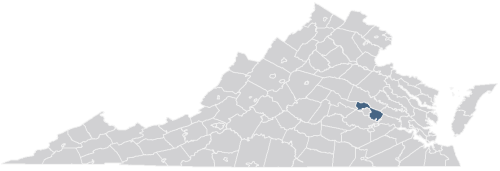
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 2



HENRICO COUNTY, VA

(ALL JURISDICTIONS)

COMMUNITY NAME	COMMUNITY NUMBER
HENRICO COUNTY, UNINCORPORATED AREAS	510077

FEMA

REVISED:

April 25, 2024

FLOOD INSURANCE STUDY NUMBER
51087CV001B
Version Number 2.8.5.6

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FLOOD INSURANCE STUDY REPORT
HENRICO COUNTY, VIRGINIA

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

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

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

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

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

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60, *Criteria for Land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were

built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

1.2 Purpose of this Flood Insurance Study Report

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

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

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Henrico County, Virginia**.**

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

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Henrico County, Unincorporated Areas	510077	02080205, 02080206	51087C0009D, 51087C0017D, 51087C0019D, 51087C0028D, 51087C0029D, 51087C0033D, 51087C0034D, 51087C0036D, 51087C0037D, 51087C0038D, 51087C0039D, 51087C0041D, 51087C0042D, 51087C0043D, 51087C0044D, 51087C0053D, 51087C0061D, 51087C0062D, 51087C0063D, 51087C0064D, 51087C0066D, 51087C0068D, 51087C0069D, 51087C0082D, 51087C0084D, 51087C0092D, 51087C0101D, 51087C0102D, 51087C0103D, 51087C0104D, 51087C0106D, 51087C0107D, 51087C0108D, 51087C0109D, 51087C0111D, 51087C0112D, 51087C0116D, 51087C0117D, 51087C0126D, 51087C0127D, 51087C0128D, 51087C0129D[1], 51087C0131D, 51087C0132D, 51087C0133D, 51087C0134D, 51087C0141D[1], 51087C0142D, 51087C0143D, 51087C0144D, 51087C0153D, 51087C0154D, 51087C0160D, 51087C0161D, 51087C0162D, 51087C0163D, 51087C0164D, 51087C0170D, 51087C0190D, 51087C0206D, 51087C0207D, 51087C0208D, 51087C0209D, 51087C0216D, 51087C0217D, 51087C0219D, 51087C0229D, 51087C0230D, 51087C0235D, 51087C0236D, 51087C0237D, 51087C0238D, 51087C0239D, 51087C0241D, 51087C0242D, 51087C0243D, 51087C0244D, 51087C0255D, 51087C0260D, 51087C0263D, 51087C0265D, 51087C0276D, 51087C0281D, 51087C0282D	

[1] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent

annual chance flood elevations (the 1-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains; and 1-percent-annual-chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

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

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

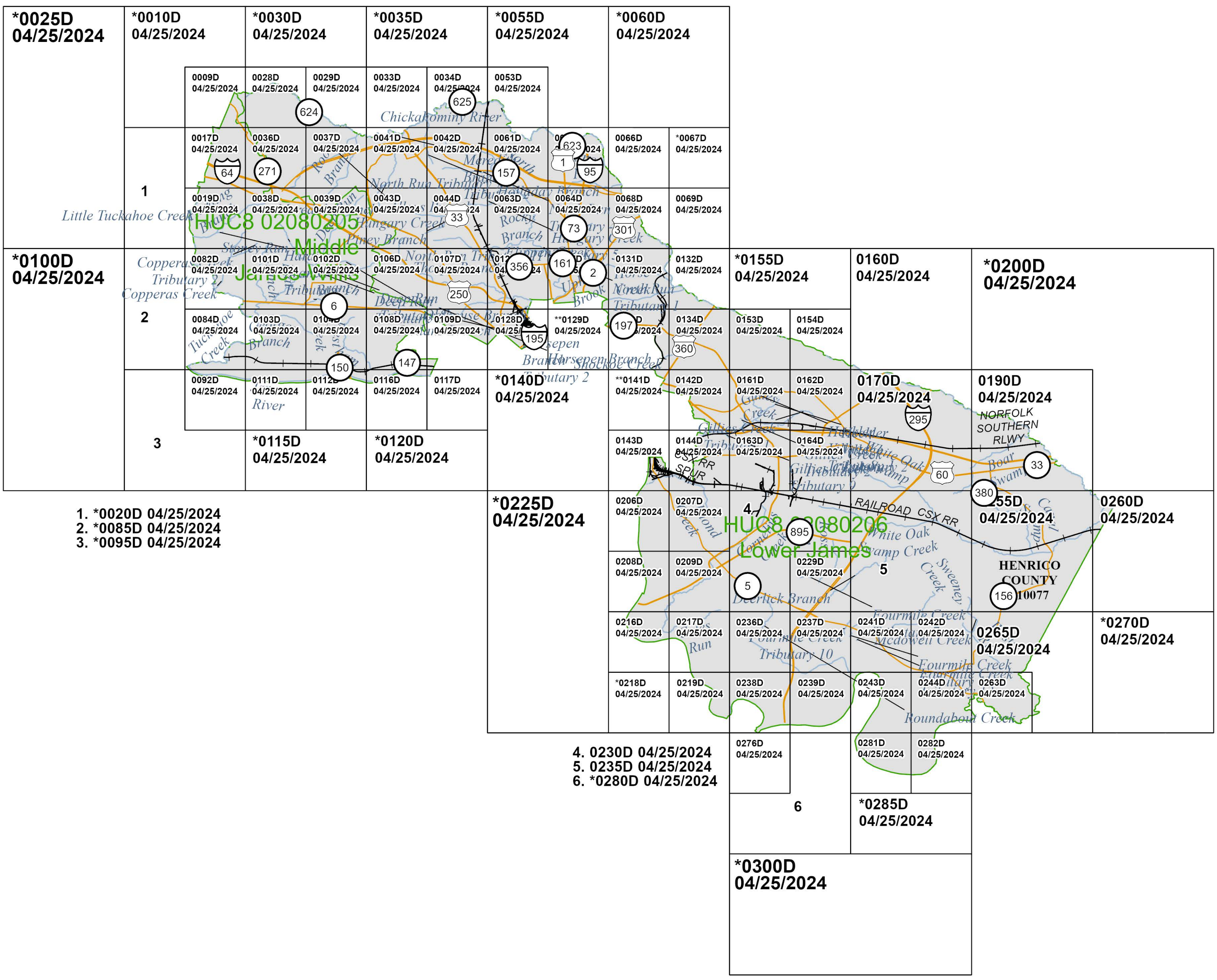
  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 30, "Map Repositories," within this FIS Report.

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

  The initial Countywide FIS Report for Henrico County became effective on December 18, 2007. Refer to Table 27 for information about subsequent revisions to the FIRMs.

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

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



1 inch = 25,109 feet 1:301,308

0 10,000 20,000 40,000 60,000 feet

Map Projection:
GCS WGS 1984
Vertical Datum: NAVD88

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

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

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

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX

HENRICO COUNTY, VIRGINIA All Jurisdictions

PANELS PRINTED:

0009, 0017, 0019, 0028, 0029, 0033, 0034, 0036, 0037, 0038, 0039, 0041, 0042, 0043, 0044, 0053, 0061, 0062, 0063, 0064, 0066, 0068, 0069, 0082, 0084, 0092, 0101, 0102, 0103, 0104, 0106, 0107, 0108, 0109, 0111, 0112, 0116, 0117, 0126, 0127, 0128, 0131, 0132, 0133, 0134, 0142, 0143, 0144, 0153, 0154, 0160, 0161, 0162, 0163, 0164, 0170, 0190, 0206, 0207, 0208, 0209, 0216, 0217, 0219, 0229, 0230, 0235, 0236, 0237, 0238, 0239, 0241, 0242, 0243, 0244, 0255, 0260, 0263, 0265, 0276, 0281, 0282

FEMA

MAP NUMBER
51087CIND1D

EFFECTIVE DATE
April 25, 2024

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

Figure 2: FIRM Notes to Users

NOTES TO USERS

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

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

For community and countywide map dates, refer to Table 27 in this FIS Report.

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

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

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

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

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

Figure 2. FIRM Notes to Users (continued)

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

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane, Virginia South FIPS 4502 Feet. The horizontal datum was the North American Datum of 1983 NAD83. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 30 of this FIS Report.

BASE MAP INFORMATION: Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Dates include most recently refreshed data. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

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

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Henrico County, Virginia, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 27 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Henrico County, Virginia, effective April 25, 2024.

Figure 2. FIRM Notes to Users (continued)

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

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

Figure 3: Map Legend for FIRM

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

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

Figure 3: Map Legend for FIRM (continued)

OTHER AREAS OF FLOOD HAZARD

Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.

Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood

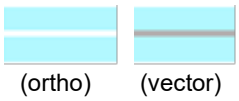
Area with Flood Risk due to Levee: Areas where a non-accredited levee, dike, or other flood control structure is shown as providing protection to less than the 1% annual chance flood.

OTHER AREAS

Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

Unshaded Zone X: Areas of minimal flood hazard.

