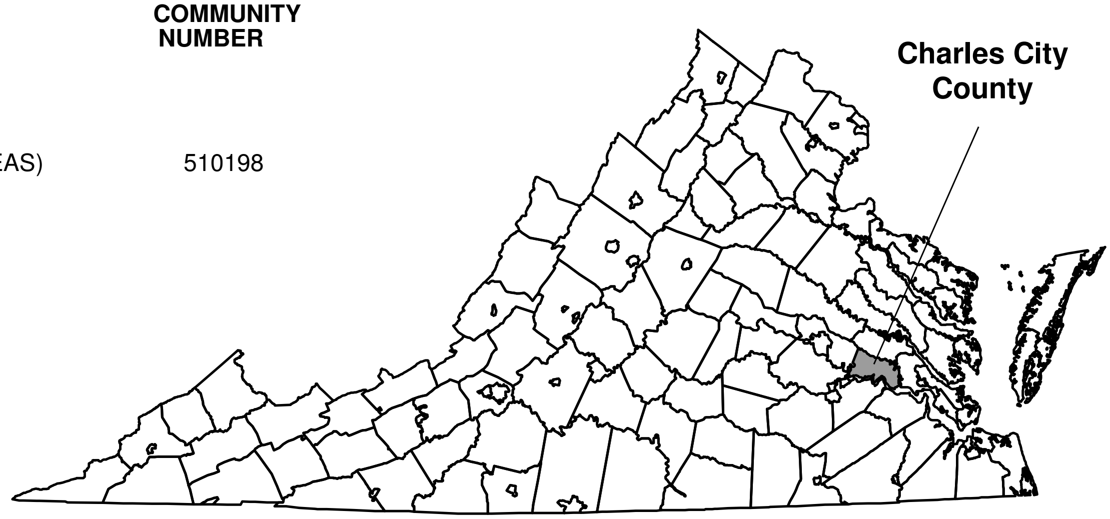
FLOOD INSURANCE STUDY

CHARLES CITY COUNTY, VIRGINIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CHARLES CITY COUNTY (UNINCORPORATED AREAS)	510198



REVISED DATE

Preliminary Date: January 31, 2014

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
51036CV000B

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.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: March 16, 2009

Revised Countywide FIS Date:

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FLOOD INSURANCE STUDY
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1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and updates previous FIS's / Flood Insurance Rate Maps (FIRMs) in the geographic area of Charles City County, Virginia and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Charles City County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) shall be able to explain them.

1.2 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.

The March 16, 2009, countywide FIS was prepared to include the unincorporated areas of, and incorporated communities within, Charles City County in a countywide format FIS. Information on the authority and acknowledgments for each jurisdiction included in the March 16, 2009 countywide FIS, as compiled from their previously printed FIS reports.

The hydrologic and hydraulic analyses for the September 5, 1990 study were prepared by the Norfolk District of the U. S. Army Corps of Engineers (COE) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 3, Amendment No. 1. This work was completed in August 1988.

For the March 16, 2009, countywide FIS, no revised hydrologic and hydraulic analyses were prepared.

Planimetric base map information is provided in digital format for all FIRM panels. In the March 16, 2009, countywide FIS, these files were compiled at scales of 6000 and 12000 from aerial photography dated 2003. Additional information was derived from transportation and hydrographic line features provided by the Richmond Regional Planning District Commission. Users of this FIRM should be aware that minor adjustments may have been made to specific base map features.

The coordinate system used for the production of the March 16, 2009, countywide FIS and FIRM is Universal Transverse Mercator (UTM), Zone 18 North, North American Datum of 1983 (NAD 83), GRS 80 spheroid. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

The Digital Flood Insurance Rate Map (DFIRM) conversion for the March 16, 2009, countywide FIS study was performed by AMEC, Earth & Environmental, Inc. for FEMA, under Contract No. HSFE03-07-D-0030, Task Order HSFE03-07-J-0002.

For the *(date)* FIS, new coastal storm surge analysis was incorporated for the Chickahominy River, James River, and Tar Bay and their estuaries. In addition the Stillwater elevations were updated. The Leonard Jackson Associates under RAMPP assisted FEMA in the development and application of a state-of-the-art storm surge risk assessment. The coastal analysis and mapping was conducted for FEMA under Contract No. HSFEHQ-09-D-0369, Task Order HSFE03-11-J-0007. The coastal analysis involved transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave setup, wave height analysis and wave run-up. In addition, a storm surge study was conducted for FEMA by the USACE and its project partners under HSFE03-06-X-0023, “NFIP Coastal Storm Surge Model for Region III” and Project HSFE03-09-X-1108, Phase II Coastal Storm Surge Model for FEMA Region III” (Reference 1). The work was performed by the Coastal Processes Branch (HF-C) of the Flood and Storm Protection Division (HF), U.S. Army Engineer Research and Development Center – Coastal & Hydraulics Laboratory (ERDC-CHL) (Reference 2).

