up to 100 knots and storm tides of 5 to 8 feet above normal were reported mainly in eastern beaches of Brunswick County, while a storm surge of 6 feet was reported at Pasquotank and Camden Counties in the Albemarle Sound.

Hurricane Fran
(9/5/1996)
The landfall location of Fran near the city of Wilmington and its progression into the Raleigh-Durham area caused an estimated $1.275 billion in damage in North Carolina alone. Fran hit with gusts up to 105 mph and a storm surge of approximately 16 feet. Over $1 billion in damage was reported in North Topsail Beach and Surf City and 23 people were killed.

Hurricane Bertha
(7/12/1996)
1996 was a damaging year in the hurricane history of North Carolina. Tropical Storm Arthur, Hurricane Bertha, and Hurricane Fran all made direct landfall on the North Carolina coastline. It was the most active tropical cyclone season in the state since 1955, when Hurricanes Connie, Diane, and Ione all hit the coast. Bertha entered North Carolina in North Topsail Beach with 105 mph gust and a storm surge of approximately 5 feet.

Hurricane Gloria
(9/26/1985)
The landfall location of Gloria was Cape Hatteras, with 90 knot winds and a storm surge of approximately 6-8 feet.

Hurricane Diana
(9/13/1984)
The landfall location of Diana was 38 miles south of Wilmington with 90 mph winds at its closest approach to Wilmington. Diana had 115 mph sustained winds before landfall. Storm surge was approximately 5-6 feet.

Hurricane Donna
(8/29/1960)
Hurricane Donna crossed the North Carolina coast between Wilmington and Morehead City of September 11, 1960. The center of the storm passed a few miles east of Wrightsville Beach, although Wilmington and Wrightsville Beach were each in the eye for about an hour. The lowest barometric pressure recorded during this storm was 962 mb at Wilmington. High tides, 6 to 8 feet above normal, together with high winds, caused severe damage at many points. Winds of hurricane force, up to 97 mph, were reported from Wilmington. During the night of September 11, the storm center moved northward, parallel, and slightly east of a line drawn between Wilmington and Norfolk. Wind gusts were in excess of 97 mph and tides were 4 to 8 feet above normal. High tides of 10.3 and 8.3 feet NGVD were reported at Atlantic Beach and Wrightsville Beach, respectively. Coastal communities from Wilmington to Nags Head suffered heavy structural damage and considerable beach erosion. Eight deaths and approximately 100 injuries were attributed to the storm. Damages were estimated at millions of dollars.

Hurricane Helene
(9/21/1958)
Hurricane Helene was one of the most powerful storms of recent history. Fortunately for the people of North Carolina, the storm center was well out at sea as it moved north on September 26 and 27. Nevertheless, high winds were recorded at Wilmington, with the highest winds measured at 85 mph and peak gusts recorded at 135 mph. The lowest reported central pressure of the storm was 932 mb; this measurement was recorded south-southeast of Cape Fear early on the morning of September 27. There was some beach erosion due to seas and tides, but this erosion was minimized by the fact that the storm occurred at the time of low astronomical tides. High tides were estimated at 3 to 5 feet above normal; a high tide of 5.1 feet NGVD was reported at Wrightsville Beach. Tides were higher on the southern edge of Pamlico Sound, when the wind shift as the storm center passed brought the tides 7 to 8 feet above normal.

Hurricane Ione
(9/10/1955)
Hurricane Ione moved up from the south and crossed the North Carolina coast near Salter Path, 10 miles west of Morehead City, at about 5 a.m. on September 19. It then slowly curved to the northeast and went out to sea near the Virginia border early on September

20. When Ione entered North Carolina, winds gusted to over 100 mph. Wind speeds of 75 mph with gusts to 107 mph were recorded at Cherry Point. The minimum barometric pressure recorded over North Carolina during this storm was 960 mb. Heavy rains also accompanied Ione. At the same time, prolonged easterly winds drove tidal water onto beaches and into sounds and estuaries to heights of 3 to 10 feet above normal. The result was the largest inundation of eastern North Carolina ever known to have occurred. At New Bern, the depth of the flood was the greatest ever recorded, about 10.5 feet above mean low water; forty city blocks were flooded, several hundred homes were washed away, and thousands more were flooded with up to 4 feet of water. A high tide of 6.9 feet NGVD was reported at Atlantic Beach, North Carolina, and an estimated 5.3 feet NGVD at Wrightsville Beach.

Hurricane Diane
(8/7/1955)
Five days after Hurricane Connie, and before the damage from that storm could be estimated, Hurricane Diane struck the coast near Carolina Beach about 6 a.m. on August 17. The highest wind speed reported during this storm was 74 mph at Wilmington Airport. Storm tides ranged from 5 to 9 feet above mean low water on the beaches (6.8 feet NGVD at Wrightsville Beach), and in some areas of sounds and rivers emptying into sounds, estimated water levels were 5 to 9 feet above normal. Water was 3 feet above flood level in the business district of Belhaven and "waist deep" in parts of Washington and New Bern. Diane caused severe beach erosion along the North Carolina coast. The total damage caused in North Carolina by both Connie and Diane was estimated to be in excess of $90 million. No deaths or injuries in North Carolina were attributed to either of the storms.

Hurricane Connie
(8/3/1955)
Hurricane Connie entered North Carolina close to Cape Lookout at about 8:30 a.m. on August 12. The prolonged pounding of high waves against the coast caused tremendous beach erosion, probably worse than that caused by Hazel in 1954. Storm tides along the coast from Southport to Nags Head were reported to be about 7 feet NGVD (6.9 feet NGVD at Wrightsville Beach and 7.5 feet NGVD at Kure Beach). Water in sounds and near the mouths of rivers was 5 to 8 feet above normal. At Wilmington, winds were reported at 72 mph, gusting to 83 mph. At Fort Macon, winds of 75 mph, gusts of 100 mph, and barometric pressure of 962 mb were reported. The storm also brought torrential rains with the maximum rainfall, around 12 inches in 48 hours, occurring near Morehead City. Total damage throughout the state was estimated at $50 million.

Hurricane Hazel
(10/5/1954)
Hurricane Hazel was the most destructive storm in the history of North Carolina. The storm crossed the coast just north of Myrtle Beach, South Carolina, as hurricane winds hit the Atlantic coast between Georgetown, South Carolina, and Cape Lookout, North Carolina. Storm tides (i.e., hurricane surge) devastated the immediate ocean front of this stretch of coast. Every fishing pier along 170 miles of coast, from Myrtle Beach to Cedar Island, North Carolina, was destroyed. The waterfront between the South Carolina/North Carolina state boundary and Cape Fear was destroyed. Beach homes, which had been built in a continuous line five miles long behind and along grass-covered dunes (some of which were 20 feet high), simply disappeared – dunes, houses, and all. From Cape Fear to Cape Lookout, the degree of devastation was not as great, but oceanfront property was damaged an average of 50 percent along this entire stretch. To the north of Cape Lookout, the damage was relatively light. Storm surges of 16.6 feet above NGVD were observed at Holden Beach Bridge and Calabash, North Carolina. The highest tide of record was observed during Hurricane Hazel, when ocean tide levels reached approximately 10 feet NGVD at Wrightsville Beach and 11 feet NGVD at Carolina Beach. The lowest recorded barometric pressure of the storm was 938 millibars (mb), reported at Little River Inlet on the North Carolina/South Carolina border. Maximum wind speeds were 83 miles per hour (mph), with gusts recorded at 98 mph at Wilmington, North Carolina, 106 mph at Myrtle Beach, South Carolina, and an estimated 150 mph at Cape Fear. The storm continued inland through North Carolina, causing widespread damage due to high winds and record rainfalls. Nineteen people were killed and 200 injured during this storm.

Table 5, "Historic Flood Elevations" is not applicable in Pasquotank County.

4.4 Flood Protection Measures

Flood protection measures may be structural (such as levees, dams, and reservoirs) or non-structural (such as land-use management ordinances, policies, or practices).

Table 6, "Non-Levee Flood Protection Measures", lists the flood protection measures undertaken to mitigate flood damage in

Pasquotank County.

Table 6 - Non-Levee Flood Protection Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Newland Drainage Canal	NP	DIKE	A low dike with gates in Newland Canal and Shepard Ditch, extending about 3.1 miles through the swamp to a local canal about 2,100 feet southwest of the Pasquotank River. The dike was completed in 1959 (United States Army Corp of Engineers, 1967).	Dike
Pasquotank River	NP	PUMP STATION	Flood gates and pumps at two locations along the Pasquotank River waterfront to provide interior drainage from the downtown area during times of moderately high river stages (FEMA, 1982)	Flood Gates and Pumps

N/A - Not Applicable

Table 7, "Levees" is not applicable in Pasquotank County.

4.5 Scope of Study

For this map maintenance revision, a scoping meeting was held in Pasquotank County to present the results of initial research to the county and communities within the county and to discuss their floodplain mapping needs. The county and communities were asked to provide input on proposed study priorities and analysis methods. These meetings resulted in the identification of flooding sources having a floodplain mapping need. Map Maintenance Plans were developed based on the results of the scoping meetings and were both mailed to each jurisdiction within Pasquotank County and posted to the State's website at www.ncfloodmaps.com.

Draft basin plans were developed based on the results of the initial scoping meetings. Final scoping meetings were held by the State and FEMA to provide counties and communities an overview of the draft basin plans, including the proposed scope and schedule for the project, and to provide an opportunity for additional county and community input. After the final scoping meeting was held, the Final Basin Plans were produced.

This FIS covers the geographic area of Pasquotank County, North Carolina, and all jurisdictions therein. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. Limits of detailed study are indicated on the Flood Profiles and/or Water-surface elevation rasters and/or the FIRM.

Table 8P, "Scope of Revisions: Revised or New Detailed Study -Preliminary", lists flooding sources that were newly studied by detailed methods or were previously studied by detailed methods and had a change in backwater elevation due to flooding effects from a newly studied flooding source.

Table 8P - Scope of Revisions: Revised or New Detailed Study - Preliminary

Source	Riverine Sources		Affected Communties
	From	To	
Charles Creek	At the upstream face of South Herrington St Bridge	Approximately .17 mile upstream from Peartree Rd.	City Of Elizabeth City
Knobbs Creek[1]	Approximately 170 feet downstream of Creek Road	Approximately 3.3 miles upstream of Creek Road	City Of Elizabeth City Pasquotank County
Knobbs Creek	At Confluence with Pasquotank River	Approximately 150 feet downstream of Creek Rd.	City Of Elizabeth City Pasquotank County
Knobbs Creek Tributary	Approximately 280 feet upstream from confluence with Knobbs Creek	Approximately 980 feet upstream of Providence Rd.	City Of Elizabeth City
Little River	Approximately 2.17 miles downstream from Old US-17	Approximately 1.5 miles upstream of US-17	Pasquotank County
Pasquotank River[1]	Approximately 5.9 miles upstream of the confluence of Sawyers Creek	Approximately 9.8 miles upstream of the confluence of Sawyers Creek	Pasquotank County

[1]**Revised to reflect backwater effects from new detailed study**

Table 9P, "Scope of Revisions: Redelineated - Preliminary" is not applicable in Pasquotank County.