FLOOD HAZARD AND OTHER BOUNDARY LINES



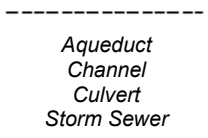
Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)

Limit of Study

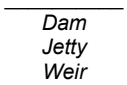
Jurisdiction Boundary

Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

GENERAL STRUCTURES

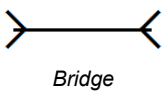


Channel, Culvert, Aqueduct, or Storm Sewer



Dam, Jetty, Weir

Levee, Dike, or Floodwall



Bridge

Figure 3: Map Legend for FIRM (continued)

REFERENCE MARKERS	
22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
8	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
513	Base Flood Elevation Line
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad

Figure 3: Map Legend for FIRM (continued)

_____	Horizontal Reference Grid Line
⎯⎯	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
^{42}**76**^{000m}**E**	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

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

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

Depending on the accuracy of available topographic data (Table 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1-percent and 0.2-percent-annual-chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1-percent-annual-chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Henrico County, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 12. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1-percent-annual-chance floodplain corresponds to the SFHAs. The 0.2-percent-annual-chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Allens Branch	Henrico County, Unincorporated Areas	At confluence with Chickahominy River	Approximately 400 feet upstream from Fords Country Lane	02080206	1.4	Y	AE	06/01/2005
Cabin Branch	Henrico County, Unincorporated Areas	Approximately 700 feet upstream from State Route 6 (Patterson Avenue)	Approximately 1,700 feet upstream from State Route 157 (Gaskins Road)	02080205	0.6	N	AE	07/17/2009
Cabin Branch Tributary 1	Henrico County, Unincorporated Areas	At confluence with Cabin Branch	Approximately 400 feet upstream from confluence with Cabin Branch	02080205	0.1	N	AE	07/17/2009
Chickahominy River	Henrico County, Unincorporated Areas	Approximately 2,800 feet downstream from the confluence of White Oak Swamp Creek	Approximately 300 feet downstream from Creighton Road	02080206	12.7	N	A	05/31/2018
Chickahominy River	Henrico County, Unincorporated Areas	Approximately 300 feet downstream from Creighton Road	Approximately 400 feet upstream from Cauthorne Road	02080206	28.6	N	AE	11/20/2020
Copperas Creek	Henrico County, Unincorporated Areas	At confluence with Tuckahoe Creek	Approximately 300 feet upstream from Church Road	02080205	2.5	Y	AE	06/01/2005
Copperas Creek Tributary 2	Henrico County, Unincorporated Areas	At confluence with Copperas Creek	Appriximately 2,000 feet upstream from Cambridge Drive	02080205	0.6	Y	AE	06/01/2005
Cosby Parcel Branch	Henrico County, Unincorporated Areas	At confluence with Chickahominy River	Approximately 1,100 feet upstream from confluence with Chickahominy River	02080206	0.2	N	A	01/13/2021

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Deep Run	Henrico County, Unincorporated Areas	At confluence with Tuckahoe Creek	At Interstate 64	02080205	4.9	Y	AE	06/01/2005
Fourmile Creek	Henrico County, Unincorporated Areas	At confluence with James River	Approximately 1,900 feet upstream from Doran Road	02080206	6.3	Y	AE	06/01/2005
Gillies Creek	Henrico County, Unincorporated Areas	At confluence with James River	Approximately 1,000 feet upstream of East Richmond Road	02080206	2.3	Y	AE	03/25/2020
Gillies Creek	Henrico County, Unincorporated Areas	Approximately 3,500 feet upstream from confluence with Stony Run	At confluence with Gillies Creek T2	02080206	2.6	Y	AE	06/01/2005
Gillies Creek Tributary 1	Henrico County, Unincorporated Areas	At confluence with Gillies Creek	Approximately 300 feet upstream from South Kalmia Avenue	02080206	1.7	Y	AE	06/01/2005
Harding Branch	Henrico County, Unincorporated Areas	At confluence with Tuckahoe Creek	At Three Chopt Road	02080205	2.5	Y	AE	06/01/2005
Harding Branch Tributary 1	Henrico County, Unincorporated Areas	At confluence with Harding Branch	At Lauderdale Drive	02080205	0.2	Y	AE	06/01/2005
Heckler Village Tributary 1	Henrico County, Unincorporated Areas	At confluence with Gillies Creek	At Nine Mile Road	02080206	0.9	Y	AE	06/01/2005
Heckler Village Tributary 2	Henrico County, Unincorporated Areas	At confluence with Heckler Village Tributary 1	Approximately 900 feet upstream of Yates Lane	02080206	0.8	Y	AE	06/01/2005
Horsepen Branch	Henrico County, Unincorporated Areas	At confluence with Upham Brook	At Orchard Road	02080206	1.8	Y	AE	06/01/2005

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Hungary Creek	Henrico County, Unincorporated Areas	At confluence with North Run	Approximately 200 feet upstream from confluence with Hungary Creek Unnamed Tributary	02080206	3.4	Y	AE	06/01/2005
James River	Henrico County, Unincorporated Areas	Approximately 20,500 feet upstream of Roxbury Road	Approximately 9,200 feet downstream of World War II Veterans Memorial Highway	02080205, 02080206	44.8	Y	AE	03/25/2020
James River	Henrico County, Unincorporated Areas	Approximately 9,200 feet downstream of World War II Veterans Memorial Highway	Approximately 11,200 feet downstream of World War II Veterans Memorial Highway	02080205	0.4	Y	AE	08/31/2020
Jordans Branch	Henrico County, Unincorporated Areas	Approximately 2,400 feet upstream from confluence with Upham Brook	At West Broad Street	02080206	1.8	Y	AE	06/01/2005
Jordans Branch	Henrico County, Unincorporated Areas	At West Broad Street	Approximately 300 feet upstream from West Broad Street	02080206	0.1	Y	AE	04/07/2014
Little Tuckahoe Creek	Henrico County, Unincorporated Areas	At confluence with Tuckahoe Creek	Approximately 1,000 feet downstream of US Highway 250	02080205	1.3	Y	AE	08/31/2020
Little Tuckahoe Creek Tributary 2	Henrico County, Unincorporated Areas	At confluence with Little Tuckahoe Creek	Approximately 1,000 feet upstream from Little Tuckahoe Creek	02080205	0.2	Y	AE	02/08/2021
Meredith Branch	Henrico County, Unincorporated Areas	At confluence with Chickahominy River	Approximately 1,200 feet upstream from confluence with Meredith Branch T1	02080206	2.5	Y	AE	06/01/2005

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
North Run	Henrico County, Unincorporated Areas	At confluence with Upham Brook	Approximately 1,000 feet downstream from East Parham Road	02080206	2.7	Y	AE	06/01/2005
North Run	Henrico County, Unincorporated Areas	Approximately 1,000 feet downstream from East Parham Road	Approximately 700 feet upstream from State Route 157 (Mountain Road)	02080206	3.2	Y	AE	12/12/2012
Rocky Branch	Henrico County, Unincorporated Areas	At confluence with North Run	At Rumford Road	02080206	2.3	Y	AE	06/01/2005
Rooty Branch	Henrico County, Unincorporated Areas	Approximately 200 feet upstream from Cox Road	At Cox Road	02080206	0.4	Y	AE	06/01/2005
Shockoe Creek	Henrico County, Unincorporated Areas	At CSX Railroad	Approximately 500 feet upstream from CSX Railroad	02080206	0.1	N	A	06/15/2021
Stoney Run	Henrico County, Unincorporated Areas	At confluence with Deep Run	Approximately 500 feet upstream from Church Road	2080205	2.1	Y	AE	06/01/2005
Stony Run	Henrico County, Unincorporated Areas	At confluence with Gillies Creek	At confluence With Stony Run Tributary 1	2080206	1.9	Y	AE	03/25/2020
Thorpe Branch	Henrico County, Unincorporated Areas	At confluence with North Run	At CSX Railroad	02080206	1.8	Y	AE	06/01/2005
Tributary A To Gillies Creek Tributary 1	Henrico County, Unincorporated Areas	At confluence with Gillies Creek Tributary 1	Approximately 1,200 feet upstream from Yates Lane	2080206	0.6	Y	AE	06/01/2005
Tributary A To Gillies Creek Tributary 1 Tributary	Henrico County, Unincorporated Areas	At confluence with Tributary A to Gillies Creek Tributary 1	At South Lake Street	2080206	0.3	Y	AE	06/01/2005

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Tuckahoe Creek	Henrico County, Unincorporated Areas	At confluence with James River	Approximately 3,600 feet downstream of Jurusalem Church Road	2080205	9.4	Y	AE	08/31/2020
Upham Brook	Henrico County, Unincorporated Areas	Near Stoneliegh Road (City of Richmond/ Henrico County Boundary)	At Bethlehem Road	02080206	2.3	Y	AE	06/01/2005
Upham Brook	Henrico County, Unincorporated Areas	Approximately 3,000 feet upstream from confluence with Jordan's Branch	Approximately 2,500 feet upstream from Wilkinson Road	02080206	5.1	Y	AE	06/01/2005
Zone A reaches in HUC 02080205	Henrico County, Unincorporated Areas	Various	Various	02080205	7.4	N	A	03/25/2020
Zone A reaches in HUC 02080206 not otherwise listed	Henrico County, Unincorporated Areas	Various	Various	02080206	83.4	N	A	03/25/2020

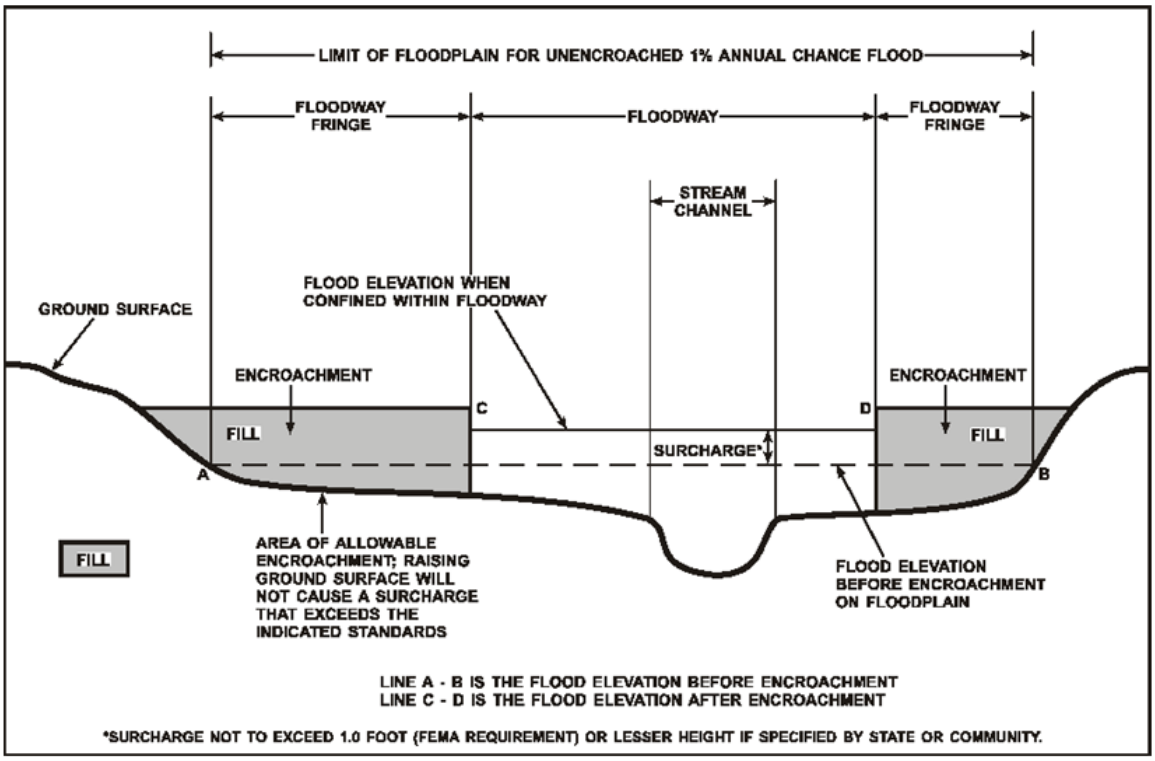
2.2 Floodways

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

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

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

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, “Floodway Data.”