In the *(date)* FIS, planimetric base map information is provided in digital format for all FIRM panels. The files are compiled at scales of 6000 and 12000 from aerial photography dated 2009.

The Digital Flood Insurance Rate Map (DFIRM) conversion for this PMR *(date)* FIS study was performed by Leonard Jackson Associates for FEMA, under Contract No. HSFEHQ-09-D-0369, Task Order HSFE03-11-J-0007.

1.3 Coordination

An initial CCO meeting is held typically with representatives of Federal Emergency Management Agency (FEMA), the community, and the study contractor to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

On June 17, 1986, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the county, and the COE (the study contractor) to determine the streams to be studied by detailed methods.

Contacts with various Federal and State agencies were made during the preparation of the study in order to minimize possible hydrologic and hydraulic conflicts. A search for basic data was made at all levels of government.

On September 19, 1989, a final CCO meeting was held with representatives of FEMA, the county, and the study contractor to review the results of the study.

For March 16, 2009, countywide FIS revision, Charles City County was notified by letter on November 30, 2007 that the FIS would be updated and converted to countywide format. A final meeting was held on June 11, 2008 and was attended by representatives of Charles City County, the study contractor, and FEMA.

For *(date)* FIS, an initial CCO meeting held on June 11, 2008, with representatives of FEMA, the study contractor (RAMPP) and Charles City County.

2.0 <u>AREA STUDIED</u>

2.1 Scope of Study

This FIS covers the geographic area of Charles City County.

Tidal flooding from the James and Chickahominy Rivers and their adjoining estuaries was studied by detailed methods. All areas within the county affected by tidal flooding were included in the detailed study. 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 through August 1993.

All or portions of the following flooding sources were studied by approximate methods: the Chickahominy River, Turkey Island Creek and Shirley Millpond. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Charles City County.

For the March 16, 2009, countywide FIS revision, no new flood hazard areas were identified.

2.2 Community Description

Charles City County is located in southeastern Virginia. The county is bordered by the unincorporated areas of New Kent County to the north, the unincorporated areas of James City County to the east, the unincorporated areas of Surry County and Prince George County to the south, and the unincorporated areas of Chesterfield County and Henrico County to the west. The following flooding sources also border the county: the Chickahominy River to the north and east, and the James River to the south. Charles City County encompasses an area of approximately 181 square miles, of which 20 square miles are water (Reference 3).

The population of Charles City County was 6,692 in 1980 (Reference 4). As determined by the 2000 Census, the population of Charles City County was 6,926, and the 2006 estimated population was 7,221, an increase of 4.3% since 2000 and the 2012 estimated population was 7,157, an increase of 3.3% since 2000 (Reference 5). Agriculture and the production of pulpwood and lumber are the principal industries in the county. The principal sources of farm income are corn, wheat, soybeans, cattle, and hogs. Eggs, milk, and standing timber are also important products (Reference 3). The floodplains of the county consist of scattered residential structures, businesses, croplands, and forests. With the county's many miles of shoreline, increased pressure for development of the floodplains is expected.

Charles City County enjoys a temperate climate, with moderate seasonal changes characterized by warm summers and cool winters. Temperatures average approximately 79 degrees Fahrenheit (°F) in July, the warmest month; and 40°F in January, the coolest month. Annual precipitation over the area averages approximately 43 inches per year (Reference 3). There is some variation in the monthly averages; however, this rainfall is distributed uniformly throughout the year. Snowfall is infrequent, generally occurring in light amounts and usually melting in a short period of time.

Charles City County is located in the Coastal Plain province and is underlain primarily by clay, sand, marl, and gravel strata. Elevations within the county range from sea level to approximately 150 feet.

2.3 Principal Flood Problems

The areas along the shoreline of Charles City County are vulnerable to tidal flooding from major storms, commonly referred to as hurricanes and northeasters. Both storms produce winds that push large volumes of water against the shore. Hurricanes, with their high winds and heavy rainfall, are the most severe storms to which the county is subjected. The term "hurricane" is applied to an intense cyclonic storm originating in tropical or subtropical latitudes in the Atlantic Ocean just north of the equator. While hurricanes may affect the area from May through November, nearly 80 percent occur during the months of August, September, and October with approximately 40 percent occurring during September. The most severe hurricane to strike the county occurred in August 1933.