Table 10P, “Scope of Revisions: Limited Detailed - Preliminary”, lists flooding sources that were newly studied by limited detailed methods or were previously studied by limited detailed methods and had a change in backwater elevation due to flooding effects from a newly studied flooding source.

Table 10P - Scope of Revisions: Limited Detailed - Preliminary

Source	Riverine Sources		Affected Communties
	From	To	
Halls Creek[1]	Approximately 4900 feet upstream of Halls Creek Road	Approximately 2.2 miles upstream of Halls Creek Road	Pasquotank County
Halls Creek Tributary 1[1]	The confluence with Halls Creek	Approximately 1.1 mile upstream of the confluence with Halls Creek	Pasquotank County
Little River	Approximately 1.5 miles upstream of US-17	Approximately 575 feet downstream of Sandy Rd.	Pasquotank County
New Begun Creek	Florida Road	Approximately 250 feet downstream of Pitts Chapel Road	Pasquotank County
Pasquotank River[1]	Approximately 9.8 miles upstream of the confluence of Sawyers Creek	Approximately 8.1 miles upstream of Morgans Corner Road	Pasquotank County
Symond Creek[1]	Just upstream of Nixonton Road	Approximately 3000 feet upstream of Nixonton Road	Pasquotank County
Symond Creek Tributary 2[1]	The confluence with Symond Creek	Approximately 0.30 mile upstream of the confluence with Symond Creek	Pasquotank County

[1] **Revised to reflect backwater effects from new detailed study**

Table 8, “Flooding Sources Studied by Detailed Methods”, lists all flooding sources within the county that were studied by detailed methods for this FIS and previous FISs.

Table 8 - Flooding Sources Studied by Detailed Methods: Revised or Newly Studied

Source	Riverine Sources		Affected Communties
	From	To	
Charles Creek	At the upstream face of South Herrington St Bridge	Approximately .17 mile upstream from Peartree Rd.	City Of Elizabeth City
Knobbs Creek	Approximately 170 feet downstream of Creek Road	Approximately 0.6 mile upstream of Berea Church Road	City Of Elizabeth City Pasquotank County
Knobbs Creek	At Confluence with Pasquotank River	Approximately 150 feet downstream of Creek Rd.	City Of Elizabeth City Pasquotank County
Knobbs Creek Tributary	Approximately 280 feet upstream from confluence with Knobbs Creek	Approximately 980 feet upstream of Providence Rd.	City Of Elizabeth City
Little River	Approximately 2.17 miles downstream from Old US-17	Approximately 1.5 miles upstream of US-17	Pasquotank County
Pasquotank River	Approximately 5.9 miles upstream of the confluence of Sawyers Creek	Approximately 9.8 miles upstream of the confluence of Sawyers Creek	Pasquotank County

Table 9, “Flooding Sources Studied by Detailed Methods: Redelineated” is not applicable in Pasquotank County.

Table 10, “Flooding Sources Studied by Detailed Methods: Limited Detailed”, lists all flooding sources within the county that were studied by limited detailed methods for either this FIS or previous FISs.

Table 10 - Flooding Sources Studied by Detailed Methods: Limited Detailed

Source	Riverine Sources		Affected Communties
	From	To	
East Branch Knobbs Creek Tributary	The confluence with Knobbs Creek Tributary	Approximately 540 feet upstream of Roanoke Avenue	City Of Elizabeth City
Halls Creek	Approximately 4900 feet upstream of Halls Creek Road	Approximately 0.3 mile upstream of Simpson Ditch Road	Pasquotank County
Halls Creek Tributary 1	The confluence with Halls Creek	Approximately 1.0 mile upstream of Body Road	Pasquotank County
Knobbs Creek Tributary	Approximately 0.2 mile upstream of Providence Road	Approximately 0.8 mile upstream of US Highway 17	City Of Elizabeth City Pasquotank County
Little River	Approximately 1.5 miles upstream of US-17	Approximately 575 feet downstream of Sandy Rd.	Pasquotank County
New Begun Creek	Florida Road	Approximately 250 feet downstream of Pitts Chapel Road	Pasquotank County
Newland Drainage Canal	The confluence with Pasquotank River	Approximately 490 feet downstream of Newland Road	Pasquotank County

Table 10 - Flooding Sources Studied by Detailed Methods: Limited Detailed

Source	Riverine Sources		Affected Communties
	From	To	
Newland Drainage Canal Tributary 1	The confluence with Newland Drainage Canal	Approximately 0.4 mile upstream of Brothers Lane	Pasquotank County
Newland Drainage Canal Tributary 1A	The confluence with Newland Drainage Canal Tributary 1	Approximately 490 feet downstream of Blindman Road	Pasquotank County
Pasquotank River	Approximately 9.8 miles upstream of the confluence of Sawyers Creek	Approximately 8.1 miles upstream of Morgans Corner Road	Pasquotank County
Pasquotank River Tributary 3	The confluence with Pasquotank River	Approximately 0.6 mile upstream of Northside Road	Pasquotank County
Symond Creek	Just upstream of Nixonton Road	Approximately 0.4 mile upstream of Nixontown Road	Pasquotank County
Symond Creek Tributary 2	The confluence with Symond Creek	Approximately 0.8 mile upstream of confluence with Symond Creek	Pasquotank County

Table 11, “Stream Name Changes” is not applicable in Pasquotank County.

Table 12, “Letters of Map Revision” is not applicable in Pasquotank County.

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.

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. For details on the county’s hydrologic analyses, the hydrologic report is available by request.

A summary of the drainage area-peak discharge relationships for the flooding sources studied by detailed methods is shown in Table 13, “Summary of Discharges”.

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Charles Creek					
Apprximately .45 mile upstream of the confluence of the Pasquotank River and Charles Creek	8.27	641	1100	1330	1880
Approximatley 1.3 miles upstream of the confluence of the Pasquotank River and Charles Creek	6.03	343	647	814	1310
East Branch Knobbs Creek Tributary					
Confluence with Knobbs Creek Tributary	2.55	*	*	795	*

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 0.3 mile upstream of West Ehringhaus Street	1.84	*	*	662	*
Halls Creek					
Approximately 0.4 mile upstream of Halls Creek Road	12.16	*	*	1924	*
Just upstream of the confluence of Halls Creek Tributary 1	5.01	*	*	1165	*
Approximately 0.5 mile upstream of the confluence of Halls Creek Tributary 1	4.77	*	*	1133	*
Approximately 0.6 mile upstream of the confluence of Halls Creek Tributary 1	3.07	*	*	883	*
Approximately 770 feet downstream of Simpson Ditch Road	2.62	*	*	807	*
Halls Creek Tributary 1					
Confluence with Halls Creek	6.25	*	*	1321	*
Approximately 1,840 feet downstream of Body Road	3.42	*	*	939	*
Approximately 800 feet downstream of Body Road	3.09	*	*	886	*
Approximately 1,000 feet upstream of Body Road	2.34	*	*	758	*
Approximately 1,900 feet upstream of Body Road	1.94	*	*	681	*
Approximately 0.6 mile upstream of Body Road	1.88	*	*	669	*
Knobbs Creek					
Approximately 0.5 mile upstream of the confluence with Knobbs Creek and Pasquotank River	28.81	1490	2570	3140	4740
At confluence with Knob Creek Tributary.	14.99	994	1760	2170	3330
Approximately 0.4 mile upstream of Creek Road	14.81	*	*	2150	*
Approximately 0.8 mile upstream of Creek Road	13.81	*	*	2070	*
Approximately 1.0 mile upstream of Creek Road	12.58	*	*	1960	*
Approximately 1.8 mile upstream of Creek Road	5.84	*	*	1270	*
Approximately 0.9 mile downstream of Berea Church Road	5.45	*	*	1220	*
Approximately 0.7 mile downstream of Berea Church Road	4.49	*	*	1100	*
Approximately 970 feet upstream of Berea Church Road	3.49	*	*	950	*
Approximately 0.4 mile upstream of Berea Church Road	1.38	*	*	562	*
Knobbs Creek Tributary					
Approximately 300 feet upstream of the confluence with Knobbs Creek and Knobbs Creek Tributary	10.87	816	1460	1810	2800
Approximately 1.65 miles upstream of the confluence with Knobbs Creek and Knobbs Creek Tributary	8.34	693	1250	1550	2420
Approximately 2.25 miles upstream of the confluence with Knobbs Creek and Knobbs Creek Tributary	5.34	527	968	1210	1910
Approximately 0.67 mile upstream of the confluence of East Branch Knobbs Creek Tributary	5.08	*	*	1175	*
Approximately 0.73 mile upstream of the confluence of East Branch Knobbs Creek Tributary	3.50	*	*	951	*
Approximately 1,470 feet upstream of US Highway 17	3.42	*	*	939	*
Approximately 1,650 feet upstream of US Highway 17	1.06	*	*	485	*
Approximately 0.5 mile upstream of US Highway 17	1.01	*	*	470	*
Little River					
Approximately 1.65 miles upstream of the confluence of Little River and Halls Creek	54.46	2200	3710	4500	6670
Approximately 3.85 miles upstream of the confluence of Little River and Halls Creek	49.60	2070	3520	4260	6340
Approximately 1.40 mile upstream of US Highway 17	46.39	*	*	4106	*
Approximately 1.60 mile upstream of US Highway 17	36.95	*	*	3610	*
Approximately 1.70 mile upstream of US Highway 17	36.28	*	*	3573	*

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 1.80 mile downstream of Foreman Bundy Road	35.71	*	*	3541	*
Approximately 1.10 mile downstream of Foreman Bundy Road	30.89	*	*	3262	*
Approximately 0.80 mile downstream of Foreman Bundy Road	30.70	*	*	3251	*
Approximately 900 feet downstream of Foreman Bundy Road	29.70	*	*	3190	*
Approximately 1.0 mile downstream of Five Bridge Road	27.39	*	*	3047	*
Approximately 0.50 mile downstream of Five Bridge Road	22.93	*	*	2756	*
Approximately 800 feet downstream of Five Bridge Road	22.01	*	*	2693	*
Approximately 0.60 mile upstream of Five Bridge Road	13.89	*	*	2075	*
Approximately 0.70 mile upstream of Five Bridge Road	12.50	*	*	1955	*
New Begun Creek					
Approximately 0.7 mile downstream of Florida Road	11.24	*	*	1840	*
Approximately 450 feet upstream of Florida Road	7.46	*	*	1460	*
Approximately 0.4 mile upstream of Florida Road	5.50	*	*	1228	*
Approximately 0.6 mile upstream of Florida Road	3.82	*	*	999	*
Approximately 0.7 mile upstream of Florida Road	3.59	*	*	965	*
Approximately 1.2 miles upstream of Florida Road	2.64	*	*	811	*
Approximately 0.8 mile downstream of Pitts Chapel Road	2.06	*	*	705	*
Approximately 970 feet downstream of Pitts Chapel Road	1.15	*	*	506	*
Newland Drainage Canal					
Confluence with Pasquotank River	64.69	*	*	4956	*
Just upstream of the confluence of Newland Drainage Canal Tributary 1	56.47	*	*	4589	*
Approximately 0.53 mile upstream of the confluence of Newland Drainage Canal Tributary 1	56.07	*	*	4571	*
Approximately 0.56 mile upstream of the confluence of Newland Drainage Canal Tributary 1	53.55	*	*	4454	*
Approximately 0.8 mile downstream of Schoolhouse Road	53.41	*	*	4447	*
Approximately 500 feet downstream of Schoolhouse Road	52.46	*	*	4402	*
Approximately 450 feet downstream of Sawyers Road	45.72	*	*	4072	*
Newland Drainage Canal Tributary 1					
Confluence with Newland Drainage Canal	7.99	*	*	1517	*
Approximately 1,500 feet upstream of the confluence with Newland Drainage Canal	7.94	*	*	1512	*
Approximately 1,650 feet upstream of the confluence of Newland Drainage Canal	6.89	*	*	1395	*
Just upstream of the confluence of Newland Drainage Canal Tributary 1A	4.29	*	*	1068	*
Approximately 800 feet upstream of Millpond Road	3.65	*	*	974	*
Newland Drainage Canal Tributary 1A					
Confluence with Newland Drainage Canal Tributary 1	2.03	*	*	699	*
Pasquotank River					
Approximately 5.8 miles upstream of the confluence of Sawyers Creek	251.90	*	*	10699	*
Approximately 7.4 miles upstream of the confluence of Sawyers Creek	248.87	*	*	10626	*
Approximately 7.5 miles upstream of the confluence of Sawyers Creek	247.78	*	*	10600	*
Approximately 7.7 miles upstream of the confluence of Sawyers Creek	247.26	*	*	10587	*
Approximately 7.9 miles upstream of the confluence of Sawyers Creek	246.37	*	*	10565	*
Approximately 9.1 miles upstream of the confluence of Sawyers Creek	245.41	*	*	10542	*
Approximately 1.2 mile downstream of the confluence of Turner Cut	244.41	*	*	10518	*