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

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

BFEs are primarily intended for flood insurance rating purposes. Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. For example, the user may use the FIRM to determine the stream station of a location of interest and then use the profile to determine the 1-percent annual chance elevation at that location. Because only selected cross sections may be shown on the FIRM for riverine areas, the profile should be used to obtain the flood elevation between mapped cross sections. Additionally, for riverine areas, whole-foot elevations shown on the FIRM may not exactly reflect the elevations derived from the hydraulic analyses; therefore, elevations obtained from the profile may more accurately reflect the results of the hydraulic analysis.

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk Project.

2.5 Coastal Flood Hazard Areas

This section is not applicable to this Flood Risk Project.

2.5.1 Water Elevations and the Effects of Waves

This section is not applicable to this Flood Risk Project.

Figure 5: Wave Runup Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

This section is not applicable to this Flood Risk Project.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this Flood Risk Project.

Figure 6: Coastal Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this Flood Risk Project.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

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

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

Table 3 lists the flood insurance zones in Henrico County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Henrico County, Unincorporated Areas	A, AE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Lower James	02080206	James River	Drains the eastern majority of the county into James River	1,441
Middle James-Willis	02080205	James River	Drains the northwest portion of the county into James River	945

4.2 Principal Flood Problems

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

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
All sources	Three types of storms cause flooding in the study area: thunderstorms, hurricane storms, and frontal storms. The summer thunderstorms, with high-intensity short-duration rainfall, are the major cause of flooding. The hurricanes create flood conditions by producing excessive amounts of rain. Frontal storms may cause flooding depending on antecedent conditions. Significant floods have occurred in the vicinity of the study area as a result of these three types of storms. Major hurricanes to hit Northern Virginia area include Camille in 1969, Agnes in 1972, Floyd in 1999, Isabel in 2003, Irene in 2011 and Sandy in 2012, all of which caused substantial damage.
James River	Low-lying areas along the James River are subject to periodic flooding. The flood of May 1771 is considered the greatest in the James River basin since the settlement of Jamestown in 1607. One of the largest floods recorded in recent times occurred in June 1972 as a result of intense rainfall associated with tropical storm Agnes. Tropical storms are responsible for some of the larger floods experienced on the James River. Flooding from these storms almost always occurs in the period from May through November, which is the hurricane season. Large floods have occurred on the James River near Richmond as follows (FEMA 2007).
Tuckahoe Creek Watershed	Flood problems on Tuckahoe Creek, Little Tuckahoe Creek, Deep Run and Stoney Run are not serious and damage is slight. Flooding results either from intense short-duration rainfall over the area or from backwater from the James River. Flooding is also somewhat aggravated by the limited waterway openings in railroad and highway fills (FEMA 2007). Some flooding of low-lying homes occurred during the June 1972 flood. Residential development of the area is now occurring, and, as the watershed is developed, there is a potential for aggravated flooding because of increased runoff and encroachment of flood plains.
Gillies Creek Watershed	Flooding in the upper portion of the Gillies Creek watershed has gone almost unnoticed in the past, because the flood plain has been practically undeveloped. Consequently, the flood problem is not serious and damage is slight. Flooding is aggravated by the limited waterway openings in railroad and highway fills. Many of the culverts are inadequate to pass the higher flood flows, thereby inundating the roadways and producing some backwater effects upstream (FEMA 2007).
Upham Brook Watershed	The flooding problem in the Upham Brook watershed stems from the inability of the natural watercourse to contain all of the runoff which results from intense rainfall over the watershed. The problem has been partially alleviated by channel improvements by the City of Richmond and Henrico County on Jordans Branch, by Henrico County on Horsepen Branch, and by the Virginia Department of Highways on the upper portion of Upham Brook during construction of 1-64. Removal of low-lying houses in the Capistrano Gardens area by Henrico County has practically eliminated the flood problem in this area. Flooding is also somewhat aggravated by the limited channel area at many of the numerous highway and other stream crossings in the watershed. Floodwaters pond up in back of many of the roadfills, and in some instances actually overtop the roadway (FEMA 2007)

Table 6 contains information about historic flood elevations in Henrico County.

Table 6: Historic Flooding Elevations

[Not Applicable to this Flood Risk Project]

4.3 Non-Levee Flood Protection Measures

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

Table 7: Non-Levee Flood Protection Measures

[Not Applicable to this Flood Risk Project]

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 8: Levees

[Not Applicable to this Flood Risk Project]

SECTION 5.0 – ENGINEERING METHODS

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

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

In addition to these flood events, the “1-percent-plus”, or “1%+”, annual chance flood elevation has been modeled and included on the flood profile for certain flooding sources in this FIS Report. While not used for regulatory or insurance purposes, this flood event has been calculated to help illustrate the variability range that exists between the regulatory 1-percent-annual-chance flood elevation and a 1-percent-annual-chance elevation that has taken into account an additional amount of uncertainty in the flood discharges (thus, the 1% “plus”). For flooding sources whose discharges were estimated using regression equations, the 1%+ flood elevations are derived by taking the 1-percent-annual-chance flood discharges and increasing the modeled discharges by a percentage equal to the average predictive error for the regression equation. For flooding sources with gage- or rainfall-runoff-based discharge estimates, the upper 84-percent confidence limit of the discharges is used to compute the 1%+ flood elevations.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 26, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. Discharges for flooding sources designated as Zone A on the FIRM are not shown in Table 9 of this FIS report, however, discharge values are included in the FIRM database in the S_Nodes feature class and L_Summary_Discharges table. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 10. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 16.) Stream gage information is provided in Table 11.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Allens Branch	Above confluence with Rooty Branch	3.5	987	*	1,725	2,155	3,290
Allens Branch	0.5 mile upstream of confluence with Rooty Branch	3.4	962	*	1,682	2,102	3,209
Allens Branch	Just downstream of Fords Country Lane	3.2	923	*	1,616	2,020	3,085
Chickahominy River	Approximately 1,500 feet downstream from Creighton Road	131.3	3,798	5,542	7,067	8,813	16,167
Chickahominy River	Approximately 1,500 feet upstream from Creighton Road	130.3	3,789	5,530	7,050	8,792	16,130
Chickahominy River	Approximately 3,200 feet upstream from Creighton Road	128.9	3,778	5,514	7,030	8,766	16,086
Chickahominy River	Approximately 6,000 feet upstream from Creighton Road	114.5	3,659	5,341	6,812	8,495	15,607
Chickahominy River	At US Highway 360 (Mechanicsville Pike)	110.7	3,628	5,296	6,756	8,426	15,485
Chickahominy River	Approximately 3,500 feet upstream from US Highway 360	110.4	3,625	5,292	6,751	8,420	15,473
Chickahominy River	Approximately 4,500 feet downstream from County Road 627	109.2	3,615	5,278	6,733	8,398	15,436
Chickahominy River	Below Upham Brook	90.9	5,900	*	8,400	9,700	13,800
Chickahominy River	At CSX Railroad	66.3	3,020	4,430	5,674	7,098	13,159
Chickahominy River	Approximately 3,000 feet upstream from CSX Railroad	64.8	3,009	4,415	5,655	7,076	13,119
Chickahominy River	Approximately 4,500 feet downstream from Chamberlayne Road	63.6	3,001	4,404	5,641	7,058	13,088
Chickahominy River	Approximately 1,500 feet downstream from Chamberlayne Road	63.1	2,998	4,399	5,635	7,051	13,075
Chickahominy River	At US Highway 301	62.7	2,996	4,396	5,631	7,046	13,067
Chickahominy River	At Interstate 295	61.5	2,970	4,376	5,617	7,042	13,136

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Chickahominy River	At confluence with Grassy Swamp Creek	23.7	2,814	4,158	5,346	6,714	12,582
Chickahominy River	At confluence with Holladay Branch	22.6	2,768	4,094	5,267	6,617	12,416
Chickahominy River	Approximately 900 feet upstream from confluence with Holladay Branch	21.9	2,720	4,026	5,181	6,511	12,231
Chickahominy River	At confluence with Meredith Branch	17.4	2,404	3,574	4,614	5,813	11,000
Chickahominy River	Approximately 2,300 feet upstream from US Highway 33	16.5	2,342	3,485	4,502	5,675	10,757
Chickahominy River	Approximately 1,300 feet downstream from confluence with Allens Branch	14.2	2,163	3,228	4,178	5,276	10,048
Chickahominy River	At confluence with Allens Branch	8.6	1,651	2,489	3,243	4,118	7,970
Chickahominy River	At Bennett Court	7.2	1,503	2,274	2,969	3,778	7,353
Chickahominy River	Approximately 1,000 feet upstream from County Road 624	4.2	1,121	1,715	2,256	2,887	5,720
Chickahominy River	At Cherr Hill Drive	2.3	808	1,251	1,658	2,137	4,317
Chickahominy River	Approximately 500 feet downstream from Dominion Club Drive	1.2	583	914	1,221	1,584	3,263
Chickahominy River	At Manor Park Drive	0.9	490	774	1,038	1,351	2,814
Copperas Creek	At Mouth	1.8	1,340	*	2,184	2,735	4,024
Copperas Creek	760 feet downstream of Lauderdale Drive	1.7	1,290	*	2,104	2,636	3,880
Copperas Creek	100 feet upstream of Lauderdale Drive	1.5	1,219	*	1,992	2,496	3,677
Copperas Creek	375 feet downstream of Cambridge Drive	1.4	1,170	*	1,915	2,400	3,536
Copperas Creek	830 feet upstream of Cambridge Drive	1.3	1,087	*	1,783	2,235	3,297
Copperas Creek	800 feet below confluence with Copperas Creek Tributary 2	1.2	1,026	*	1,685	2,114	3,120
Copperas Creek	Above confluence with Copperas Creek Tributary 2	0.6	700	*	1,164	1,462	2,168
Copperas Creek	0.4 mile downstream of Church Road	0.5	603	*	1,006	1,265	1,879
Copperas Creek	0.6 mile downstream of Church Road	0.3	474	*	798	1,004	1,496