Another type of storm that can cause severe damage to the county is the northeaster. This is also a cyclonic storm, and originates with little or no warning along the middle and northern Atlantic Coast. These storms occur most frequently in the winter months but may occur at any time. Accompanying winds are not of hurricane force, but are persistent, causing above-normal tides for long periods of time. The March 1962 northeaster was the most severe to ever hit the county.

The amount and extent of damage caused by any tidal flood will depend upon the topography of the area flooded, rate of rise in floodwaters, depth and duration of flooding, exposure to wave action, and the extent to which damageable property has been placed in the floodplain. The depth of flooding during these storms depends upon the velocity, direction, and duration of the wind; the size and depth of the body of water over which the wind is acting; and the astronomical tide. The duration of flooding depends upon the duration of the tide-producing forces. Floods caused by a hurricane are usually of a much shorter duration than the ones caused by a northeaster. Flooding from hurricanes rarely lasts more than one tidal cycle; however, flooding caused by northeasters may last several days, during which the most severe flooding takes place at the time of the peak astronomical tide.

The timing or coincidence of the maximum storm surge with the normal high tide is an important factor in the consideration of flooding from tidal sources. The mean range of tide in the James River is 1.9 feet at the confluence of the Chickahominy River and 2.6 feet at Hopewell. The range of tide may be somewhat less in the connecting bays and inlets (Reference 6).

The area also contains estuaries of the James River that are subject to tidal flooding in their lower reaches but fluvial flooding on the upper reaches.

Flooding on the upper reaches of these streams may be caused by heavy rains occurring at any time during the year. Flooding may also occur as a result of intense rainfall produced by local thunderstorms or tropical disturbances such as hurricanes, which move into the area from the Gulf or Atlantic coasts. The effects of riverine flooding are not addressed in this study.

Charles City County has experienced major storms since the early settlement of the area. Historical accounts of severe storms in the area date back several hundred years. The following paragraphs discuss some of the large storms that have occurred in recent history.

The hurricane of August 23, 1933, was one of the most severe storms that ever occurred in the Middle Atlantic region. This tropical hurricane passed inland near Cape Hatteras on August 22, passed slightly west of Norfolk, and continued towards the north accompanied by extreme high wind and tide. The storm surge in the bay and tidal estuaries was the highest of record and coincided with astronomical high tide. The water level reached a maximum of 8 feet in Hampton Roads (Reference 7).

Hurricane "Hazel," the second most destructive of recent hurricanes to strike the area, entered the mainland south of Wilmington, North Carolina, during the morning of October 15, 1954, and moved rapidly northward, passing over Norfolk and Fredericksburg in the early afternoon. The winds were from the east and southeast until the eye passed. When the eye passed, the winds shifted to the southwest with higher velocities. The hurricane surge was not as high as the August 1933 storm, although the tidal surge was superimposed on the normal high tide. In addition to damage by tidal flooding, much damage was caused to roofs, communication lines, and other structures by the high wind. Damage of this nature is characteristic of that to be expected during hurricanes (Reference 7).

A recent flood of major proportions in the area occurred during the northeaster of March 6-8, 1962. Disastrous flooding and high waves occurred along the Atlantic seaboard from New York to Florida. This flood was unusual, even for a northeaster, since it was caused by a low pressure cell that moved from south to north past Hampton Roads and then reversed its course, moving again to the south and bringing with it huge volumes of water and high waves. The maximum flood height occurred on the morning of March 7 and reached 7.4 feet in Hampton Roads (Reference 8).

Another recent flooding occurred when rainfall from Hurricane Gaston caused the Chickahominy River to crest above flood state and peak on September 1, 2004 at a flow of 18,900 cfs at a maximum flood height of 12.58 feet (Reference 9). When moving inland, Gaston's heavy rains caused flash flooding that inundated areas of Charles City County. The flooding from Gaston was the worst for central Virginia since Hurricane Floyd in 1999 (Reference 10).

The FEMA provided federal funds to Charles City to recover the loss occurred due to Tropical Storm Ernesto of August 29, 2006 (Reference 11). The Hurricane Sandy did not have any adverse affect in the Charles City County (Reference 12).