Table 13 - Summary of Discharges

Flooding Source		Discharges (cfs)			
Location	Drainage Area (square miles)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Approximately 1.3 mile downstream of the confluence of Turner Cut	234.01	*	*	10262	*
Approximately 0.9 mile downstream of the confluence of Turner Cut	231.59	*	*	10202	*
NP	123.00	*	*	8025	*
Just upstream of the confluence of Turners Cut	118.47	*	*	6981	*
Approximately 0.26 mile upstream of the confluence of Turners Cut	118.41	*	*	6976	*
Approximately 0.29 mile upstream of the confluence of Turners Cut	115.95	*	*	6896	*
Just upstream of the confluence of Pasquotank River Tributary 3	105.45	*	*	6535	*
Approximately 1,000 feet upstream of the confluence of Pasquotank River Tributary 3	104.42	*	*	6499	*
Approximately 2.0 miles upstream of the confluence of Pasquotank River Tributary 3	103.61	*	*	6471	*
Approximately 1.3 miles downstream of US Highway 17	101.95	*	*	6412	*
Approximately 0.61 mile downstream of US Highway 17	101.84	*	*	6408	*
Approximately 0.57 mile downstream of US Highway 17	100.32	*	*	6354	*
Approximately 1.0 mile upstream of US Highway 17	99.80	*	*	6335	*
Approximately 1.1 miles upstream of US Highway 17	89.61	*	*	5960	*
Just upstream of the confluence of Newland Drainage Canal	24.19	*	*	2840	*
Approximately 0.7 mile upstream of the confluence of Newland Drainage Canal	23.74	*	*	2811	*
Approximately 1.0 mile upstream of the confluence of Newland Drainage Canal	22.82	*	*	2749	*
Approximately 2.3 miles upstream of the confluence of Newland Drainage Canal	22.36	*	*	2717	*
Approximately 2.8 miles upstream of the confluence of Newland Drainage Canal	21.41	*	*	2651	*
Approximately 3.3 miles upstream of the confluence of Newland Drainage Canal	20.52	*	*	2588	*
Approximately 3.8 miles upstream of the confluence of Newland Drainage Canal	18.57	*	*	2446	*
Approximately 4.1 miles upstream of the confluence of Newland Drainage Canal	18.45	*	*	2437	*
Approximately 4.2 miles upstream of the confluence of Newland Drainage Canal	16.98	*	*	2325	*
Approximately 5.8 miles upstream of the confluence of Newland Drainage Canal	16.22	*	*	2266	*
Pasquotank River Tributary 3					
Approximately 300 feet downstream of Northside Road	9.39	*	*	1663	*
Symond Creek					
Approximately 900 feet downstream of Nixonton Road	2.57	*	*	798	*
Approximately 460 feet downstream of Meadstown Road	1.46	*	*	580	*
Approximately 1,300 feet upstream of Meadstown Road	1.35	*	*	554	*
Symond Creek Tributary 2					
Confluence with Symond Creek	0.42	*	*	287	*

Table 14, “Summary of Stillwater Elevations” is not applicable in Pasquotank County.

Table 15, “Gage Information” is not applicable in Pasquotank County.

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the flood elevations for the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and/or Water-surface elevation rasters. For stream segments for which BFEs were computed, selected cross-section locations are also shown on the FIRM. Flood Profiles and/or Water-surface elevation rasters were developed showing computed water-surface elevations for floods of the selected recurrence intervals.

Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles and/or Water-surface elevation rasters or in the Floodway Data tables in the FIS Report.

For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in the FIS 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 Flood Profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For details on the county's hydraulic analyses, the hydraulic report is available by request.

For the streams studied by detailed methods, water surface elevations of floods of the selected recurrence intervals were computed through use of the Army Corps of Engineers' HEC RAS step backwater computer program . The hydraulic analyses were based on unobstructed flow. The flood elevations shown on the Profiles and/or Water-surface elevation rasters are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. The computer models were calibrated using historic high water data collected during field investigations.

The cross section geometries were obtained from a combination of digital elevation data obtained by Light Detection and Ranging (LIDAR) and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. Natural floodplain cross sections were surveyed approximately every 4000 feet along the detail study reaches to obtain the channel geometry between bridges and culverts. Overbank cross section data for the backwater analyses were obtained from recently flown LIDAR data.

Channel roughness factors (Manning's "n") used in the hydraulic computations were made in the field by an engineer where stream access was possible, with orthophotos used to supplement areas that could not be accessed. The channel and overbank "n" values for all of the streams studied by detailed methods are shown in Table 16, "Roughness Coefficients".

Table 16 - Roughness Coefficients

Stream	Channel "n"	Overbank "n"
Charles Creek	0.045 to 0.060	0.070 to 0.200
East Branch Knobbs Creek Tributary	0.045	0.060 to 0.200
Halls Creek	0.045	0.101 to 0.200
Halls Creek Tributary 1	0.045	0.101 to 0.200
Knobbs Creek	0.040 to 0.060	0.060 to 0.200
Knobbs Creek Tributary	0.044 to 0.060	0.060 to 0.200
Little River	0.040 to 0.070	0.014 to 0.200
New Begun Creek	0.045	0.101 to 0.200
Newland Drainage Canal	0.045	0.120 to 0.200
Newland Drainage Canal Tributary 1	0.045	0.110 to 0.200
Newland Drainage Canal Tributary 1A	0.045	0.130 to 0.200
Pasquotank River	0.040 to 0.060	0.060 to 0.200
Pasquotank River Tributary 3	0.045	0.100 to 0.200
Symond Creek	0.045	0.060 to 0.200
Symond Creek Tributary 2	0.045	0.060 to 0.200

For flooding sources studied by limited detailed methods in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this report and the FIRM panels. This method entails developing a HEC-RAS hydraulic model, resulting in the calculation of BFEs and the delineation of the 1% annual chance floodplain (designated as Zone AE). Cross sections for the flooding sources studied by limited detailed methods were obtained using digital elevation data obtained with LIDAR technology developed as part of the North Carolina Statewide Floodplain Mapping Program. The hydraulic model is prepared using this digital elevation data, without surveying bathymetric or structural data. Where bridge or culvert data are readily available, such as from the North Carolina Department of Transportation, these data have been reflected in the hydraulic model. If these structural data are not readily available, field measurements of these structures were made to approximate their geometry in the hydraulic models. In addition, this method does not include field surveys that determine specifics on channel and floodplain characteristics. A limited detailed study is a "buildable" product that can be upgraded to a fully detailed study at a later date by verifying stream channel characteristics, bridge and culvert opening geometry, and by analyzing multiple recurrence intervals.

The results of the HEC-RAS computations are tabulated for all cross sections (Table 17, "Limited Detailed Flood Hazard Data"). Flood Profiles have not been developed for streams studied by limited detailed methods. Water-surface elevation rasters were developed for steams studied by limited detailed methods. In addition, floodways for streams studied by limited detailed methods are not delineated on the FIRM. However, the 1% annual chance water-surface elevations, flood discharges, and non-encroachment widths from the limited detailed studies for every modeled cross section are given in Table 17. The non-encroachment widths given at modeled cross sections can be used by communities to enforce floodplain management ordinances that meet the requirement defined in 44 CFR 60.3(c)(10).

Between cross sections for streams studied by limited detailed methods, 1% annual chance water-surface elevations can be calculated by mathematical interpolation using the distance along the stream centerline. Non-encroachment widths and, therefore, the location of a non-encroachment area boundary between cross sections should be determined based on either 1) mathematical interpolation, or 2) the non-encroachment width at the upstream or downstream cross section, whichever is larger. If the width determined by this second method is wider than the Special Flood Hazard Area (SFHA) or the 1% annual chance floodplain delineated on the FIRM for this location along the stream, the non-encroachment area shall be considered to be coincident with the SFHA. A full detailed study incorporating field survey data in the HEC-RAS hydraulic model may be submitted for a Letter of Map Revision (LOMR) request to map a regulatory floodway along a section of a stream in lieu of applying the non-encroachment widths listed in Table 17.