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Copperas Creek Tributary 2	At Mouth	0.4	522	*	876	1,102	1,639
Copperas Creek Tributary 2	180 feet downstream of Ridgefield Parkway	0.3	454	*	764	963	1,434
Deep Run	Above confluence of Stony Run	4.7	2,000	*	2,600	2,850	3,600
Deep Run	Interstate Route 64	1.2	1,650	*	2,100	2,350	2,800
Fourmile Creek	At Mouth	19.8	1,429	*	2,368	2,923	4,428
Fourmile Creek	Above confluence with Fourmile Creek Tributary 14	18.9	1,280	*	2,142	2,645	4,026
Fourmile Creek	Above confluence with Bailey Creek	13.7	1,023	*	1,729	2,137	3,266
Fourmile Creek	Above confluence with Fourmile Creek Tributary 11	12.5	968	*	1,639	2,026	3,099
Fourmile Creek	0.3 mile downstream of New Market Road	10.9	893	*	1,516	1,875	2,871
Fourmile Creek	Above confluence with Deerlick Branch	5.5	615	*	1,055	1,307	2,007
Fourmile Creek Tributary 7	At Mouth	1.8	307	*	541	694	1,064
Fourmile Creek Tributary 7	100 feet upstream of footbridge	1.8	304	*	536	687	1,055
Gillies Creek	Approximately 3,290 feet from Government Road	13.8	3,015	4,348	5,406	6,987	16,251
Gillies Creek	Approximately 3,620 feet from Government Road	8.8	2,365	3,354	4,185	5,432	12,132
Gillies Creek	Laburnun Avenue	6.5	1,700	*	3,200	3,800	5,900
Gillies Creek	950 feet downstream of Laburnum Avenue	6.3	1,528	*	2,385	2,954	4,328
Gillies Creek	Above confluence with Heckler Village Tributary 1	5.0	1,324	*	2,077	2,575	3,779

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Gillies Creek	Above confluence with Gillies Creek Tributary 1	2.9	949	*	1,506	1,870	2,755
Gillies Creek Tributary 1	At Mouth	2.0	1,260	*	2,124	2,575	3,833
Gillies Creek Tributary 1	0.4 mile downstream of Oakleys Lane	1.9	446	*	755	938	1,425
Gillies Creek Tributary 1	0.2 mile downstream of Oakleys Lane	1.7	425	*	720	896	1,362
Gillies Creek Tributary 1	940 feet upstream of Oakleys Lane	1.4	374	*	637	792	1,207
Gillies Creek Tributary 1	530 feet downstream of Holly Avenue	0.5	317	*	522	652	973
Gillies Creek Tributary 1	Kalmia Avenue	0.4	283	*	469	586	876
Harding Branch	At Mouth	1.8	1,360	*	2,215	2,774	4,080
Harding Branch	Dam	1.6	1,255	*	2,048	2,566	3,779
Harding Branch	Above confluence with Harding Branch Tributary 1	1.2	1,059	*	1,738	2,180	3,216
Harding Branch	710 feet upstream of confluence with Harding Branch Tributary 1	1.1	992	*	1,631	2,047	3,022
Harding Branch	30 feet downstream of Church Road	1.0	949	*	1,562	1,960	2,895
Harding Branch	0.2 miles downstream of Gayton Road	0.9	862	*	1,424	1,788	2,644
Harding Branch	330 feet downstream of Gayton Road	0.8	811	*	1,342	1,685	2,494
Harding Branch	370 feet upstream of Lauderdale Drive	0.5	599	*	1,000	1,257	1,867
Harding Branch	410 feet upstream of Park Terrace Drive	0.4	515	*	865	1,088	1,619
Harding Branch	260 feet upstream of Footbridge 3	0.2	297	*	517	652	986
Harding Branch Tributary 1	At Mouth	0.2	385	*	652	821	1,226
Heckler Village Tributary 1	At Mouth	1.2	569	*	918	1,143	1,694
Heckler Village Tributary 1	Above confluence with Heckler Village Tributary 2	0.8	448	*	730	909	1,352
Heckler Village Tributary 1	0.2 mile downstream of Colwyck Drive	0.7	399	*	652	813	1,211
Heckler Village Tributary 1	Colwyck Drive	0.6	378	*	620	773	1,152

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Heckler Village Tributary 1	230 feet upstream of Colwyck Drive	0.5	193	*	337	420	645
Heckler Village Tributary 2	At Mouth	0.3	143	*	254	317	490
Heckler Village Tributary 2	220 feet downstream of Colwyck Drive	0.3	123	*	221	276	430
Heckler Village Tributary 2	310 feet upstream of Wynfield Terrace	0.2	73	*	134	168	264
Horsepen Branch	At Mouth	1.9	1,963	*	3,008	3,702	5,290
Horsepen Branch	520 feet downstream of I-64	1.8	1,897	*	2,907	3,576	5,108
Horsepen Branch	380 feet downstream of Bethlehem Road	1.7	1,808	*	2,770	3,405	4,860
Horsepen Branch	0.2 mile upstream of Bethlehem Road	1.5	1,716	*	2,629	3,231	4,607
Horsepen Branch	870 feet downstream of West Broad Street	1.4	1,622	*	2,486	3,053	4,349
Horsepen Branch	Above confluence with Horsepen Branch Tributary 3	1.0	1,335	*	2,044	2,505	3,558
Horsepen Branch	540 feet downstream of Engle Road	1.0	1,302	*	1,993	2,443	3,468
Horsepen Branch	Above confluence with Horsepen Branch Tributary 1	0.6	959	*	1,467	1,793	2,532
Hungary Creek	At Mouth	3.2	2,800	*	3,920	4,280	5,440
Hungary Creek	Richmond, Fredricksburg, and Potomac Railroad	2.3	2,200	*	3,150	3,450	4,435
Hungary Creek	Staples Mill Road	1.3	1,600	*	2,200	2,400	3,100
Hungary Creek	Sunburst Road	0.1	340	*	490	530	690
James River	Upstream of the confluence of Appomattox River	7,023	153,397	203,732	246,060	292,651	420,569
James River	Upstream of the confluence of Proctors Creek	6,929	151,345	201,007	242,768	288,736	414,943
James River	At the USGS gage 02037500	6,753	147,500	195,900	236,600	281,400	404,400
James River	At confluence with James River	6,653	145,317	193,000	233,098	277,234	398,414
Jordans Branch	0.4 mile downstream of Interstate 64	3.6	2,366	*	3,850	4,632	6,876
Jordans Branch	Interstate 64	3.4	2,309	*	3,758	4,521	6,711

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Jordans Branch	Railroad Yard	2.3	1,834	*	2,984	3,589	5,329
Jordans Branch	750 feet upstream of Railroad Yard	2.3	1,793	*	2,917	3,510	5,210
Jordans Branch	0.2 mile downstream of Staples Mill Road	1.8	1,577	*	2,567	3,088	4,584
Jordans Branch	Staples Mill Road	1.6	1,466	*	2,354	2,832	4,203
Jordans Branch	Broad Street	1.3	1,300	*	2,116	2,545	3,778
Jordans Branch	Markel Road	1.2	1,233	*	2,006	2,413	3,582
Jordans Branch	170 feet upstream of Markel Road	1.2	1,220	*	1,986	2,389	3,546
Jordans Branch	570 feet upstream of Fitzhugh Avenue	*	*	*	740	1,129	2,247
Jordans Branch	110 feet downstream of Monument Avenue	*	*	*	652	995	1,980
Little Tuckahoe Creek	Approximately 1.4 mile upstream from State Route 288	9.6	1,782	2,796	3,748	4,933	10,377
Little Tuckahoe Creek	Approximately 0.9 mile upstream from Broad Street Road	9.2	1,741	2,724	3,645	4,787	10,027
Little Tuckahoe Creek	Approximately 0.6 mile upstream from Broad Street Road	9.0	1,715	2,680	3,582	4,698	9,809
Little Tuckahoe Creek	Approximately 0.3 mile upstream from Broad Street Road	7.3	1,532	2,412	3,241	4,272	9,044
Little Tuckahoe Creek	Approximately 620 feet downstream from Broad Street Road	5.5	1,299	2,057	2,776	3,672	7,859
Little Tuckahoe Creek	Approximately 900 feet downstream from Interstate 64	4.9	1,218	1,910	2,560	3,358	7,054
Little Tuckahoe Creek	Approximately 0.4 mile downstream from Interstate 64	4.6	1,185	1,852	2,473	3,230	6,720
Little Tuckahoe Creek	Approximately 0.7 mile downstream from Interstate 64	4.3	1,141	1,770	2,352	3,051	6,248