2.4 Flood Protection Measures

There are no existing flood control structures that would provide protection during major floods in Charles City County. There are several measures that have provided some protection against flooding. These include bulkheads, seawalls, jetties, and nonstructural measures for floodplain management, such as zoning codes. The "uniform Statewide Building Code," which went into effect in September 1973, states, "where a structure is located in a 100-year flood plain, the lowest floor of all future construction or substantial improvement to an existing structure… must be built at or above that level, except for nonresidential structures which may be floodproofed to that level" (Reference 13).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 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-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent 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 which equals or exceeds the 100-year flood (1 percent chance of annual exceedance) in any 50-year period is approximately 40 percent (4 in 10), and, 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.

3.1 Coastal Analyses

Coastal analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Pre-countywide Analyses

Tidal flood-frequency elevations used in this study for the James and Chickahominy Rivers were taken from the Flood Insurance Study for the City of Norfolk (Reference 14).

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

Special consideration was given to the vulnerability of Charles City County to wave attack along shorelines of the James River during severe hurricanes and northeasters. Areas of shoreline subjected to significant wave attack are referred to as coastal high hazard zones. Methods have been developed to determine which sections of a shoreline fall into this category (Reference 15). The factors considered for such a determination include: choice of a suitable fetch, its length and width, sustained wind velocities, coastal water depths, and physical features of the shoreline that would appreciably affect wave propagation. All of these factors are analyzed to determine if a wave with a height of 3 feet could be generated. The 3-foot wave has been determined to be the minimum size wave capable of causing major damage to conventional wood-frame or brick veneer structures. This criterion has been adopted by FEMA for the determination of V zones.

Based on the above criteria, the shoreline of Charles City County is not exposed to severe wave attack and has not been designated as part of a coastal high hazard zone.

Countywide Revision

No new coastal analyses were performed for March 16, 2009, countywide FIS revision. However, the entire study was updated to the North American Vertical Datum of 1988 (NAVD 88).

Physical Map Revision

For the *(date)* FIS, users of the FIRM should be aware that coastal flood elevations are provided in Table 1, "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.

Development along the coastline of Charles City County consists of mainly private residences and agricultural land. Extensive residential development exists along the James and Chickahominy Rivers and their estuaries. Undeveloped area are located throughout Charles City County, consisting of mainly of farmlands, woodlands and marsh.

An analysis was performed to establish the frequency peak elevation relationships for coastal flooding in Charles City County. The Federal Emergency Management Agency (FEMA), Region III office, initiated a study in 2008 to update the coastal storm surge elevations within the states of Virginia, Maryland, and Delaware, and the District of Columbia including the Atlantic Ocean, Chesapeake Bay including its tributaries, and the Delaware Bay. The study replaces outdated coastal storm surge stillwater elevations for all Flood Insurance Studies (FISs) in the study area, including Charles City County, VA, and serves as the basis for updated Flood Insurance Rate Maps (FIRMs). Study efforts were initiated in 2008 and concluded in 2012.

The end-to-end storm surge modeling system includes the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC) for simulation of 2-dimensional hydrodynamics (Luettich et. al, 2008). ADCIRC was dynamically coupled to the unstructured numerical wave model Simulating WAves Nearshore (unSWAN) to calculate the contribution of waves to total storm surge (USACE, 2012.). The resulting model system is typically referred to as SWAN+ADCIRC (USACE, 2012). A seamless modeling grid was developed to support the storm surge modeling efforts. The modeling system validation consisted of a comprehensive tidal calibration followed by a validation using carefully reconstructed wind and pressure fields from three major flood events for the Region III domain: Hurricane Isabel, Hurricane Ernesto, and extratropical storm Ida. Model skill was accessed by quantitative comparison of model output to wind, wave, water level and high water mark observations.

TABLE 1 - SUMMARY OF STILLWATER ELEVATIONS

	ELEVATION (feet) NAVD88			
FLOODING SOURCE AND LOCATION	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
JAMES RIVER AND ESTUARIES				
Entire shoreline within community	5.8-6.3	7.1-7.4	7.4-8.0	8.8-9.5
CHICKAHOMINY RIVER AND ESTUARIES				
Entire shoreline within community	5.7-5.9	6.9-7.1	7.2-7.4	8.8-9.1

The stillwater elevations for the 10-, 2-, 1-, and 0.2- percent annual chance floods have been determined for the James and the Chickahominy Rivers are shown in Table 1, "Summary of Stillwater Elevations."