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
East Branch Knobbs Creek Tributary				
012	1,173	795	6.9[1]	153 / 50
019	1,946	795	8.4	60 / 180
024	2,394	795	8.4	150 / 180
030	2,976	795	8.5	80 / 200
035	3,481	662	8.5	140 / 185
041	4,076	662	8.6	100 / 100
046	4,639	662	8.6	100 / 100
052	5,173	662	8.6	100 / 100
055	5,501	662	8.6	100 / 100
061	6,083	662	8.6	100 / 100
065	6,488	662	8.6	100 / 100
070	7,013	662	8.7	100 / 100
075	7,489	662	8.7	100 / 100
085	8,470	662	8.7	150 / 150
Halls Creek				
116	11,605	1,165	4.0[1]	52 / 107
120	11,993	1,165	4.2	61 / 113
125	12,513	1,165	4.6	152 / 38
130	13,020	1,133	4.8	116 / 134
135	13,512	883	5.0	68 / 164
140	14,010	883	5.1	138 / 61
145	14,509	883	5.4	72 / 45
150	15,009	883	5.7	89 / 16
155	15,512	883	6.0	48 / 159
159	15,899	883	6.1	81 / 141
166	16,574	883	6.5	38 / 63
172	17,237	883	7.1	42 / 133
176	17,585	883	7.3	26 / 144
180	17,990	807	7.5	171 / 33
183	18,338	807	7.7	155 / 48
190	18,988	807	8.6	55 / 145

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
195	19,545	807	8.8	78 / 111
202	20,153	807	9.2	175 / 20
Halls Creek Tributary 1				
005	506	1,321	4.4	111 / 210
010	989	1,321	4.4	152 / 135
015	1,507	1,321	4.6	138 / 86
020	1,997	1,321	4.8	163 / 58
025	2,497	1,321	5.0	82 / 95
030	3,002	1,321	5.1	182 / 109
035	3,500	1,321	5.2	143 / 84
040	3,985	939	5.4	124 / 117
045	4,505	939	5.5	152 / 47
050	5,003	886	5.6	180 / 75
060	5,988	886	7.8	80 / 80
065	6,533	758	7.8	80 / 100
071	7,068	758	7.9	35 / 100
075	7,542	681	8.0	50 / 70
079	7,920	681	8.0	70 / 90
086	8,558	681	8.0	30 / 100
090	8,995	669	8.1	45 / 50
095	9,495	669	8.3	115 / 12
101	10,142	669	8.5	50 / 65
107	10,741	669	8.9	80 / 30
Knobbs Creek Tributary				
135	13,537	1,207	7.0[1]	313 / 280
140	13,951	1,207	7.1	36 / 269
144	14,432	1,207	7.2	47 / 358
149	14,901	1,207	7.3	107 / 335
154	15,431	1,175	7.3	344 / 253
164	16,356	951	8.8	200 / 200
173	17,250	939	8.8	220 / 300
176	17,620	485	8.8	220 / 120
180	18,024	485	8.8	200 / 150
186	18,561	470	8.9	190 / 140
192	19,153	470	8.9	150 / 130
196	19,648	470	8.9	100 / 150
202	20,216	470	8.9	75 / 125
Little River				
791	79,093	3,610	6.5	1,000 / 1,110
797	79,745	3,573	6.5	599 / 765
805	80,517	3,573	6.6	635 / 2,472
812	81,179	3,573	6.6	793 / 1,185
820	81,956	3,573	6.6	980 / 816
827	82,717	3,573	6.7	877 / 1,106
833	83,339	3,541	6.7	684 / 1,264
838	83,850	3,541	6.7	1,293 / 835

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
843	84,303	3,541	6.7	471 / 922
849	84,858	3,541	6.8	443 / 879
854	85,358	3,541	6.8	514 / 690
860	85,973	3,541	6.9	921 / 530
864	86,399	3,262	6.9	1,051 / 632
874	87,354	3,262	7.0	850 / 1,376
879	87,897	3,251	7.0	703 / 1,430
883	88,328	3,251	7.0	616 / 1,024
889	88,885	3,251	7.1	309 / 1,082
894	89,376	3,251	7.1	539 / 925
899	89,851	3,251	7.2	979 / 421
905	90,465	3,251	7.2	834 / 379
909	90,884	3,251	7.2	894 / 533
914	91,362	3,190	7.3	587 / 980
918	91,787	3,190	7.3	500 / 1,082
926	92,574	3,190	7.5	934 / 638
937	93,747	3,190	7.6	329 / 1,179
943	94,284	3,190	7.6	680 / 634
950	94,962	3,047	7.7	780 / 695
957	95,704	3,047	7.7	696 / 1,033
964	96,447	3,047	7.8	640 / 949
970	97,020	3,047	7.8	640 / 690
974	97,442	2,756	7.8	1,146 / 530
981	98,079	2,756	7.9	747 / 574
987	98,656	2,756	8.0	718 / 424
991	99,057	2,756	8.1	701 / 700
1006	100,572	2,693	8.4	582 / 920
1014	101,353	2,693	8.6	455 / 958
1020	101,972	2,693	8.7	603 / 839
1026	102,575	2,693	8.7	641 / 960
1037	103,747	2,075	8.8	531 / 900
1047	104,687	1,955	8.8	973 / 130
1054	105,357	1,955	8.9	140 / 1,013
1064	106,402	1,955	10.0	1,015 / 291
New Begun Creek				
160	16,012	1,840	4.5	700 / 436
165	16,515	1,460	4.6	645 / 792
170	17,014	1,460	4.6	841 / 704
175	17,500	1,460	4.7	928 / 1,000
180	18,006	1,460	4.7	616 / 837
185	18,514	1,228	4.7	560 / 814
190	19,008	1,228	4.8	597 / 560
195	19,517	999	4.8	906 / 100
200	20,014	965	4.8	461 / 700
205	20,508	965	4.8	417 / 777

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
210	20,999	965	4.8	432 / 600
215	21,510	965	4.9	800 / 450
220	22,012	965	4.9	900 / 450
225	22,501	811	4.9	808 / 450
230	23,006	811	4.9	348 / 634
235	23,513	811	4.9	585 / 530
240	23,989	811	4.9	702 / 227
245	24,510	811	4.9	700 / 600
250	25,005	811	4.9	380 / 700
255	25,507	705	5.0	580 / 673
265	26,497	705	5.0	200 / 675
270	26,995	705	5.0	114 / 174
275	27,515	705	5.3	194 / 173
280	28,050	705	5.6	457 / 360
286	28,556	506	6.0	499 / 200
291	29,107	506	6.3	839 / 80
Newland Drainage Canal				
015	1,500	4,956	7.0[1]	118 / 377
020	2,000	4,956	7.0[1]	392 / 107
025	2,500	4,956	7.0[1]	277 / 196
030	3,000	4,956	7.2	277 / 195
035	3,500	4,956	7.3	52 / 370
040	4,000	4,589	7.5	196 / 232
045	4,500	4,589	7.6	166 / 254
050	5,000	4,589	7.8	51 / 354
055	5,500	4,589	8.0	145 / 383
060	6,000	4,589	8.2	191 / 192
065	6,500	4,571	8.3	314 / 245
070	7,000	4,454	8.5	171 / 112
075	7,500	4,454	8.8	51 / 174
080	8,000	4,454	9.0	97 / 146
085	8,500	4,447	9.4	51 / 250
090	9,000	4,447	9.6	103 / 291
095	9,500	4,447	9.8	80 / 214
100	10,000	4,447	10.0	78 / 267
105	10,500	4,447	10.3	231 / 284
115	11,500	4,447	10.6	311 / 134
120	12,000	4,402	10.8	354 / 142
125	12,500	4,402	11.0	160 / 168
130	13,000	4,402	11.1	100 / 101
135	13,500	4,402	11.4	172 / 59
140	14,000	4,402	11.6	53 / 64
145	14,500	4,072	11.9	100 / 98
155	15,500	4,072	12.4	107 / 48
160	16,000	4,072	12.7	87 / 48

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
165	16,500	4,072	12.9	51 / 48
170	17,000	4,072	13.3	132 / 48
175	17,500	4,072	13.6	55 / 52
180	18,000	4,072	13.9	48 / 195
185	18,500	4,072	14.2	48 / 194
Newland Drainage Canal Tributary 1				
010	978	1,517	7.3[1]	263 / 63
015	1,497	1,512	7.3[1]	189 / 63
020	1,987	1,395	7.3[1]	55 / 246
025	2,519	1,395	7.3[1]	146 / 96
030	3,006	1,395	7.3[1]	111 / 108
035	3,462	1,395	7.3[1]	126 / 161
040	3,967	1,395	7.3[1]	243 / 183
045	4,481	1,395	7.3	131 / 216
049	4,887	1,395	7.4	389 / 83
055	5,478	1,068	7.6	72 / 302
060	5,992	1,068	7.7	101 / 231
065	6,499	1,068	7.9	340 / 15
070	7,036	1,068	9.1	171 / 97
075	7,489	974	9.2	204 / 47
080	7,953	974	9.3	89 / 189
084	8,441	974	9.4	67 / 206
089	8,890	974	9.6	78 / 159
094	9,389	974	9.7	140 / 219
099	9,860	974	10.5	57 / 284
104	10,353	974	10.6	68 / 249
109	10,927	974	10.7	149 / 97
115	11,493	974	10.9	130 / 136
Newland Drainage Canal Tributary 1A				
007	650	699	7.4[1]	84 / 89
012	1,187	699	7.5	13 / 207
016	1,626	699	7.8	103 / 106
020	2,017	699	8.0	78 / 122
024	2,444	699	8.2	33 / 114
Pasquotank River				
1460	145,966	10,518	5.4	995 / 4,222
1465	146,511	10,262	5.4	958 / 4,937
1471	147,063	10,262	5.4	1,308 / 5,044
1475	147,534	10,262	5.5	1,193 / 5,269
1480	147,951	10,262	5.5	872 / 5,534
1484	148,394	10,202	5.5	978 / 5,673
1489	148,909	10,202	5.5	2,359 / 5,569
1494	149,418	10,202	5.6	3,198 / 5,044
1499	149,920	10,202	5.6	3,820 / 4,503
1504	150,398	10,202	5.6	4,238 / 3,846
1510	151,028	10,202	5.6	4,216 / 3,473

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
1516	151,582	10,202	5.6	4,017 / 3,526
1520	151,984	10,202	5.6	4,173 / 3,398
1524	152,359	10,202	5.6	4,502 / 3,236
1529	152,926	6,981	5.7	5,263 / 2,863
1532	153,212	6,981	5.7	5,888 / 2,441
1541	154,119	6,979	5.7	6,696 / 1,404
1545	154,451	6,896	5.7	6,736 / 1,186
1550	154,994	6,896	5.7	6,576 / 1,583
1555	155,462	6,896	5.7	6,474 / 1,852
1560	155,995	6,896	5.7	6,625 / 1,400
1565	156,480	6,896	5.7	6,510 / 1,208
1571	157,109	6,896	5.7	3,566 / 1,992
1577	157,655	6,896	5.7	3,187 / 2,211
1582	158,204	6,896	5.7	2,717 / 2,349
1587	158,651	6,896	5.7	2,550 / 2,359
1591	159,079	6,896	5.8	2,524 / 2,271
1596	159,567	6,896	5.8	2,501 / 2,114
1600	159,990	6,535	5.8	3,032 / 766
1605	160,530	6,535	5.8	2,421 / 795
1611	161,066	6,499	5.8	3,113 / 1,529
1615	161,470	6,499	5.8	3,168 / 1,380
1619	161,895	6,499	5.8	4,528 / 1,270
1625	162,527	6,499	5.8	5,164 / 1,105
1633	163,260	6,499	5.9	5,588 / 412
1637	163,729	6,499	5.9	5,938 / 188
1641	164,140	6,499	5.9	5,618 / 73
1648	164,832	6,499	5.9	5,817 / 73
1653	165,327	6,499	5.9	6,077 / 656
1660	165,994	6,499	5.9	5,406 / 1,196
1665	166,527	6,499	5.9	1,293 / 1,534
1670	167,000	6,499	6.0	1,152 / 1,371
1679	167,903	6,499	6.0	633 / 1,208
1687	168,652	6,499	6.0	423 / 1,381
1696	169,592	6,499	6.1	2,010 / 1,529
1701	170,061	6,499	6.1	1,548 / 1,144
1706	170,558	6,471	6.1	4,128 / 601
1710	170,961	6,471	6.1	4,332 / 484
1715	171,492	6,471	6.2	4,631 / 583
1720	172,036	6,471	6.2	4,436 / 1,066
1726	172,589	6,471	6.2	4,055 / 1,269
1733	173,341	6,471	6.2	3,946 / 2,206
1739	173,892	6,471	6.2	3,705 / 2,937
1744	174,388	6,471	6.2	3,343 / 3,515
1748	174,770	6,471	6.2	2,638 / 3,978
1756	175,563	6,471	6.2	1,664 / 4,595