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Little Tuckahoe Creek	Approximately 0.8 mile downstream from Interstate 64	4.2	1,122	1,735	2,301	2,976	6,055
Little Tuckahoe Creek	Approximately 0.9 mile downstream from Interstate 64	3.8	1,060	1,639	2,171	2,805	5,690
Little Tuckahoe Creek	Approximately 1.2 mile downstream from Interstate 64	3.2	977	1,507	1,993	2,566	5,166
Little Tuckahoe Creek	Approximately 1.3 mile downstream from Interstate 64	3.1	955	1,471	1,944	2,498	5,010
Little Tuckahoe Creek	Approximately 0.9 mile upstream from Ashland Road	1.8	713	1,109	1,475	1,906	3,880
Meredith Branch	At Mouth	4.0	2,250	*	3,609	4,507	6,593
Meredith Branch	300 feet upstream of Road to Tidewater Quarry	3.8	2,179	*	3,498	4,370	6,395
Meredith Branch	Above confluence with Meredith Branch Tributary 3	3.6	2,095	*	3,367	4,207	6,159
Meredith Branch	430 feet upstream of Echo Lake Dam	3.4	2,045	*	3,290	4,111	6,020
Meredith Branch	390 feet downstream of Footbridge	3.3	1,986	*	3,197	3,996	5,854
Meredith Branch	70 feet upstream of Footbridge	3.2	1,941	*	3,128	3,910	5,728
Meredith Branch	190 feet downstream of confluence with Meredith Branch Tributary 4	3.0	1,881	*	3,033	3,792	5,558
Meredith Branch	Above confluence with Meredith Branch Tributary 4	2.3	1,603	*	2,598	3,251	4,774
Meredith Branch	750 feet upstream of confluence with Meredith Branch Tributary 4	2.3	1,583	*	2,565	3,210	4,715
Meredith Branch	Above confluence with Meredith Branch Tributary 5	1.6	1,237	*	2,021	2,532	3,729
Meredith Branch	Above confluence with Meredith Branch Tributary 1	1.0	960	*	1,580	1,983	2,929
North Run	At Mouth	17.0	8,325	*	11,160	12,500	20,050

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
North Run	Above confluence of Rocky Branch	12.5	6,600	*	9,375	10,225	16,000
North Run	Above confluence of Hungary Creek	6.3	4,080	*	5,800	6,350	8,500
North Run	Richmond, Fredericksburg, and Potomac Railroad	1.0	1,725	*	2,410	2,625	3,400
Rocky Branch	At Mouth	2.5	2,750	*	3,825	4,175	5,360
Rocky Branch	Richmond, Fredericksburg, and Potomac Railroad	1.8	2,575	*	3,640	3,990	4,790
Rocky Branch	Stoneman Road	1.1	1,800	*	2,600	2,800	3,200
Rooty Branch	500 feet downstream of Nuckols Road	1.1	1,012	*	1,663	2,085	3,079
Rooty Branch	340 feet upstream of Nuckols Road	1.0	921	*	1,517	1,904	2,814
Rooty Branch	180 feet downstream of dam	0.8	835	*	1,380	1,733	2,564
Stoney Run	At Mouth	2.7	1,600	*	2,100	2,350	2,800
Stoney Run	Church Road	1.5	1,400	*	1,850	2,000	2,450
Stony Run	Approximately 3,650 feet from Government Road	5.0	1,700	2,369	2,977	3,875	8,166
Stony Run	Approximately 210 feet from Interstate 64	4.2	1,622	2,229	2,793	3,659	7,650
Thorpe Branch	At Mouth	0.8	700	*	970	1,070	1,240
Thorpe Branch	Hermitage Road	0.6	440	*	600	660	720
Thorpe Branch	Warwick Road	0.4	230	*	320	350	38
Tributary A To Gillies Creek Tributary 1	At Mouth	0.7	221	*	385	480	739
Tributary A To Gillies Creek Tributary 1	820 feet upstream of Hawkes Lane	0.3	145	*	257	321	497
Tributary A To Gillies Creek Tributary 1 Tributary	At Mouth	0.2	75	*	139	174	274
Tuckahoe Creek	Near confluence with East Branch Tuckahoe Creek	60.2	9,222	13,366	17,176	21,622	36,148

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Tuckahoe Creek	Approximately 1.0 mile downstream from Patterson Avenue	57.8	8,553	12,189	15,471	19,187	29,955
Tuckahoe Creek	At Mouth	56.4	10,900	*	15,000	16,500	21,000
Tuckahoe Creek	Approximately 750 feet upstream from Patterson Avenue	43.2	6,261	8,901	11,264	13,923	21,560
Tuckahoe Creek	Above confluence of Deep Run	42.8	9,500	*	12,900	14,200	17,700
Tuckahoe Creek	Approximately 1.0 mile upstream from Patterson Avenue	42.4	6,223	8,852	11,205	13,853	21,459
Tuckahoe Creek	Approximately 1.0 mile upstream from Patterson Avenue	41.9	6,205	8,828	11,176	13,819	21,409
Tuckahoe Creek	Approximately 1.2 mile downstream from Patterson Avenue	36.4	5,937	8,458	10,715	13,255	20,551
Tuckahoe Creek	Approximately 2.4 mile upstream from State Route 288	27.6	5,310	7,605	9,664	11,984	18,655
Tuckahoe Creek	Approximately 1.4 mile upstream from State Route 288	24.2	2,971	4,510	5,911	7,606	15,074
Tuckahoe Creek	Approximately 1.3 mile upstream from State Route 288	14.5	2,221	3,382	4,442	5,714	11,372
Upham Brook	At Mouth	37.5	6,300	*	11,500	14,000	21,000
Upham Brook	Interstate 95	32.7	7,000	*	12,900	15,700	24,000
Upham Brook	Confluence of North Run	16.0	4,300	*	7,700	9,300	14,000
Upham Brook	Confluence of Trumpet Branch	12.9	4,100	*	7,200	8,700	13,000
Upham Brook	Confluence of Jordans Branch	6.8	2,200	*	4,100	5,000	7,800
Upham Brook	Confluence of Horsepen Creek	4.2	1,600	*	2,900	3,500	5,400

*Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

Table 11: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Chickahominy River	02042500	USGS	Chickahominy River near Providence Forge, VA	251	04/04/1942	09/30/2016
James River	02037500	USGS	James River Near Richmond	6,753	09/07/1935	02/25/2016

5.2 Hydraulic Analyses

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

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed in Table 23, “Floodway Data.”

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Allens Branch	At confluence with Chickahominy River	Approximately 400 feet upstream from Fords Country Lane	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 5.0.5 (USACE 2018)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Cabin Branch	Approximately 700 feet upstream from State Route 6 (Patterson Avenue)	Approximately 1,700 feet upstream from State Route 157 (Gaskins Road)	Not available	HEC-RAS version 5.0.5 (USACE 2018)	07/17/2009	AE	LOMC 09-03-0224P revised the hydrologic and hydraulic analysis. Boundary conditions were revised in this revision to achieve tie-in.
Cabin Branch Tributary 1	At confluence with Cabin Branch	Approximately 400 feet upstream from confluence with Cabin Branch	Not available	HEC-RAS version 4.0 (USACE 2006)	07/17/2009	AE	LOMC 09-03-0224P revised the hydrologic and hydraulic analysis. Special flood hazard delineations have been maintained in this FIS revision.
Chickahominy River	Approximately 2,800 feet downstream from the confluence of White Oak Swamp Creek	Approximately 300 feet downstream from Creighton Road	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.3 (USACE 2017)	05/31/2018	A	Effects of hydraulic structures were not considered within the modeling.
Chickahominy River	Approximately 300 feet downstream from Creighton Road	Approximately 400 feet upstream from Cauthorne Road	Regression Equations (USGS 2011, USGS 2014a) PeakFQ	HEC-RAS version 5.0.3 (USACE 2017)	11/20/2020	AE	Hydraulic models incorporated field measured bridge and culvert data. USGS stream gage 02042500 was utilized for hydrologic considerations.
Copperas Creek	At confluence with Tuckahoe Creek	Approximately 300 feet upstream from Church Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Copperas Creek Tributary 2	At confluence with Copperas Creek	Appriximately 2,000 feet upstream from Cambridge Drive	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Cosby Parcel Branch	At confluence with Chickahominy River	Approximately 1,100 feet upstream from confluence with Chickahominy River	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	01/13/2021	A	Effects of hydraulic structures were considered within the modeling.
Deep Run	At confluence with Tuckahoe Creek	At Interstate 64	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Fourmile Creek	At confluence with James River	Approximately 1,900 feet upstream from Doran Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Gillies Creek	At confluence with James River	Approximately 1,000 feet upstream of East Richmond Road	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	03/25/2020	AE w/ Floodway	Hydraulic models incorporated field measured bridge and culvert data. National bridge inventory used for dimensions of Jennie Scher Road.
Gillies Creek	Approximately 3,500 feet upstream from confluence with Stony Run	At confluence with Gillies Creek T2	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Gillies Creek Tributary 1	At confluence with Gillies Creek	Approximately 300 feet upstream from South Kalmia Avenue	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Harding Branch	At confluence with Tuckahoe Creek	At Three Chopt Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Harding Branch Tributary 1	At confluence with Harding Branch	At Lauderdale Drive	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Heckler Village Tributary 1	At confluence with Gillies Creek	At Nine Mile Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Heckler Village Tributary 2	At confluence with Heckler Village Tributary 1	Approximately 900 feet upstream of Yates Lane	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Horsepen Branch	At confluence with Upham Brook	At Orchard Road	Gage Analysis	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Hungary Creek	At confluence with North Run	Approximately 200 feet upstream from confluence with Hungary Creek Unnamed Tributary	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
James River	Approximately 20,500 feet upstream of Roxbury Road	Approximately 9,200 feet downstream of World War II Veterans Memorial Highway	Regression Equations (USGS 2011, USGS 2014a) PeakFQ Version 7.2 (USGS 2018)	HEC-RAS version 5.0.5 (USACE 2018)	03/25/2020	AE w/ Floodway	Hydraulic model incorporated field measured bridge and weir data. USGS stream gage 02037500 was used in the hydrologic analyses. Model calibrated to rating curve.
James River	Approximately 9,200 feet downstream of World War II Veterans Memorial Highway	Approximately 11,200 feet downstream of World War II Veterans Memorial Highway	Regression Equations (USGS 2011, USGS 2014a) PeakFQ Version 7.2 (USGS 2018)	HEC-RAS version 5.0.5 (USACE 2018)	08/31/2020	AE w/ Floodway	Hydraulic model incorporated field measured bridge and weir data. USGS stream gage 02037500 was used in the hydrologic analyses. Model calibrated to rating curve.
Jordans Branch	Approximately 2,400 feet upstream from confluence with Upham Brook	At West Broad Street	Gage Analysis	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Jordans Branch	At West Broad Street	Approximately 300 feet upstream from West Broad Street	Gage Analysis	HEC-RAS version 4.1 (USACE 2010)	04/07/2014	AE w/ Floodway	LOMC 13-03-1863P revised the hydraulic analysis. Special flood hazard delineations have been maintained in this FIS revision.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Little Tuckahoe Creek	At confluence with Tuckahoe Creek	Approximately 1,000 feet downstream of US Highway 250	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	08/31/2020	AE w/ Floodway	Hydraulic models incorporated field measured bridge and culvert data.
Little Tuckahoe Creek Tributary 2	At confluence with Little Tuckahoe Creek	Approximately 1,000 feet upstream from Little Tuckahoe Creek	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.7 (USACE 2019)	02/08/2021	AE w/ Floodway	LOMC 20-03-0873P revised the hydrologic and hydraulic analysis. Effects of hydraulic structures were considered within the modeling.
Meredith Branch	At confluence with Chickahominy River	Approximately 1,200 feet upstream from confluence with Meredith Branch T1	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 5.0.5 (USACE 2018)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
North Run	At confluence with Upham Brook	Approximately 1,000 feet downstream from East Parham Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
North Run	Approximately 1,000 feet downstream from East Parham Road	Approximately 700 feet upstream from State Route 157 (Mountain Road)	Not available	HEC-RAS	12/12/2012	AE w/ Floodway	LOMC 12-03-0257P revised the hydrologic and hydraulic analysis. Special flood hazard delineations have been maintained in this FIS revision.
Rocky Branch	At confluence with North Run	At Rumford Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Rooty Branch	Approximately 200 feet upstream from Cox Road	At Cox Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Shockoe Creek	At CSX Railroad	Approximately 500 feet upstream from CSX Railroad	SWMM 5.1 (EPA 2015)	SWMM 5.1.012	06/15/2021	A	Mapping is based on output from EPA SWMM Model for Shockoe Watershed.
Stoney Run	At confluence with Deep Run	Approximately 500 feet upstream from Church Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Stony Run	At confluence with Gillies Creek	At confluence With Stony Run Tributary 1	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	03/25/2020	AE w/ Floodway	Hydraulic models incorporated field measured bridge and culvert data.
Thorpe Branch	At confluence with North Run	At CSX Railroad	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Tributary A To Gillies Creek Tributary 1	At confluence with Gillies Creek Tributary 1	Approximately 1,200 feet upstream from Yates Lane	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Tributary A To Gillies Creek Tributary 1 Tributary	At confluence with Tributary A to Gillies Creek Tributary 1	At South Lake Street	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Tuckahoe Creek	At confluence with James River	Approximately 3,600 feet downstream of Jurusalem Church Road	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	08/31/2020	AE w/ Floodway	Hydraulic models incorporated field measured bridge and culvert data.
Upham Brook	Near Stoneliegh Road (City of Richmond/ Henrico County Boundary)	At Bethlehem Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Upham Brook	Approximately 3,000 feet upstream from confluence with Jordan's Branch	Approximately 2,500 feet upstream from Wilkinson Road	Regression Equations (USGS 1994, USGS 1983)	HEC-RAS version 3.0.1 (USACE 2003)	06/01/2005	AE w/ Floodway	Effects of urbanization were considered in the hydrologic modeling. Special flood hazard delineations have been maintained from prior flood insurance studies.
Zone A reaches in HUC 02080205	Various	Various	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	03/25/2020	A	Effects of hydraulic structures were considered within the modeling.
Zone A reaches in HUC 02080206 not otherwise listed	Various	Various	Regression Equations (USGS 2011, USGS 2014a)	HEC-RAS version 5.0.5 (USACE 2018)	03/25/2020	A	Effects of hydraulic structures were considered within the modeling.