The tidal surge in the Chesapeake Bay affects approximately 83 miles on Charles City County coastline. The southern coastline along James river is more prone to damaging wave action during high wind events due to the significant fetch over which winds can operate. The widths of several embayments narrow considerably. In these areas, the fetch over which winds can operate for wave generation is significantly less.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in the National Academy of Sciences (NAS) report (Reference 16). This method is based on three major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth, and the wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that the wave height may be diminished by the dissipation of energy due to the presence of obstructions such as sand dunes, dikes, seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures described in Reference 16. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

The coastal analysis and mapping for Charles City County was conducted for FEMA by RAMPP (Leonard Jackson Associates) under Contract No. HSFEHQ-09-D-0369, Task Order HSFE03-11-J-0007. The coastal analysis involved transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave setup, wave height analysis and wave runup.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 1, in accordance with the User's Manual for Wave Height Analysis (Reference 17). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at larger intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Table 2, "Transect Descriptions," provides a listing of the transect locations and stillwater elevations, as well as initial wave crest elevations.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and wave crest elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The 1-percent-annual chance stillwater elevations were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave crest elevations were determined at whole-foot increments along the transect. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. It was assumed that the beach area would erode during a major storm, thus reducing its effectiveness in decreasing wave heights.

Figure 2 is a profile for a typical transect illustrating the effects of energy dissipation and regeneration on a wave as it moves inland. This figure shows the wave crest elevations being decreased by obstructions, such as buildings, vegetation, and rising ground elevations, and being increased by open, unobstructed wind fetches. Actual conditions in Charles City County may not include all the situations illustrated in Figure 2.