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
1761	176,146	6,471	6.3	2,384 / 4,464
1768	176,841	6,471	6.3	2,600 / 4,137
1772	177,215	6,471	6.3	2,721 / 3,965
1776	177,625	6,471	6.3	4,276 / 3,385
1783	178,276	6,471	6.3	4,327 / 3,194
1786	178,623	6,471	6.3	4,438 / 3,052
1790	178,983	6,412	6.3	4,642 / 3,501
1793	179,294	6,412	6.3	4,273 / 3,454
1797	179,675	6,412	6.4	4,090 / 3,175
1800	179,951	6,412	6.4	3,970 / 3,300
1804	180,412	6,412	6.4	3,778 / 3,388
1810	180,974	6,412	6.4	3,886 / 2,804
1815	181,455	6,412	6.4	3,991 / 2,488
1820	182,001	6,412	6.4	3,583 / 2,458
1825	182,485	6,408	6.4	3,898 / 2,231
1830	183,000	6,354	6.4	4,332 / 2,290
1834	183,407	6,354	6.4	4,493 / 1,996
1845	184,494	6,354	6.8	7,100 / 65
1848	184,812	6,354	6.8	7,512 / 87
1851	185,109	6,354	6.8	7,916 / 87
1860	186,024	6,354	6.9	7,637 / 57
1865	186,470	6,354	6.9	7,379 / 100
1870	187,048	6,354	6.9	6,806 / 100
1874	187,380	6,354	6.9	6,563 / 100
1880	187,975	6,354	6.9	6,156 / 100
1885	188,489	6,354	6.9	5,755 / 100
1890	188,960	6,354	6.9	5,734 / 77
1894	189,413	6,354	6.9	6,076 / 770
1899	189,914	6,354	6.9	6,308 / 267
1904	190,436	6,354	7.0	6,792 / 319
1909	190,939	6,335	7.0	6,813 / 322
1915	191,477	5,960	7.0	6,998 / 100
1921	192,093	5,960	7.0	6,766 / 249
1925	192,515	5,960	7.0	6,960 / 567
1931	193,108	5,960	7.0	6,343 / 1,101
1936	193,638	2,840	7.0	6,391 / 535
1940	193,959	2,840	7.0	6,499 / 357
1944	194,401	2,840	7.0	6,673 / 166
1950	195,012	2,840	7.0	6,442 / 70
1953	195,325	2,840	7.0	6,127 / 60
1960	195,967	2,840	7.0	6,558 / 100
1964	196,434	2,840	7.0	6,735 / 100
1969	196,869	2,840	7.0	7,341 / 100
1975	197,465	2,811	7.0	7,321 / 100
1982	198,187	2,811	7.1	6,468 / 270

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
1986	198,622	2,749	7.1	6,135 / 356
1990	198,969	2,749	7.1	5,831 / 507
1995	199,509	2,749	7.1	5,883 / 514
2000	199,973	2,749	7.1	5,576 / 70
2005	200,509	2,749	7.1	5,875 / 50
2010	201,014	2,749	7.1	5,967 / 344
2013	201,338	2,749	7.1	5,230 / 100
2019	201,904	2,749	7.1	4,777 / 100
2024	202,357	2,749	7.1	4,881 / 100
2029	202,911	2,749	7.1	4,974 / 100
2033	203,252	2,749	7.1	4,333 / 100
2040	204,033	2,749	7.1	4,341 / 140
2045	204,525	2,749	7.2	4,002 / 80
2050	204,992	2,749	7.2	3,321 / 80
2055	205,481	2,717	7.2	3,179 / 100
2059	205,948	2,717	7.2	2,640 / 221
2065	206,512	2,717	7.2	3,395 / 383
2069	206,944	2,717	7.2	3,444 / 100
2076	207,580	2,717	7.2	3,786 / 321
2082	208,217	2,717	7.2	3,475 / 430
2088	208,798	2,651	7.2	3,331 / 100
2093	209,318	2,651	7.2	3,158 / 271
2098	209,842	2,651	7.2	2,721 / 412
2103	210,318	2,651	7.3	2,295 / 750
2107	210,685	2,651	7.3	2,008 / 908
2112	211,249	2,588	7.3	1,581 / 1,245
2116	211,629	2,588	7.3	643 / 1,309
2120	212,031	2,588	7.3	261 / 1,933
2123	212,339	2,588	7.3	204 / 2,166
2130	212,956	2,588	7.4	524 / 1,742
2134	213,448	2,446	7.4	571 / 1,914
2140	213,952	2,446	7.4	472 / 2,218
2143	214,345	2,446	7.4	723 / 2,277
2147	214,704	2,446	7.4	997 / 2,030
2153	215,294	2,437	7.5	972 / 950
2158	215,848	2,325	7.5	891 / 661
2163	216,271	2,325	7.6	788 / 1,058
2169	216,860	2,325	7.7	1,039 / 847
2174	217,398	2,325	7.8	661 / 1,183
2181	218,073	2,325	8.0	143 / 1,653
2185	218,457	2,325	8.0	124 / 2,139
2189	218,928	2,325	8.1	124 / 2,368
2194	219,418	2,325	8.2	124 / 2,757
2199	219,947	2,325	8.3	124 / 2,695
2204	220,367	2,325	8.5	124 / 1,570

Table 17 - Limited Detailed Flood Hazard Data

Cross Section	Stream Station	Flood Discharge (cfs)	1% Annual Chance Water-Surface Elevation (feet NAVD 88)	Non-Encroachment Width (feet) Left/Right from Stream Centerline
2210	220,997	2,325	9.0	124 / 1,570
2216	221,621	2,325	9.4	170 / 1,600
2221	222,124	2,325	9.6	350 / 1,804
2226	222,604	2,325	9.9	200 / 1,704
2231	223,074	2,325	10.0	101 / 2,059
2235	223,490	2,325	10.2	110 / 2,222
2239	223,948	2,266	10.3	180 / 2,282
2244	224,371	2,266	10.4	388 / 2,269
2248	224,791	2,266	10.5	746 / 100
2255	225,485	2,266	11.3	1,523 / 100
2260	225,999	2,266	11.5	1,530 / 100
2265	226,540	2,266	11.7	1,556 / 100
2269	226,923	2,266	11.9	1,191 / 100
2276	227,567	2,266	12.2	1,207 / 100
2280	227,961	2,266	12.4	903 / 292
2285	228,490	2,266	12.6	1,103 / 100
Pasquotank River Tributary 3				
030	3,009	1,663	8.0	182 / 91
035	3,478	1,663	8.1	75 / 150
040	3,991	1,663	8.2	31 / 168
045	4,517	1,663	8.3	47 / 61
050	5,001	1,663	8.7	122 / 16
055	5,506	1,663	9.2	127 / 26
060	6,010	1,663	10.2	85 / 36
Symond Creek				
102	10,204	580	4.3	191 / 65
106	10,643	580	4.4	318 / 63
109	10,940	580	4.4	230 / 11
115	11,537	554	4.5	72 / 21
120	11,954	554	4.8	102 / 47
124	12,401	554	5.0	115 / 43
131	13,090	554	5.2	145 / 30
137	13,668	554	5.4	157 / 24
141	14,079	554	5.6	170 / 50
146	14,594	554	5.8	46 / 90
151	15,095	554	6.2	64 / 60
Symond Creek Tributary 2				
030	2,997	287	4.7	30 / 10
035	3,513	287	5.2	20 / 20
040	3,962	287	5.9	25 / 10

[1]Elevation includes backwater effects

5.3 Coastal Analyses

For the areas of Pasquotank 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 the 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 each of the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Table 18P, “Summary of Coastal Analyses - Preliminary: Revised or Newly Studied”

Table 18P - Summary of Coastal Analyses - Preliminary: Revised or Newly Studied

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis Was Completed	Study Type
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	2D WAVE MODEL	12/16/2011	DETAILED STUDY
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	ADCIRC	12/6/2011	DETAILED STUDY
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	TAW METHOD	7/28/2014	DETAILED STUDY
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	WHAFIS 4.0	7/28/2014	DETAILED STUDY

Table 18, “Summary of Coastal Analyses”

Table 18 - Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis Was Completed
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	2D WAVE MODEL	12/16/2011
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	ADCIRC	12/6/2011
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	TAW METHOD	7/28/2014
Albemarle Sound	The Pasquotank/Camden County Boundary	The Pasquotank/Perquimans County Boundary	*	WHAFIS 4.0	7/28/2014

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 20, “Coastal Transect Parameters.”

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 in conjunction with numerical hydrodynamic models to determine the corresponding storm surge levels. An extreme value analysis was performed on the storm surge modeling results to determine a stillwater elevation for the 1% annual chance event.

Tidal gages can be used instead of historic records of storms when the available tidal gage record for the area represents both the astronomical tide component and the storm surge component. Table 16 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the stillwater elevations. For areas between gages, peak stillwater elevations for selected recurrence intervals were estimated by combining interpolation between gages and observed high water marks during major storms. A regionalized statistical approach was applied to the gage data so that stillwater elevations in areas between gages could be identified.

Table 19, “Tide Gage Analysis Specifics” is not applicable in Pasquotank County.

Combined Riverine and Tidal Effects
Riverine and surge rates for the lower reaches of the Inundation River were combined by developing curves for rate of occurrence vs. flood level for each flood source.

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. The oscillating component of wave setup, dynamic wave setup, was calculated for areas subject to wave runup hazards.

5.3.2 Waves

A coastal wave model (Coastal State University 2007) was used to calculate the nearshore wave fields required for the addition of wave setup effects. Three nested grids were used to obtain sufficient nearshore resolution to represent the radiation stress gradients required as ADCIRC inputs. Radiation stress fields output from the inner grids are used by ADCIRC to estimate the contribution of breaking waves (wave setup effects) to the total stillwater elevation.