Table 13: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
All flooding sources mapped as Zone A on the FIRM	0.045 - 0.055	0.045 - 0.120
Allens Branch	0.040 - 0.050	0.100 - 0.200
Cabin Branch	0.045	0.013 - 0.101
Cabin Branch Tributary 1	0.045	0.013 - 0.101
Chickahominy River	0.032 - 0.045	0.032 - 0.120
Copperas Creek	0.045 - 0.055	0.100 - 0.200
Copperas Creek Tributary 2	0.040 - 0.055	0.110 - 0.200
Deep Run	0.060	0.060
Fourmile Creek	0.0450	0.100 - 0.200
Fourmile Creek Tributary 7	0.0450	0.140
Gillies Creek	0.025 - 0.060	0.045 - 0.200
Gillies Creek Tributary 1	0.050	0.110 - 0.200
Harding Branch	0.035 - 0.055	0.060 - 0.200
Harding Branch Tributary 1	0.035 - 0.045	0.060 - 0.200
Heckler Village Tributary 1	0.035 - 0.050	0.100 - 0.200
Heckler Village Tributary 2	0.035 - 0.050	0.100 - 0.280
Horsepen Branch	0.035 - 0.050	0.100 - 0.200
Hungary Creek	0.0450	0.0450
James River	0.038 - 0.050	0.040 - 0.100
Jordans Branch	0.020 - 0.050	0.060 - 0.140
Little Tuckahoe Creek	0.0400	0.030 - 0.100
Little Tuckahoe Creek Tributary 2	0.050	0.110 - 0.200
Meredith Branch	0.035 - 0.055	0.100 - 0.200
North Run	0.045 - 0.060	0.045 - 0.060
Rocky Branch	0.0450	0.0450
Rooty Branch	0.035 - 0.050	0.100 - 0.200
Stoney Run	0.060	0.100
Stony Run	0.040 - 0.048	0.040 - 0.080
Thorpe Branch	0.0450	0.0450
Tributary A To Gillies Creek Tributary 1	0.050	0.100 - 0.200
Tributary A To Gillies Creek Tributary 1 Tributary	0.050	0.110 - 0.200
Tuckahoe Creek	0.035 - 0.060	0.030 - 0.100
Upham Brook	0.055 - 0.140	0.050 - 0.150

5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

Table 14: Summary of Coastal Analyses
[Not Applicable to this Flood Risk Project]

5.3.1 Total Stillwater Elevations

This section is not applicable to this Flood Risk Project.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas
[Not Applicable to this Flood Risk Project]

Table 15: Tide Gage Analysis Specifics
[Not Applicable to this Flood Risk Project]

5.3.2 Waves

This section is not applicable to this Flood Risk Project.

5.3.3 Coastal Erosion

This section is not applicable to this Flood Risk Project.

5.3.4 Wave Hazard Analyses

This section is not applicable to this Flood Risk Project.

Table 16: Coastal Transect Parameters
[Not Applicable to this Flood Risk Project]

Figure 9: Transect Location Map
[Not Applicable to this Flood Risk Project]

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 17: Summary of Alluvial Fan Analyses
[Not Applicable to this Flood Risk Project]

Table 18: Results of Alluvial Fan Analyses
[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

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

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

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

To obtain current elevation, description, and/or location information for benchmarks in the area, please visit the NGS website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Henrico County are provided in Table 19.

Table 19: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Drewy Bluff	SE	37.375	-77.375	-1.090
Dutch Gap	SE	37.375	-77.250	-1.110
Glen Allen	SE	37.625	-77.500	-0.980
Hylas	SE	37.625	-77.625	-0.970
Richmond	SE	37.500	-77.375	-1.060
Seven Pines	SE	37.500	-77.250	-1.060
Yellow Tavern	SE	37.625	-77.375	-1.040
Average Conversion from NGVD29 to NAVD88 = -1.044 Feet				

Table 20: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

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

Base map information shown on the FIRM was derived from the sources described in Table 21.

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
USGS National Map: Orthoimagery for Henrico County	United States Geological Survey (USGS) National Map	2020*	Not Provided	Orthorectified digital aerial photographs and satellite images of 1-meter (m) pixel resolution or finer
National Hydrography Dataset	United States Geological Survey	2017	1:24,000	Streams, rivers, and lakes were derived from NHD data (USGS 2017)
TIGER Roads and Rail Data	U.S. Census Bureau	2016	1:100,000	Road center lines, rail center lines and attribute information (USGS 2017)
Virginia Administrative Boundaries	Virginia Geographic Information Network	2018	1: 6,000	County boundary (US Census 2016)

*Most recently refreshed data

6.3 Floodplain and Floodway Delineation

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

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22.

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.

The floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 23, "Floodway Data."

Certain flooding sources may have been studied that do not have published BFEs on the FIRMs, or for which there is a need to report the 1-percent-annual-chance flood elevations at selected cross sections because a published Flood Profile does not exist in this FIS Report. These streams may have also been studied using methods to determine non-encroachment zones rather than floodways. For these flooding sources, the 1-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22. All topographic data used for modeling or mapping has been converted as necessary to NAVD88.

Table 22: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Henrico County, Unincorporated Areas	All flooding sources not individually mentioned	2014 USGS VA NRCS SANDY	18.7cm	CVA at 95th percentile	USGS 2014
Henrico County, Unincorporated Areas	Allens Branch, Copperas Creek, Copperas Creek Tributary 2, Deep Run, Fourmile Creek, Fourmile Creek Tributary 7, Gillies Creek, Gillies Creek Tributary 1, Harding Branch, Harding Branch Tributary 1, Heckler Village Tributary 1, Heckler Village Tributary 2, Horsepen Branch, Hungary Creek, Jordans Branch, Meredith Branch, North Run, Rocky Branch, Rooty Branch, Stoney Run, Thorpe Branch, Tributary A To Gillies Creek Tributary 1, Tributary A To Gillies Creek Tributary 1 Tributary, Upham Brook	Contour Lines	2 foot	Not available	FEMA 2007

Table 22: Summary of Topographic Elevation Data used in Mapping (continued)

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Henrico County, Unincorporated Areas	North Run	Not available	Not available	Not available	LOMC3
Henrico County, Unincorporated Areas	Little Tuckahoe Creek Tributary 2	Not available	Not available	Not available	LOMC6
Henrico County, Unincorporated Areas	Cabin Branch Tributary 1	Contour Lines	2 foot	Not available	LOMC7

BFEs shown at cross sections on the FIRM represent the 1-percent-annual-chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in areas of ponding, and other areas with static base flood elevations.