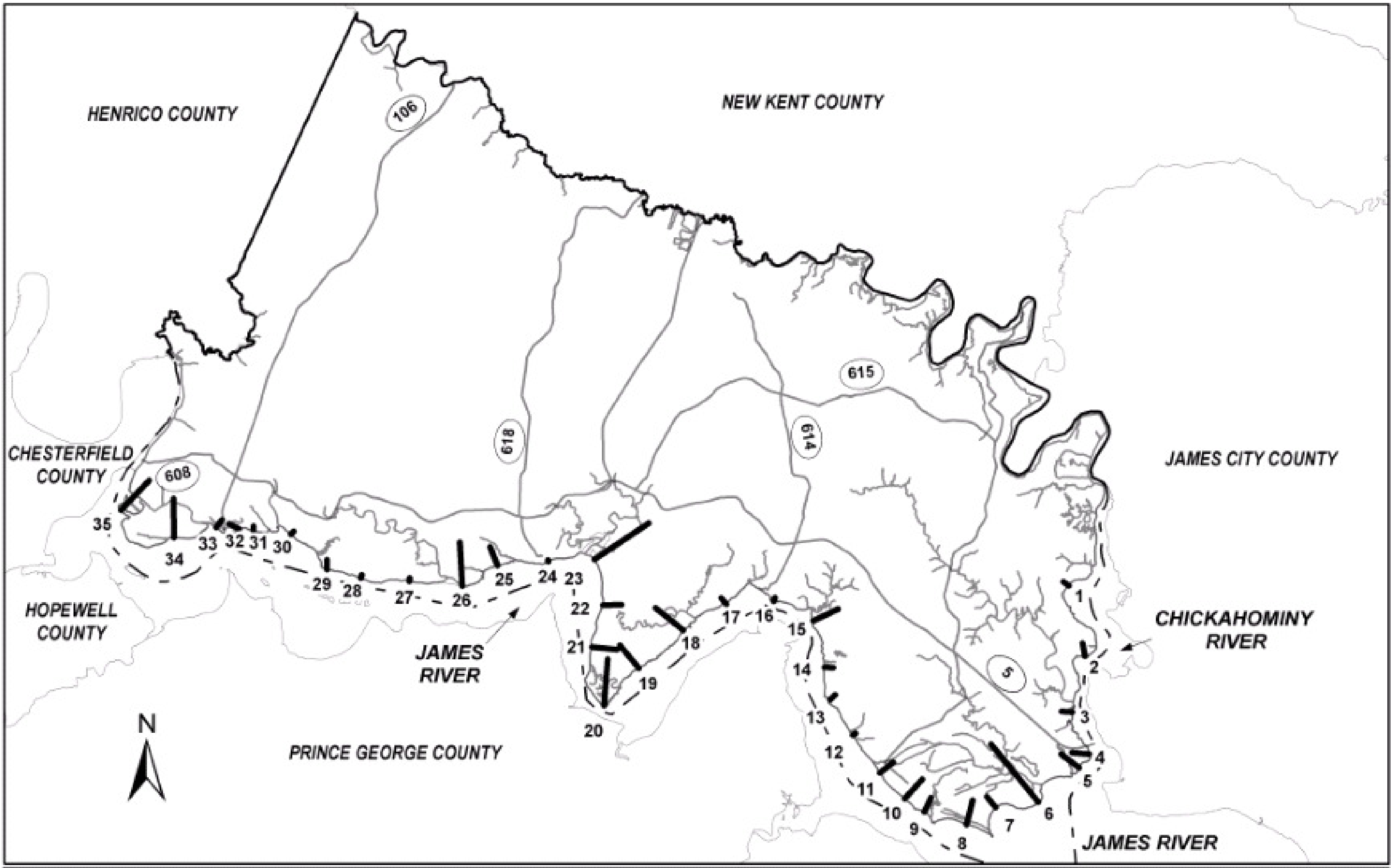

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHARLES CITY COUNTY, VA AND INCORPORATED AREAS

APPROXIMATE SCALE

2 1 0 2 4 6 8 Miles

TRANSECT LOCATION MAP

TABLE 2: TRANSECT DESCRIPTIONS

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				Zone Designation and BFE (ft NAVD 88)
		Coordinates	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
Chickahominy River	1	N 37.31374 W -76.888573	1.1	2.7	5.8	7.0	7.3	8.9	AE 9
Chickahominy River	2	N 37.291434 W -76.881452	0.9	3.0	5.8	6.9	7.3	8.9	AE 9
Chickahominy River	3	N 37.273432 W -76.886112	1.4	2.7	5.8	6.9	7.3	8.9	AE 9
Chickahominy River	4	N 37.2602 W -76.879083	1.7	2.9	5.7	6.9	7.2	9.0	VE 11
Chickahominy River	5	N 37.255817 W -76.88297	1.7	3.2	5.8	6.9	7.3	9.1	VE 12
Chickahominy River	6	N 37.244645 W -76.898909	2.1	3.9	5.8	7.0	7.3	9.1	VE 11
Chickahominy River	7	N 37.242624 W -76.91585	1.7	4.4	5.9	7.1	7.4	9.1	VE 11
James River	8	N 37.236993 W -76.927244	1.8	4.4	5.8	7.0	7.4	9.1	VE 12
James River	9	N 37.240715 W -76.944056	1.0	4.2	5.8	7.1	7.4	9.1	VE 12
James River	10	N 37.244798 W -76.952116	1.1	4.2	5.9	7.1	7.4	9.1	VE 11
James River	11	N 37.252834 W -76.962216	1.1	3.7	5.8	7.1	7.4	9.1	VE 17

TABLE 2: TRANSECT DESCRIPTIONS (continued)

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				Zone Designation and BFE (ft NAVD 88)
		Coordinates	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
James River	12	N 37.264751 W -76.973232	0.6	4.0	5.9	7.1	7.4	9.2	VE 16
James River	13	N 37.275954 W -76.982638	0.9	3.6	5.9	7.1	7.4	9.3	VE 10
James River	14	N 37.286157 W -76.985173	0.6	3.2	5.9	7.1	7.5	9.2	VE 10
James River	15	N 37.30084 W -76.989997	0.4	2.8	5.9	7.1	7.4	9.3	VE 12
James River	16	N 37.306852 W -77.00588	0.7	2.3	5.9	7.1	7.5	9.3	AE 9
James River	17	N 37.305478 W -77.024659	1.4	2.6	5.9	7.1	7.5	9.3	AE 9
James River	18	N 37.296981 W -77.041541	1.8	3.0	5.9	7.2	7.5	9.5	VE 10
James River	19	N 37.284603 W -77.05895	1.6	3.2	6.0	7.2	7.6	9.4	VE 11
James River	20	N 37.272455 W -77.072464	1.7	3.3	5.9	7.3	7.6	9.4	VE 10
James River	21	N 37.291038 W -77.077863	1.7	3.1	6.0	7.3	7.6	9.3	VE 11
James River	22	N 37.304487 W -77.073764	1.5	2.8	6.0	7.3	7.6	8.9	VE 10

TABLE 2: TRANSECT DESCRIPTIONS (continued)