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 18, “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 20, "Coastal Transect Parameters"

Table 20: Coastal Transect Parameters

Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	.2% Annual Chance
Albemarle Sound		**From The Albermarle Sound**			**To 5.2 Miles North of Camden Cswy US-158 on the Camden, Pasquotank County Border**		
1	0.0	0.1	*	*	*	*	4.7
			*	*	*	3.6 - 3.6	*
2	0.0	0.0	*	*	*	*	4.7
			*	*	*	3.6 - 3.6	*
3	0.3	0.5	*	*	*	*	4.7
			*	*	*	3.6 - 3.6	*
4	0.8	1.3	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.7 - 4.7
5	1.0	1.7	*	*	*	3.6	*
			*	*	*	3.6 - 3.6	4.6 - 4.6
7	1.3	1.8	*	*	*	*	4.6
			*	*	*	3.5 - 3.5	*
8	1.5	2.3	*	*	*	*	4.6
			*	*	*	3.5 - 3.5	*
9	1.8	2.5	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
10	1.9	2.7	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
11	1.9	2.4	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
12	2.0	2.8	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
13	2.4	3.9	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
14	5.7	5.7	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
15	4.8	5.3	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
16	4.8	5.1	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
17	4.0	4.7	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
18	0.7	3.6	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
19	4.2	4.3	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
20	4.6	4.2	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
21	5.2	4.5	*	*	*	*	4.4
			*	*	*	3.4 - 3.4	*
22	4.1	4.5	*	*	*	*	4.5
			*	*	*	3.5 - 3.5	*
23	2.8	3.2	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
24	2.9	3.3	*	*	*	*	4.6
			*	*	*	3.6 - 3.6	*
25	3.2	3.4	*	*	*	*	4.7
			*	*	*	3.7 - 3.7	4.7 - 4.8
26	3.5	3.3	*	*	*	3.7	*
			*	*	*	3.7 - 3.7	4.7 - 4.8
27	3.1	3.1	*	*	*	3.8	*
			*	*	*	3.7 - 3.8	4.8 - 4.9

Table 20: Coastal Transect Parameters

Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	.2% Annual Chance
28	2.8	3.0	*	*	*	3.9	*
			*	*	*	3.7 - 3.9	4.8 - 4.9
29	2.6	3.0	*	*	*	3.9	*
			*	*	*	3.7 - 3.9	4.7 - 5.0
30	2.8	3.1	*	*	*	4.0	*
			*	*	*	3.7 - 4.0	4.8 - 5.1
31	2.7	3.1	*	*	*	4.0	*
			*	*	*	4.0 - 4.0	5.1 - 5.1
32	2.4	3.1	*	*	*	4.1	*
			*	*	*	4.1 - 4.1	5.2 - 5.2
33	2.0	3.0	*	*	*	4.1	*
			*	*	*	4.1 - 4.1	5.2 - 5.3
34	1.6	2.8	*	*	*	4.1	*
			*	*	*	4.1 - 4.2	5.3 - 5.3
35	1.6	2.5	*	*	*	4.1	*
			*	*	*	4.1 - 4.2	5.3 - 5.3
36	2.3	3.0	*	*	*	4.2	*
			*	*	*	4.1 - 4.2	5.3 - 5.3

6.0 Mapping Methods

6.1 Vertical and Horizontal Control

Vertical Datum

All FISs 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. With the finalization of the North American Vertical Datum of 1988 (NAVD 88), all North Carolina FISs have been prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown on the FIRM for Pasquotank County are referenced to NAVD 88. Structure and ground elevations in the county must, therefore, be referenced to NAVD 88. It is important to note that FISs for adjacent communities in neighboring states may be referenced to NGVD 29. This may result in BFE differences across political boundaries between the communities.

As noted above, the elevations shown in this FIS are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor for Pasquotank County is # feet. The locations used to establish the conversion factor were USGS quadrangle corners that fell within the county, as well as those that were within 2.5 miles outside the county. The benchmarks are referenced to NAVD 88. Table 21, "Datum Conversion Locations and Values," is shown below.

Table 21, "Datum Conversion Locations and Values."

Table 21 - Datum Conversion Locations and Values

Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
36.50	-76.38	-1.03
36.37	-76.25	-0.94
36.25	-76.12	-0.93
36.25	-76.00	-0.89
36.38	-76.38	-1.00
36.25	-76.25	-0.96
36.13	-76.12	-0.98
Average conversion in Pasquotank County from NGVD 29 to NAVD 88 = -0.96 feet		

The vertical datum conversion factor for all flooding sources which run along a county boundary are in accordance with the conversion factor used in those contiguous counties.

BFEs shown on the FIRM represent whole-foot rounded values. For example, a 1% annual chance water-surface elevation of 102.4 feet will appear as 102 on the FIRM and 102.6 feet will appear as 103. Therefore, users who wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and/or Water-surface elevation rasters and supporting data tables in the FIS Report, which are shown, at a minimum, to the nearest 0.1 foot.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (http://www.ngs.noaa.gov).

Vertical Control Monuments

Qualifying bench marks within Pasquotank County that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical, with a vertical stability classification of A, B, or C, are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier (PID).

The National Geodetic Survey establishes precisely located monuments on the North Carolina Grid System and Bench Marks referenced to a vertical datum (NGVD 1929 and NAVD 1988).

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

Monuments with a Stability D classification may be used as Elevation Reference Marks (ERMs) when a Stability C or better monument is not an option. These ERMs must be approved by NCGS and can be set and used as elevation bench marks to establish vertical control and produce NC DFIRMs. Including such ERMs will greatly augment North Carolina’s useable vertical control network.

In addition, when local jurisdictions have established their own vertical monument network, these monuments may also be shown on the FIRM with the appropriate designations. Local monuments will be placed on the FIRM if the community has requested that they be included and if the monuments meet the aforementioned criteria.

North Carolina Geodetic Survey (NCGS) and contractor surveyed vertical control monuments will be shown on the FIRM panels. Those cataloged by NCGS meet similar requirements to the NGS monuments as described above. Most monuments that have been cataloged by NCGS have been established to NGS standards, but have not been submitted to NGS for inclusion into the NSRS. The qualifying criteria for depicting bench marks established by the State’s contractors on the new digital FIRM panels include:

- GPS surveying of permanent 3-D survey monuments to 5-centimeter or better local network accuracy guidelines, in accordance with NOAA Technical Memorandum NOS NGS-58 “Guidelines for Establishing GPS-Derived Ellipsoid Heights (Standards: 2 cm and 5 cm),” and conversion to NAVD 88 orthometric heights using NGS’ latest geoid mode;
- Requiring a stability classification of “C” or better; and
- Submitting GPS files and station descriptions to NCGS.

To obtain current information for cataloging local bench marks in the NSRS, please visit the Data Sheet page of the NGS website at http://www.ngs.noaa.gov/cgi-bin/datasheet.prl, or contact the NGS Information Services Branch at:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-32822
(301) 713-3242

Information regarding the NCGS or State contractor bench marks can be obtained through the NCGS website at www.ncgs.state.nc.us, or by phone at (919) 733-3836.

It is important to note that temporary vertical monuments, sometimes called Elevation Reference Marks, 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, interested individuals may contact FEMA to access this information.

Horizontal Datum and Control
The digital files that comprise the FIRM are georeferenced to an established coordinate system. The coordinate system used for the production of this FIRM is North Carolina State Plane (FIPSZONE 3200) referenced to the North American Datum of 1983 (NAD83), GRS80 ellipsoid.

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.

The projection used in the preparation of this map was the North Carolina State Plane Coordinate System. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, or projection used in the production of FIRMs for adjacent states may result in slight positional differences in map features across the state boundary. These differences do not affect the accuracy of this FIRM.

As part of the North Carolina CTS Initiative, North Carolina digital FIRM panel numbers are consistent with the North Carolina Land Records Management Program (LRMP).

The 11-digit digital FIRM panel numbering system for North Carolina is: SS MM LLLL PP X, where SS = State Federal Information Processing Code (37); MM = Easting-Northing (EN) 1,000,000-foot coordinates; LLLL = LRMP map numbers to include the EN 100,000-foot coordinates, and the EN 10,000-foot coordinates; PP = place holders for additional EN 1,000-foot coordinates; and X = suffix ("J" for the initial edition). North Carolina's State Plane Coordinate System origin is outside the State boundary to the southwest (in Georgia), the eastings range from approximately 0,404,000 (Tennessee border) to 3,040,000 (Atlantic Ocean); and the northings range from approximately 0,045,000 (South Carolina border) to 1,043,000 (Virginia border). Digital FIRM panels were compiled at either 1"=1,000', covering an area of 20,000 feet x 20,000 feet (20" x 20" panels); or at 1"=500', covering an area of 10,000 feet x 10,000 feet (20" x 20" panels). An additional 2 digits (both zeros) are held in reserve as a "place holder" in the event that future FIRMs are printed at a larger scale; e.g., 1"=250', covering an area of 5,000 feet x 5,000 feet for which the 1,000-foot coordinates would either be 0 or 5.

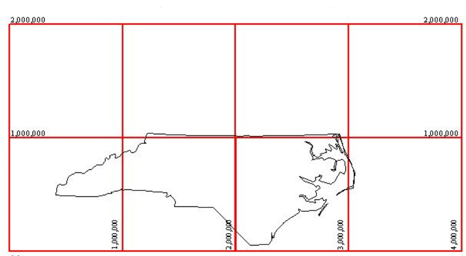


Figure 3 - North Carolina's State Plane Coordinate System

6.3 Floodplain and Floodway Delineation

Floodplain Boundaries

For streams restudied by detailed and limited detailed methods, the 1% and 0.2% annual chance floodplains were delineated using flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic data acquired using airborne Light Detection and Ranging (LIDAR). This LIDAR data was acquired during the (insert date from basin plan and update for map maintenance, if necessary) flying season.

The topographic data satisfies a vertical root-mean-square error (RMSE) accuracy standard of 20 cm (1.3 feet accuracy at the 95% confidence limit) for the Outer Banks and 25 cm (1.6 feet accuracy at the 95% confidence limit) for those portions of the basin lying west of the Outer Banks. These data could be contoured at roughly a 2-foot vertical contour interval. All elevations were referenced to the NAVD 88 and reflect orthometric heights. Variably spaced, bare-earth digital topographic data in ASCII point file format were combined with imagery (either flown concurrently with the LIDAR data or using existing digital orthophotos) to establish a Triangulated Irregular Network (TIN) of digital elevation points, which include selected breaklines to be used for hydraulic modeling. Furthermore, a uniformly spaced sampling of the TIN resulted in uniformly spaced Digital Elevation Models (DEMs), with 20 ft x 20 ft post spacing, which was generated in multiple file formats.

For coastal floodplains, after analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic data described above. Controlling features affecting the elevations were identified and considered in relation to their positions at particular transect and their variation between transects. •

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones VE, AO, AH, A99, AR, A, and AE), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundaries have been shown.

Floodway Delineation

The floodways presented in this FIS 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. The results of the floodway computations are tabulated for selected cross sections (Table 22, "Floodway Data"). The computed floodway is shown on the FIRM. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. In areas where the top of the bridge or road is higher than the 1.0-percent annual chance (100-year) flood, the FIRM will show the flood discharge as contained within the structure for emergency management purposes. It is important to note that FEMA and community floodway regulations still apply in and around those areas.