Table 23: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	616	200	1,153	1.9	197.9	196.5[2]	197.5	1.0
B	964	160	1,066	2.0	197.9	197.1[2]	198.1	1.0
C	1,381	140	827	2.6	197.9	197.9	198.9	1.0
D	1,847	170	1,063	2.0	199.1	199.1	200.1	1.0
E	2,201	140	904	2.4	199.6	199.6	200.6	1.0
F	2,539	120	740	2.9	200.3	200.3	201.2	0.9
G	2,885	85	569	3.8	201.0	201.0	202.0	1.0
H	3,422	78	541	3.9	202.7	202.7	203.6	0.9
I	3,896	120	752	2.8	204.2	204.2	205.2	1.0
J	4,356	93	568	3.7	205.3	205.3	206.2	0.9
K	4,970	137	923	2.3	207.2	207.2	208.2	1.0
L	5,465	105	678	3.1	208.3	208.3	209.2	0.9
M	6,143	270	1,676	1.3	209.7	209.7	210.7	1.0
N	7,239	64	460	4.4	213.7	213.7	213.7	0.0

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Chickahominy River

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: ALLENS BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	427	620[2]	2,223	1.2	144.9	134.9[3]	135.9	1.0
B	1,324	110	368	7.4	144.9	138.0[3]	138.0	0.0
C	1,998	190	1,006	2.7	144.9	141.1[3]	141.3	0.2
D	2,541	150	1,054	2.6	144.9	142.7[3]	143.5	0.8
E	2,929	250	1,457	1.8	144.9	143.8[3]	144.7	0.9
F	3,216	215	1,252	2.1	144.9	144.5[3]	145.4	0.9
G	3,583	230	1,645	1.6	147.7	147.7	148.6	0.9
H	3,970	220	1,652	1.5	148.1	148.1	149.1	1.0
I	4,474	270	2,074	1.2	150.2	150.2	151.2	1.0
J	4,930	175	1,288	1.9	150.5	150.5	151.5	1.0
K	5,221	175	1,088	2.2	150.7	150.7	151.7	1.0
L	5,596	200	1,285	1.9	151.4	151.4	152.4	1.0
M	6,161	95	659	3.4	152.3	152.3	153.3	1.0
N	6,686	90	407	5.5	153.8	153.8	154.7	0.9
O	7,116	130	653	3.2	157.2	157.2	158.1	0.9
P	7,622	25	126	11.6	160.7	160.7	160.8	0.1
Q	7,891	30	147	9.9	167.1	167.1	167.8	0.7
R	8,253	65	812	1.8	180.7	180.7	181.4	0.7
S	8,652	95	964	1.5	180.7	180.7	181.6	0.9
T	9,254	125	964	1.5	181.1	181.1	182.1	1.0
U	9,749	108	592	2.5	181.8	181.8	182.7	0.9
V	10,359	95	276	5.3	186.4	186.4	186.5	0.1
W	10,805	80	403	3.1	190.5	190.5	191.3	0.8
X	11,223	48	221	5.7	192.5	192.5	193.5	1.0

[1] Feet above mouth

[2] Computed without consideration of floodway effects from Tuckahoe Creek

3 Elevation computed without consideration of backwater effects from Tuckahoe Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: COPPERAS CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Y	11,723	80	419	3.0	197.1	197.1	198.0	0.9
Z	12,304	31	167	6.0	200.1	200.1	201.0	0.9
AA	12,670	31	114	8.8	203.8	203.8	204.2	0.4
AB	12,968	25	103	9.7	208.6	208.6	209.1	0.5
AC	13,427	62	397	2.5	218.6	218.6	219.5	0.9
AD	13,723	38	204	4.9	219.3	219.3	220.2	0.9

[1] Feet above mouth

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3	21	129	8.5	160.0	159.6[2]	160.6	1.0
B	250	54	180	6.1	170.6	170.6	171.2	0.6
C	459	45	231	4.8	174.2	174.2	175.1	0.9
D	797	67	351	3.1	176.8	176.8	177.8	1.0
E	1,350	83	643	1.5	189.4	189.4	190.4	1.0
F	1,849	65	286	3.4	189.9	189.9	190.9	1.0
G	2,440	73	211	4.6	196.9	196.9	197.3	0.4
H	3,179	93	309	3.1	204.3	204.3	205.2	0.9
I	3,372	95	347	2.8	205.8	205.8	206.8	1.0

[1] Feet above confluence with Copperas Creek

[2] Elevation computed without consideration of backwater effects from Copperas Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: COPPERAS CREEK TRIBUTARY 2

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,200	689	9,407	0.7	144.4	138.6[2]	139.4	0.8
B	5,680	762	6,941	0.9	144.4	138.8[2]	139.6	0.8
C	7,595	256	2,944	2.0	144.4	143.7[2]	144.6	0.9
D	9,830	424	4,065	1.5	146.1	146.1	147.0	0.9
E	11,010	391	3,175	1.9	146.1	146.1	147.0	0.9
F	11,510	139	680	9.1	146.5	146.5	147.2	0.7
G	12,510	201	1,630	3.9	151.1	151.1	152.0	0.9
H	15,610	413	3,314	1.9	153.4	153.4	154.3	0.9
I	16,510	425	3,382	1.9	153.8	153.8	154.8	1.0
J	17,040	230	1,403	2.0	154.1	154.1	155.1	1.0
K	18,270	250	1,451	2.0	155.3	155.3	156.3	1.0
L	19,420	230	1,015	2.8	157.1	157.1	158.0	0.9
M	20,170	226	866	3.3	159.7	159.7	160.7	1.0
N	20,860	270	1,063	2.7	162.3	162.3	163.3	1.0
O	21,730	190	816	3.5	165.6	165.6	166.6	1.0
P	22,250	165	953	3.0	167.5	167.5	168.4	0.9
Q	22,900	252	1,350	2.1	168.7	168.7	169.7	1.0
R	23,990	207	954	2.5	170.2	170.2	171.2	1.0
S	25,050	80[3]	386	3.4	173.4	173.4	173.4	0.0
T	25,598	220	2,119	0.6	180.8	180.8	180.8	0.0

[1] Feet above mouth

[2] Elevations computed without consideration of backwater effects from Tuckahoe Creek

[3] Floodway width previously updated in December 2007 based upon 1998 topographic information.

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: DEEP RUN

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	895	800	5,357	0.6	13.9	8.0[2]	9.0	1.0
B	2,473	1,305	9,384	0.3	13.9	8.3[2]	9.3	1.0
C	3,889	1,365	7,879	0.3	13.9	8.4[2]	9.4	1.0
D	4,844	800	5,762	0.4	13.9	8.5[2]	9.5	1.0
E	5,895	1,000	7,139	0.3	13.9	8.5[2]	9.5	1.0
F	6,936	595	4,573	0.5	13.9	8.6[2]	9.6	1.0
G	8,056	540	3,877	0.6	13.9	8.8[2]	9.8	1.0
H	9,378	365	2,167	1.0	13.9	9.0[2]	10.0	1.0
I	10,801	628	3,221	0.7	18.2	18.2	18.2	0.0
J	11,763	458	960	2.2	18.2	18.2	18.2	0.0
K	12,180	46	287	7.5	19.7	19.7	19.8	0.1
L	12,713	160	995	2.0	20.9	20.9	21.9	1.0
M	13,322	34	304	6.7	21.5	21.5	22.4	0.9
N	13,793	45	290	7.0	22.9	22.9	23.7	0.8
O	14,982	50	346	5.9	26.7	26.7	27.6	0.9
P	15,813	81	522	3.9	29.9	29.9	30.9	1.0
Q	16,419	73	406	5.0	31.9	31.9	32.9	1.0
R	16,930	175	836	2.4	34.3	34.3	35.3	1.0
S	17,500	220	1,449	1.4	35.5	35.5	36.4	0.9
T	18,184	80	441	4.6	36.1	36.1	37.1	1.0
U	18,714	200	674	3.0	40.3	40.3	40.8	0.5
V	19,394	260	1,089	1.7	43.2	43.2	44.0	0.8
W	20,262	385	994	1.9	45.6	45.6	46.6	1.0
X	21,535	100	622	3	52.3	52.3	52.4	0.1

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Tuckahoe Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: FOURMILE CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Y	22,000	130	702	2.7	52.5	52.5	53.1	0.6
Z	23,126	160	673	2.8	54.9	54.9	55.9	1.0
AA	24,033	419	1,261	1.5	58.5	58.5	59.4	0.9
AB	24,870	329	853	2.2	61.5	61.5	62.5	1.0
AC	25,376	380	1,521	1.2	63.1	63.1	64.1	1.0
AD	25,837	259	999	1.9	63.8	63.8	64.8	1.0
AE	26,206	283	1,014	1.9	64.8	64.8	65.7	0.9
AF	26,793	168	579	2.3	66.4	66.4	67.4	1.0
AG	27,983	120	418	3.1	70.0	70.0	70.3	0.3
AH	28,761	267	717	1.8	72.5	72.5	73.5	1.0
AI	29,245	115	390	3.4	74.1	74.1	75.1	1.0
AJ	30,027	68	322	4.1	77.8	77.8	78.8	1.0
AK	30,863	395	1,078	1.0	80.0	80.0	81.0	1.0
AL	31,392	183	341	3.1	81.5	81.5	81.6	0.1
AM	31,732	203	795	1.4	84.9	84.9	85.0	0.1
AN	32,292	141	454	2.4	85.5	85.5	86.0	0.5
AO	32,847	130	384	2.8	88.7	88.7	89.6	0.9
AP	33,399	40	162	4.6	92.3	92.3	92.9	0.6