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				Zone Designation and BFE (ft NAVD 88)
		Coordinates	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
James River	23	N 37.318866 W -77.077542	1.1	2.6	6.0	7.3	7.6	8.8	VE 10
James River	24	N 37.317857 W -77.09589	1.5	2.7	6.0	7.3	7.7	8.9	VE 13
James River	25	N 37.316265 W -77.116054	1.3	3.1	6.1	7.4	7.7	9.1	VE 10
James River	26	N 37.309571 W -77.12994	0.9	3.4	6.1	7.4	7.7	9.3	VE 10
James River	27	N 37.310679 W -77.151028	1.0	2.5	6.1	7.5	7.8	9.4	VE 13
James River	28	N 37.311328 W -77.170453	1.0	3.2	6.2	7.5	7.9	8.9	VE 14
James River	29	N 37.313747 W -77.183924	1.3	3.2	6.2	7.6	7.9	8.8	VE 11
James River	30	N 37.324791 W -77.198544	0.9	3.2	6.2	7.6	7.9	9.1	VE 11
James River	31	N 37.325672 W -77.213616	0.9	3.1	6.2	7.6	7.9	9.0	VE 15
James River	32	N 37.326065 W -77.219284	0.8	3.1	6.2	7.6	8.0	9.4	VE 10
James River	33	N 37.326422 W -77.228412	0.9	3.2	6.3	7.7	8.0	8.9	VE 10

TABLE 2: TRANSECT DESCRIPTIONS (continued)

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				Zone Designation and BFE (ft NAVD 88)
		Coordinates	Significant Wave Height Hs (ft)	Peak Wave Period Tp (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
James River	34	N 37.322894 W -77.245087	1.6	3.1	6.3	7.7	8.0	8.8	VE 11
James River	35	N 37.331124 W -77.266467	1.5	3.1	6.3	7.7	8.0	8.9	VE 10

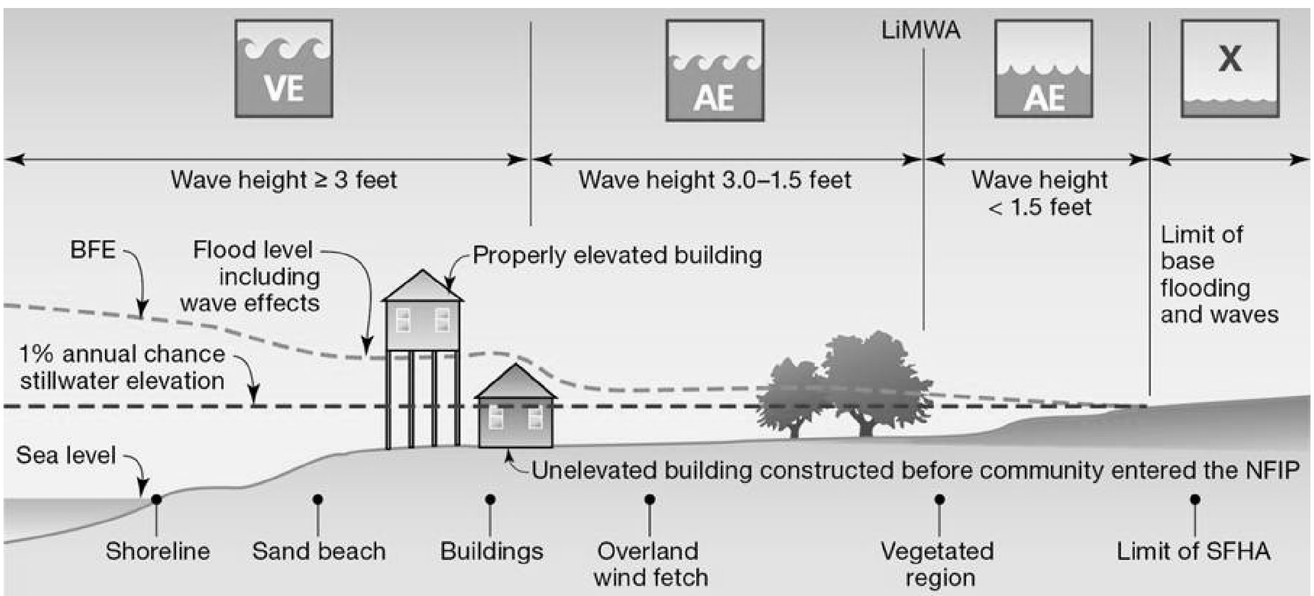

FIGURE 2 – TRANSECT SCHEMATIC

All qualifying benchmarks within a given jurisdiction that are catalogued by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Benchmarks catalogued 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 (e.g., mounted in bedrock)

- Stability B: Monuments which generally hold their position/elevation (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)

In addition to NSRS benchmarks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

3.2 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the completion of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are now prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are now referenced to NAVD 88. In order to perform this conversion, effective NGVD 29 elevation values were adjusted downward by 1.04 feet. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191
http://www.ngs.noaa.gov/

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1 percent annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2 percent annual chance flood elevations; delineations of the 1 percent and 0.2 percent annual chance floodplains; and a 1 percent annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, and Floodway Data tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1 percent annual chance and 0.2 percent annual chance boundaries have been determined at each cross section. The delineations are based on the best available topographic information.