Table 22 - Floodway Data

Floodway Source		Floodway			Water Surface Elevation			
Cross Section	Distance (Feet Above Mouth)	Width (Feet)	Section Area (Square Feet)	Mean Velocity (Feet Per Second)	Regulatory	Without Floodway	With Floodway	Increase
Charles Creek								
043	4,266	108	369	2.7	4.0[1]	1.7	2.0	0.3
051	5,085	100	425	2.3	4.1[1]	2.8	3.0	0.3
061	6,117	132	599	1.6	4.3[1]	3.4	3.8	0.4
069	6,872	160	777	1.3	4.4[1]	3.7	4.2	0.5
074	7,360	141	677	1.4	4.5[1]	3.9	4.4	0.5
079	7,868	52	324	2.5	4.6[1]	4.1	4.7	0.5
083	8,325	118	563	1.4	5.4	5.4	5.8	0.4
088	8,774	101	517	1.6	5.6	5.6	6.0	0.4
093	9,335	108	497	1.6	5.9	5.9	6.4	0.5
097	9,748	125	873	0.9	6.7	6.7	7.7	1.0
101	10,106	130	748	1.1	6.8	6.8	7.8	1.0

Table 22 - Floodway Data

Floodway Source		Floodway			Water Surface Elevation			
Cross Section	Distance (Feet Above Mouth)	Width (Feet)	Section Area (Square Feet)	Mean Velocity (Feet Per Second)	Regulatory	Without Floodway	With Floodway	Increase
106	10,554	94	596	1.4	7.6	7.6	8.3	0.7
112	11,191	55	402	2.0	7.8	7.8	8.6	0.8
Knobbs Creek								
113	11,293	496	2,030	1.6	4.1[1]	2.3	2.4	0.1
135	13,539	733	2,930	1.1	4.2[1]	2.8	3.1	0.2
160	15,967	630	2,981	1.0	4.3[1]	3.4	3.9	0.5
189	18,882	1,004	5,084	0.6	4.5[1]	3.8	4.6	0.8
207	20,725	664	3,940	0.8	4.7[1]	4.2	5.0	0.9
217	21,749	1,070	6,313	0.5	4.7[1]	4.3	5.2	0.9
246	24,601	1,442	7,999	0.3	4.9	4.9	5.8	1.0
265	26,502	1,400	6,830	0.3	5.0	5.0	5.9	0.9
285	28,465	2,300	9,383	0.2	5.0	5.0	6.0	1.0
304	30,447	2,070	7,969	0.2	5.1	5.1	6.1	1.0
326	32,581	1,620	6,743	0.2	5.2	5.2	6.2	1.0
345	34,501	1,270	4,875	0.2	5.3	5.3	6.2	1.0
365	36,460	1,600	6,402	0.2	5.3	5.3	6.3	1.0
386	38,630	1,650	3,614	0.3	5.4	5.4	6.4	1.0
399	39,912	300	1,343	0.8	5.7	5.7	6.6	0.9
409	40,927	110	594	1.6	6.2	6.2	7.0	0.8
419	41,920	90	464	1.2	6.5	6.5	7.3	0.8
424	42,399	70	413	1.4	6.6	6.6	7.4	0.8
Knobbs Creek Tributary								
022	2,195	464	2,003	0.9	4.8[1]	3.2	3.7	0.5
031	3,139	490	2,333	0.8	4.8[1]	3.6	4.2	0.6
042	4,236	547	2,701	0.7	4.8[1]	3.9	4.5	0.5
055	5,521	576	3,117	0.6	4.8[1]	4.2	4.8	0.6
063	6,314	507	2,880	0.6	4.8[1]	4.3	5.0	0.7
073	7,332	758	4,272	0.4	4.8[1]	4.4	5.1	0.7
082	8,236	920	3,009	0.6	4.8[1]	4.4	5.1	0.7
093	9,258	332	1,391	1.1	5.1	5.1	5.6	0.4
097	9,659	300	1,838	0.8	6.0	6.0	6.3	0.4
102	10,184	557	3,441	0.4	6.7	6.7	7.0	0.3
110	10,994	447	2,558	0.6	6.7	6.7	7.0	0.3
118	11,753	300	1,282	0.9	6.8	6.8	7.1	0.3
127	12,749	480	2,555	0.5	6.8	6.8	7.2	0.4
Little River								
593	59,343	709	2,697	1.7	4.0[1]	2.1	2.4	0.2
619	61,870	1,041	4,819	0.9	4.1[1]	3.0	3.7	0.7
642	64,193	1,203	5,947	0.8	4.2[1]	3.5	4.4	0.9
664	66,355	1,705	8,326	0.5	4.3[1]	3.9	4.8	1.0
684	68,443	1,435	6,382	0.7	4.6	4.6	5.2	0.6
698	69,825	947	5,348	0.8	4.9	4.9	5.6	0.7
708	70,829	121	997	4.3	5.4	5.4	6.2	0.8
738	73,786	2,413	17,258	0.2	6.2	6.2	6.9	0.8
757	75,737	1,175	7,971	0.5	6.2	6.2	7.0	0.8

Table 22 - Floodway Data

Floodway Source		Floodway			Water Surface Elevation			
Cross Section	Distance (Feet Above Mouth)	Width (Feet)	Section Area (Square Feet)	Mean Velocity (Feet Per Second)	Regulatory	Without Floodway	With Floodway	Increase
784	78,417	2,006	10,656	0.4	6.5	6.5	7.2	0.7
Pasquotank River								
1255	125,463	5,405	25,338	0.4	4.4	4.4	4.7	0.3
1284	128,449	5,544	28,897	0.4	4.5	4.5	5.0	0.4
1315	131,548	5,008	26,780	0.4	4.6	4.6	5.2	0.5
1346	134,593	4,559	25,998	0.4	4.8	4.8	5.4	0.6
1376	137,557	5,412	32,120	0.3	4.9	4.9	5.6	0.7
1407	140,695	3,757	22,970	0.5	5.1	5.1	5.8	0.7
1439	143,887	5,041	31,199	0.3	5.3	5.3	6.1	0.8
1460	145,966	5,217	32,857	0.3	5.4	5.4	6.2	0.8

[1]**Elevation includes backwater effects**

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 (hv2) is greater than or equal to 200 ft3/sec2. 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 23: Summary of Coastal Transect Mapping Considerations

Source	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)		
Albemarle Sound	15	*	*	AE 5-5	*	WHAFIS
	20	*	*	AE 5-5	*	WHAFIS
	26	*	*	AE 3-3	*	WHAFIS
	32	*	*	AE 2-3	*	WHAFIS
	33	*	*	AE 2-2	*	WHAFIS
	31	*	*	AE 3-3	*	WHAFIS
	30	*	VE 7-9	AE 3-3 AO 3-3 VE 3-3	RUNUP EXTENT	WHAFIS
	29	*	VE 7-8	AE 3-3 AO 3-3 VE 3-3	RUNUP EXTENT	WHAFIS
	28	*	VE 8	AE 3-3 VE 3-3	WAVE OVERTOPPING SPLASH ZONE	WHAFIS
	27	*	AE 7	AE 3-3	*	WHAFIS
	23	*	*	AE 3-4	*	WHAFIS
	24	*	*	AE 3-4	*	WHAFIS
	16	*	*	AE 5-5	*	WHAFIS
	17	*	*	AE 4-6	*	WHAFIS
	6	*	*	AE 1-1	*	WHAFIS
	7	*	*	AE 1-1	*	WHAFIS
	8	*	*	AE 1-2	*	WHAFIS
	9	*	*	AE 2-2	*	WHAFIS
	13	*	*	AE 2-2	*	WHAFIS
	12	*	*	AE 2-2	*	WHAFIS
	11	*	*	AE 2-2	*	WHAFIS
	10	*	*	AE 2-2	*	WHAFIS
	14	*	*	AE 6-6	*	WHAFIS
	34	*	*	AE 2-2	*	WHAFIS
	37	*	*	AE 3-3	*	WHAFIS
	36	*	*	AE 2-2	*	WHAFIS
	35	*	*	AE 2-2	*	WHAFIS
	1	*	*	AE 0-0	*	WHAFIS
	5	*	*	AE 1-1	*	WHAFIS
	2	*	*	AE 0-0	*	WHAFIS
	4	*	*	AE 1-1	*	WHAFIS
	3	*	*	AE 0-0	*	WHAFIS

Table 23: Summary of Coastal Transect Mapping Considerations

Source	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)		
	22	*	*	AE 4-4	*	WHAFIS
	21	*	*	AE 5-5	*	WHAFIS
	25	*	*	AE 3-3	*	WHAFIS
	18	*	*	AE 1-1	*	WHAFIS
	19	*	*	AE 4-5	*	WHAFIS

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. In areas where the Zone VE designation is based on the presence of a primary frontal dune the LiMWA was not delineated.

7.0 Revising the FIS

7.1 Letters of Map Amendment and Letters of Map Revision - Based on Fill

LOMAs and LOMR-Fs are documents issued by FEMA that officially remove a property and/or a structure from a Special Flood Hazard Area (SFHA), if data supporting the removal are submitted. LOMAs and LOMR-Fs are generally determinations regarding areas that are too small to be shown on a FIRM panel; consequently, the changes they describe become official without revising the FIRM or the FIS Report.

NFIP regulations require that the lowest adjacent grade (the lowest ground touching the structure) be at or above the 1% annual chance flood elevation for a LOMA to be issued. Currently, there is no fee for FEMA's review of a LOMA request, but the requester of a LOMA is responsible for providing all the information needed for the review, which may include structure and/or property elevations certified by a licensed land surveyor or professional engineer. Therefore, LOMA requesters may need to retain the services of a land surveyor or engineer.

A LOMA cannot be used for property on which fill has been placed. For those situations, a LOMR-F must be used. As a participant in the NFIP, a local government must adopt ordinances that meet the minimum Federal floodplain management standards, which are outlined in Section 60.3 of the NFIP regulations. For a number of reasons, these ordinances generally vary from community to community. Nonetheless, because the placement of fill within the floodplain can affect flood hazards in the surrounding area, additional information is needed before FEMA can process a LOMR-F request. Among the data required for a LOMR-F is the community acknowledgment form. This form is FEMA's assurance that all appropriate Federal, State, and local floodplain management requirements have been met. Furthermore, NFIP regulations require that the lowest adjacent grade (the lowest ground touching the structure) be at or above the 1% annual chance flood elevation for a LOMR-F to be issued removing the structure from the floodplain. Because LOMR-F requests are the result of changed physical conditions rather than limitations of scale or topographic definition, FEMA charges a fee for the review of a LOMR-F request. As with the LOMA, the requester of a LOMR-F is responsible for providing all supporting information, including structure and/or property elevation data.

In cases where property owners plan to add fill in the SFHA, NFIP regulations require plans and technical information to be submitted for review by FEMA before construction takes place. FEMA will issue a conditional LOMR-F stating how flood hazards would change and what portions of the property, if any, would remain in the SFHA if the project were built according to the submitted plans.

The issuance of a LOMA or LOMR-F ends the property owner's obligation to purchase flood insurance as a condition of Federal or federally backed financing. However, the property owner's mortgage company maintains the prerogative to require flood insurance as a condition of providing financing. Before attempting to obtain a LOMA or LOMR-F, property owners are advised to consult their mortgage companies regarding this policy. Even if the mortgage company indicates that it will require flood insurance if a LOMA or LOMR-F is issued, it may be advantageous for property owners to request a LOMA or LOMR-F because flood insurance premiums are lower for properties removed from the SFHA than for properties that remain within the SFHA.

For additional information regarding LOMAs, LOMR-Fs, conditional LOMR-Fs, or current application fees, please call the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP (1-877-336-2627).

7.2 Letters of Map Revision

A Letter of Map Revision (LOMR) is a document issued by FEMA and the NCFMP that revises an FIS Report and/or FIRM. A LOMR is used to change flood risk zones, floodplain and/or floodway delineations, flood elevations, or planimetric features such as road systems or corporate limits. A LOMR provides FEMA and the NCFMP with a cost-effective means of revising the FIS information without physically changing and reprinting the map or report itself. A portion of the FIRM panel or FIS Report showing the revised information is issued with the LOMR. The LOMR is sent to all affected communities and is archived in the communities' NFIP map repository for public reference.