Pre-countywide Analysis

For the flooding sources studied in detail, the 1 percent and 0.2 percent annual chance floodplain boundaries have been delineated using topographic maps at a scale of 1:24,000 with contour intervals of 5 and 10 feet (Reference 9).

For the flooding sources studied by approximate methods, the 1 percent annual chance floodplain boundaries were delineated using the Flood Hazard Boundary Map for the unincorporated areas of Charles City County (Reference 10).

Countywide Revision

Floodplains were spatially adjusted to fit the best available stream centerline data. Also, floodplain boundaries from the jurisdictions outlined in section 1.1 have been combined in the March 19, 2009, countywide revision.

The 1 percent and 0.2 percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1 percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2 percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1 percent and 0.2 percent annual chance floodplain boundaries are close together, only the 1 percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1 percent annual chance floodplain boundary is shown on the FIRM (Exhibit).

Physical Map Revision

The 1 percent and 0.2 percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1 percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AO, and VE), and the 0.2 percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1 percent and 0.2 percent annual chance floodplain boundaries are close together, only the 1 percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. Floodplain boundaries were delineated from 2011 LiDAR based mass points complied to meet a 3.5 foot horizontal accuracy (Reference 18).

Areas of coastline subject to significant wave attack are referred to as coastal high hazard zones. The USACE has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high hazard zones (Reference 19). The 3-foot wave has been determined the minimum size wave capable of causing major damage to conventional wood frame of brick veneer structures. The one exception to the 3-foot wave criteria is where a primary frontal dune exists. The limit the coastal high hazard area then becomes the landward toe of the primary frontal dune or where a 3-foot or greater breaking wave exists, whichever is most landward. The coastal high hazard zone is depicted on the FIRMs as Zone VE, where the delineated flood hazard includes wave heights equal to or greater than three feet.

Post-storm field visits and laboratory tests have confirmed that wave heights as small as 1.5 feet can cause significant damage to structures when constructed without consideration to the coastal hazards. Additional flood hazards associated with coastal waves include floating debris, high velocity flow, erosion, and scour which can cause damage to Zone AE-type construction in these coastal areas. To help community officials and property owners recognize this increased potential for damage due to wave action in the AE zone, FEMA issued guidance in December 2008 on identifying and mapping the 1.5-foot wave height line, referred to as the Limit of Moderate Wave Action (LiMWA). While FEMA does not impose floodplain management requirements based on the LiMWA, the LiMWA is provided to help communicate the higher risk that exists in that area. Consequently, it is important to be aware of the area between this inland limit and the Zone VE boundary as it still poses a high risk, though not as high of a risk as Zone VE.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1 percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1 percent annual chance floodplains that are determined in the FIS 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.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2 percent annual chance floodplain, areas within the 0.2 percent annual chance floodplain, and to areas of 1 percent annual chance flooding where average depths are less than 1 foot, areas of 1 percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1 percent annual chance flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0. In the 1 percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1 percent and 0.2 percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Charles City County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 3, "Community Map History."

7.0 OTHER STUDIES

Flood Insurance Studies were prepared for the unincorporated areas of James City County, Surry County, and New Kent County (References 20, 21, and 22). The results of those studies are in complete agreement with the results of the September 5, 1990, FIS study for the unincorporated areas of Charles City County.

Flood Insurance Studies have been prepared for the unincorporated areas of Henrico County, Chesterfield County, and Prince George County (References 23, 24, and 25). The results of the September 5, 1990, FIS study for the unincorporated areas of Charles City County are in general agreement with the results of those studies.

There is an on-going PMR Flood Insurance Study for the New Kent County and incorporated areas (Reference 26). The results in the *(date)* FIS, for the incorporated areas will be in complete agreement with the results of the Flood Insurance Study.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Charles City County has been complied into this FIS. Therefore, this FIS supersedes all previously printed FIS reports, and FIRMs for all of the incorporated and unincorporated jurisdictions within Charles City County.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Charles City County, Unincorporated Areas	January 17, 1975	None	March 16, 2009	September 5, 1990 March 16, 2009

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHARLES CITY COUNTY, VA AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, Federal Emergency Management Agency, One Independence Mall, Sixth Floor, 615 Chestnut Street, Philadelphia, Pennsylvania 19106-4404.

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