In cases where a proposed project (such as construction in the 1% annual chance floodplain) would result in a significant rise in 1% annual chance water-surface elevations, NFIP regulations require the community to submit plans and technical information for review by FEMA and the NCFMP before construction takes place. This assures communities participating in the NFIP that proposed projects meet minimum NFIP requirements. The result of FEMA and the NCFMP reviews is documented in a conditional LOMR.

For additional information regarding LOMRs, conditional LOMRs, or current application fees, please call the FEMA Map Assistance Center toll-free information line at 1-877-FEMA MAP (1-877-336-2627) or the NCFMP at 919-715-5711.

7.3 Physical Map Revisions

Physical Map Revisions (PMRs) are processed to incorporate information concerning conditions present in the community that are not reflected in the FIS, and involve distributing republished FISs that supersede the most current NFIP data in the community repository. PMRs may be initiated by a request from a community resident or agency, or FEMA may initiate a PMR to incorporate one or more LOMRs, to reflect significant changes in corporate limits, to correct errors, or to update flood hazards to match new information from an adjacent community's FIS. Due to the costs associated with updating and distributing FISs, map revisions will be processed as LOMRs rather than PMRs whenever possible. For more information regarding PMRs, please contact the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP (1-877-336-2627), the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report, or the NCFMP at 919-715-5711.

7.4 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards in a given community. FEMA accomplishes this through a national mapping needs assessment process that assigns priorities and allocates funds to sponsor or subsidize new flood hazard analyses used to update FIS Reports. For map maintenance restudies within the state of North Carolina, scoping will be performed by county approximately 2.5-3.5 years after the previous effective date. Scoping will focus on streams with restudy needs within those previously effective counties rather than on full countywide restudies. A restudy refers specifically to updating or reevaluating engineering analyses that were performed for a flood mapping project that directly impact BFEs and/or flood hazard boundary extents or analysis of previously unstudied flood prone areas. Restudy project evaluation triggers and prioritization values are an essential component of the map maintenance program. For more information regarding NCFMP-contracted restudies, please contact the NCFMP at 919-715-5711 or at www.ncfloodmaps.com. For more information regarding FEMA-contracted restudies, please contact the FEMA Map Information eXchange (FMIX) toll-free information line at 1-877-FEMA MAP(1-877-336-2627) or the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report.

7.5 Map Revision History

The current FIRM is a subset of the Statewide FIRM, showing flood hazard information for the entire geographic area of Pasquotank County. Previously, separate Flood Hazard Boundary Maps (FHBMs), Flood Boundary and Floodway Maps (FBFMs), and/or FIRMs were prepared for each identified flood prone jurisdiction within the county. Historical data relating to the NFIP maps prepared for each community prior to and including the 10/5/2004 North Carolina Statewide FIRM, which includes Pasquotank County, are presented in Table 24, "Map Revision History."

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Pasquotank County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FIRMs, and/or FBFMs for all of the incorporated and unincorporated jurisdictions within Pasquotank County.

Table 24 - Map Revision History

Community	Initial Identification Date	Initial FIRM Effective Date	FIS Revision Date
CITY OF ELIZABETH CITY	11/9/1973	4/3/1978	10/05/2004
PASQUOTANK COUNTY	1/3/1975	12/4/1985	10/05/2004

8.0 Study Contracting and Community Coordination

8.1 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS revises and updates the previous countywide FIS for the geographic area of Pasquotank County and Incorporated Areas. Table 25, "Authority and Acknowledgments," includes information for the previous countywide FIS and for this revision. This table also includes information for the single-jurisdiction FISs published for each community included in this countywide FIS (if available) as compiled from their previously printed FIS Reports

Table 25 — Authority and Acknowledgments

Community	FIS Dated	Study Contracted By	Data Source	Contract or IAA Number	Work Completed In
CITY OF ELIZABETH CITY	10/5/2004	NCFMP	NCFMP	286-000023	10/28/1014
CITY OF ELIZABETH CITY	10/5/2004	NCFMP	NCFMP	19-000017	10/29/2012
PASQUOTANK COUNTY	10/5/2004	NCFMP	NCFMP	286-000023	10/28/1014
PASQUOTANK COUNTY	10/5/2004	NCFMP	NCFMP	19-000017	10/29/2012

This FIS Report was produced through a unique cooperative partnership between the State of North Carolina and FEMA. The State of North Carolina, through FEMA's Cooperating Technical Partner (CTP) Initiative, has become the first Cooperating Technical State (CTS) and will assume primary ownership of the NFIP FIRM panels for all North Carolina communities. This role has traditionally been fulfilled by FEMA. The North Carolina Floodplain Mapping Program is conducting flood hazard analyses and producing updated, digital FIRM panels. The hydrologic and hydraulic analyses and the FIRM panels for the initial statewide mapping for Pasquotank County were produced by NCFMP under contract with the State of North Carolina and issued on effective 11/30/2015. For this revision, the hydrologic and hydraulic analyses and the FIRM panels were produced by NCFMP, under contract with the State of North Carolina.

8.2 Consultation Coordination Officer's Meetings/Scoping Meetings

In general, for each FIS an initial Consultation Coordination Officer's (CCO) meeting is held with representatives from FEMA, the communities, and the study contractors to explain the nature and purpose of the FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held with representatives from FEMA, the communities, and the study contractors to review the results of the study

The dates of the initial and final CCO meetings held for Pasquotank County and Incorporated Areas were compiled from the previous countywide FIS Report and are shown in Table 26, "Consultation Coordination Officer's Meetings

Table 26 — Consultation Coordination Officer's Meetings

Community	For FIS Dated	Initial CCO Date	Attended By	Final CCO Date	Attended By
CITY OF ELIZABETH CITY	2/5/1985	8/8/8888	NP	8/7/1984	Representatives of the SC, FEMA, and community officials
CITY OF ELIZABETH CITY	2/5/1985	8/8/8888	NP	8/28/1984	Representatives of the study contractor, FEMA, and community officials
CITY OF ELIZABETH CITY	2/5/1985	8/8/8888	NP	9/6/1984	Representatives of Tetra Tech, FEMA, and Town of Roper
CITY OF ELIZABETH CITY ETJ	2/5/1985	8/8/8888	NP	8/7/1984	Representatives of the SC, FEMA, and community officials
CITY OF ELIZABETH CITY ETJ	2/5/1985	8/8/8888	NP	8/28/1984	Representatives of the study contractor, FEMA, and community officials
CITY OF ELIZABETH CITY ETJ	2/5/1985	8/8/8888	NP	9/6/1984	Representatives of Tetra Tech, FEMA, and Town of Roper
PASQUOTANK COUNTY	12/4/1985	8/8/8888	NP	8/7/1984	Representatives of the SC, FEMA, and community officials
PASQUOTANK COUNTY	12/4/1985	8/8/8888	NP	1/1/1985	Representatives of the study contractor, FEMA, and the county
PASQUOTANK COUNTY	12/4/1985	8/8/8888	NP	1/8/1985	Representatives from the Town of Manteo, Tetra Tech, Inc., and FEMA
PASQUOTANK COUNTY	12/4/1985	8/8/8888	NP	1/9/1985	Representatives of Tetra Tech Inc., the county, and FEMA

For each FIS produced during the initial phase of statewide, an Initial Scoping Meeting was held with representatives from FEMA, the county, the incorporated communities, and the State of North Carolina. A Final Scoping meeting was held to review the Draft Basin Plan and finalize the streams to be studied by detailed methods. This information was then used to create the Final Basin Plan.

For map maintenance revisions, only one scoping meeting was held to identify the streams to be newly studied by detailed methods, redelineated, or to be studied by limited detailed methods. This information was then used to create the Map Maintenance Plan.

The historical dates of the Initial and Final Scoping Meetings held during the first round of statewide mapping for Pasquotank County are shown in Table 28, "Scoping Meetings." Meetings held for the map maintenance revision are also included below for Pasquotank County.

Table 28 — Scoping Meetings

Community	Riverbasin	Initial Scoping Date	Attended By	Final Scoping Date	Attended By
CITY OF ELIZABETH CITY	PASQUOTANK	12/14/2000	FEMA, State of NC Emergency Management, community officials, and Dewberry	5/17/2001	FEMA, State of NC Emergency Management, community officials, and Dewberry
CITY OF ELIZABETH CITY ETJ	PASQUOTANK	12/14/2000	FEMA, State of NC Emergency Management, community officials, and Dewberry	5/17/2001	FEMA, State of NC Emergency Management, community officials, and Dewberry
PASQUOTANK COUNTY	PASQUOTANK	12/14/2000	FEMA, State of NC Emergency Management, community officials, and Dewberry	5/17/2001	FEMA, State of NC Emergency Management, community officials, and Dewberry

Preliminary Meetings are held in each county to disseminate and review the FIS Report and FIRM panels. This meeting is required by FEMA. Public Participation Meetings are not required by FEMA, but provide an opportunity to review and discuss the FIS Report and FIRM panels for each jurisdiction in a public setting. The dates for the preliminary and public participation meetings are shown in Table 30, "Preliminary and Public Participation Meetings."

Table 30 — Preliminary and Public Participation Meetings

Community	For FIS Dated	Meeting Location	Preliminary Meeting Date	Attended By	Public Meeting Date	Attended By
PASQUOTANK COUNTY	7/19/2005	NP	2/13/2004	Representatives from the county, the community, the State, Dewberry, and Watershed Concepts	4/1/2004	NP

9.0 Guide to 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 http://www.fema.gov.

The Map Repositories table below lists locations where FIRMs for Pasquotank 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 27 — Map Repositories

Community	Address	City	State	Zip Code
City of Elizabeth City	Elizabeth County Planning Department, 302 East Colonial Ave, Room 308	Elizabeth City	NC	27907
Pasquotank County	Pasquotank County Planning Department, 206 East Main Street	Elizabeth City	NC	27907

9.1 Additional Information

All FIRM panels created for the State of North Carolina are produced in a seamless statewide format; however, FIS Reports are produced for individual counties.

Copies of FIRM panels are available for a nominal fee. To obtain a copy of the current flood map for a specific community, contact the FEMA Map Service Center at 1-800-358-9616. To facilitate the processing of your request, please review the current flood map on file at your local community repository and obtain the panel number in which you are interested. If necessary, users may also order a FIRM Index from the Map Service Center to determine the appropriate panel numbers. The Map Service Center also accepts orders for the Community Status Book and the Flood Insurance Manual. The FIS Report, FIRM panels, and digital data used to produce the FIRM panels are available online at www.ncfloodmaps.com.

Information concerning the data used in the preparation of this FIS, contained in an Engineering Study Data Package, may be obtained by contacting the FEMA Regional Office at the address listed on the Notice to Flood Insurance Study Users page at the front of this report.

Table 29, "Additional Information" is not applicable in Pasquotank County.

10.0 Appendix

10.1 Bibliography

All bibliography and reference information associated within this Flood Insurance Study are maintained and accessible within the geodatabase structure and associated metadata. Users requiring more specific information should contact the North Carolina Floodplain Mapping Program (NCFMP) at www.ncfloodmaps.com under the Contacts menu