[1] Feet above mouth

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: FOURMILE CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	9,995	103	537	10.1	49.7	49.7	49.8	0.1
B	11,339	85 / 0[2]	440	12.3	54.8	54.8	54.8	0.0
C	11,418	186 / 0[2]	1,923	2.8	62.7	62.7	63.7	1.0
D	12,374	109	882	6.2	63.3	63.3	64.1	0.8
E	12,822	70	549	8.4	65.0	65.00	66.00	1.0
F	13,347	53	477	9.6	72.1	72.10	72.10	0.0
G	14,247	66	793	5.8	79.0	79.00	79.90	0.9
H	15,227	47	471	9.8	84.1	84.10	84.50	0.4
I	17,262	210	1,781	2.6	92.1	92.10	93.10	1.0
J	18,612	133	749	6.1	96.5	96.50	97.10	0.6
K	19,562	260	1,755	2.2	101.2	101.20	102.20	1.0
L	20,532	380	2,483	1.5	108.4	108.40	108.40	0.0
M	21,039	285	1,885	1.6	108.4	108.40	108.40	0.0
N	21,679	170	1,123	2.6	109.2	109.20	109.80	0.6
O	22,109	227	1,224	2.1	110.5	110.50	111.50	1.0
P	22,762	182	1,166	2.2	112.7	112.70	113.70	1.0
Q	23,898	98	442	5.8	117.5	117.50	118.50	1.0
R	24,284	162	844	3.1	120.7	120.70	121.60	0.9
S	24,497	159	863	3.0	121.9	121.90	122.90	1.0
T	25,179	130	909	2.8	125.2	125.20	126.20	1.0
U	25,719	287	1,622	1.6	126.9	126.90	127.80	0.9
V	26,353	142	629	3.0	128.7	128.70	129.30	0.6

[1] Feet above confluence with James River

[2] Total floodway width / width within jurisdiction

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: GILLIES CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,808	96	372	2.5	128.3	125.8[2]	126.8	1.0
B	2,183	140	493	1.9	128.7	127.4[3]	128.4	1.0
C	3,422	27	175	5.1	135.4	135.4	136.4	1.0
D	3,705	19	117	7.7	136.5	136.5	137.1	0.6
E	4,578	250	1,202	0.8	139.2	139.2	140.1	0.9
F	5,096	275	1,048	0.8	139.4	139.4	140.4	1.0
G	5,552	59	211	3.8	139.7	139.7	140.7	1.0
H	5,931	63	262	3.0	141.6	141.6	142.6	1.0
I	6,480	29	206	3.8	143.0	143.0	143.8	0.8
J	6,922	34	248	3.2	145.6	145.6	146.0	0.4
K	7,406	40	181	3.6	146.0	146.0	146.7	0.7
L	7,857	55	277	2.4	148.6	148.6	149.4	0.8
M	8,198	45	196	3.3	149.5	149.5	150.3	0.8
N	8,650	76	303	2.2	150.9	150.9	151.7	0.8
O	8,904	40	198	3.0	152.9	152.9	153.2	0.3
P	9,112	19	58	10.0	153.5	153.5	153.5	0.0

[1] Feet above mouth

[2] Elevation computed without consideration of controlling effects of Gillies Creek

3 Elevation computed without consideration of backwater effects from Gillies Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: GILLIES CREEK TRIBUTARY 1

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	649	755	3,242	0.9	148.3	146.8[2]	147.7	0.9
B	1,244	365	1,770	1.6	148.3	147.5[2]	148.2	0.7
C	1,779	260	1,011	2.7	148.9	148.9	149.2	0.3
D	2,248	230	1,132	2.5	152.0	152.0	152.7	0.7
E	2,979	411	4,968	0.5	166.0	166.0	166.5	0.5
F	4,604	283	1,968	1.0	167.9	167.9	168.1	0.2
G	5,191	66	416	4.9	167.9	167.9	168.1	0.2
H	5,487	45	294	7.0	168.8	168.8	169.1	0.3
I	5,985	69	282	7.3	173.3	173.3	173.8	0.5
J	6,246	84	309	6.6	178.3	178.3	178.4	0.1
K	6,591	92	657	3.0	183.2	183.2	184.2	1.0
L	7,145	44	294	6.7	184.0	184.0	184.7	0.7
M	7,489	35	180	9.9	186.2	186.2	187.0	0.8
N	7,711	34	265	6.8	188.7	188.7	189.6	0.9
O	8,387	34	192	8.8	192.9	192.9	193.5	0.6
P	8,675	55	489	3.5	202.7	202.7	203.7	1.0
Q	9,070	55	303	5.6	203.1	203.1	203.7	0.6
R	9,674	35	180	9.4	208.2	208.2	208.3	0.1
S	10,416	55	202	6.2	214.7	214.7	214.8	0.1
T	10,729	100	394	3.2	217.4	217.4	218.4	1.0
U	11,074	74	187	6.7	221.9	221.9	222.9	1.0
V	11,819	408	1,979	0.6	238.7	238.7	238.7	0.0
W	12,711	140	672	1.6	238.7	238.7	238.7	0.0
X	13,256	55	261	2.5	240.5	240.5	240.7	0.2

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Tuckahoe Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: HARDING BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	127	289	322	2.6	167.9	154.9[2]	155.9	1.0
B	457	179	125	6.6	167.9	159.3[2]	159.3	0.0
C	1,007	50	279	2.9	170.9	170.9	171.8	0.9

[1] Feet above confluence with Harding Branch

[2] Elevation computed without consideration of backwater effects from Harding Branch

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: HARDING BRANCH TRIBUTARY 1

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	357	100	280	4.1	110.0	109.9[2]	109.9	0.0
B	939	434	8,007	0.1	137.5	137.5	137.6	0.1
C	1,785	370	5,288	0.2	137.5	137.5	137.6	0.1
D	2,695	281	2,786	0.3	137.5	137.5	137.6	0.1
E	3,505	80	348	2.2	137.5	137.5	137.6	0.1
F	3,904	32	106	7.3	140.8	140.8	140.8	0.0
G	4,335	30	181	2.3	144.5	144.5	144.6	0.1
H	4,664	30	200	2.1	144.9	144.9	145.1	0.2
I	4,893	20	97	4.3	145.0	145.0	145.3	0.3

[1] Feet above mouth

[2] Computed without consideration of backwater effects from Gillies Creek

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	343	100	68	4.7	137.5	127.8[2]	127.8	0.0
B	765	41	66	4.8	137.5	136.1[2]	136.1	0.0
C	1,103	35	134	2.1	141.0	141.0	141.0	0.0
D	1,453	14	32	0.4	141.6	141.6	141.6	0.0
E	2,094	23	144	1.9	146.3	146.3	147.2	0.9
F	2,680	24	58	4.7	148.3	148.3	148.6	0.3
G	2,935	14	23	7.3	152.0	152.0	152.0	0.0
H	3,225	14	40	4.2	155.7	155.7	155.9	0.2
I	3,750	9	42	4.0	158.2	158.2	159.0	0.8
J	4,159	81	175	1.0	158.5	158.5	159.4	0.9

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Heckler Village Tributary 1

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: HECKLER VILLAGE TRIBUTARY 2

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	97	124	775	4.8	173.7	165.2[2]	166.2	1.0
B	617	30	1,153	1.9	173.7	172.9[2]	173.2	0.3
C	1,055	34	449	8.3	173.7	173.6[2]	174.4	0.8
D	1,318	53	744	4.8	175.2	175.2	176.0	0.8
E	2,129	40	567	6.3	182	182.0	182.9	0.9
F	2,557	78	439	8.2	183.9	183.9	183.9	0.0
G	2,792	80	635	5.6	186.8	186.8	187.8	1.0
H	3,109	100	755	4.5	189.7	189.7	190.0	0.3
I	3,588	55	429	7.9	190.6	190.6	190.6	0.0
J	3,984	130	807	4.2	193.4	193.4	194.1	0.7
K	4,451	170	1,174	2.8	194.4	194.4	195.0	0.6
L	4,938	66	387	8.3	194.4	194.4	195.3	1.0
M	5,553	100	674	4.8	199.3	199.3	199.4	0.1
N	5,987	136	921	3.3	200.5	200.5	201.4	0.9
O	7,119	126	974	2.5	205.1	205.1	206.1	1.0
P	7,363	100	670	3.7	205.1	205.1	206.1	1.0
Q	7,722	100	551	4.4	205.8	205.8	206.7	0.9
R	8,158	64	371	6.6	206.7	206.7	207.6	0.9
S	8,513	60	290	8.4	207.9	207.9	208.9	1.0
T	8,816	36	213	8.4	211.6	211.6	211.6	0.0
U	9,132	70	297	6.0	215.6	215.6	215.7	0.1
V	9,294	68	336	5.3	217.5	217.5	218.5	1.0

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Upham Brook

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: HORSEPEN BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	700	117	588	7.2	174.4	174.4	174.9	0.5
B	1,100	81	540	7.8	176.1	176.1	176.7	0.6
C	3,000	140	787	5.1	182.7	182.7	183.4	0.7
D	4,350	200	1,197	3.2	187.5	187.5	188.2	0.7
E	5,000	333	1,751	2.1	188.0	188.0	188.7	0.7
F	5,717	161	599	6.1	188.7	188.7	189.3	0.6
G	6,700	165	702	5.1	191.9	191.9	192.5	0.6
H	7,612	39	532	2.1	203.4	203.4	203.4	0.0
I	9,253	211	689	2.4	206.6	206.6	206.6	0.0
J	10,020	255	1,780	0.9	208.0	208.0	208.3	0.3
K	10,868	241	1,393	1.7	208.2	208.2	208.4	0.2
L	11,578	188	1,897	1.3	214.3	214.3	215.2	0.9
M	12,988	156	779	2.1	215.0	215.0	215.8	0.8
N	14,088	280	2,594	0.6	224.1	224.1	225.1	1.0
O	14,848	265	1,348	1.2	224.1	224.1	225.1	1.0
P	15,748	84	222	5.4	228.1	228.1	228.1	0.0
Q	16,676	104	243	4.9	234.1	234.1	235.1	1.0
R	17,078	45	239	2.2	239.4	239.3	239.6	0.2

[1] Feet above confluence with North Run

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	37,982	7,905 / 7,338	107,739	2.7	11.5	11.5	11.5	0.0
B	78,000	2,398 / 672	49,411	5.9	15.1	15.1	15.2	0.1
C	98,247	4,334 / 4,164	69,059	4.2	20.3	20.3	20.3	0.0
D	102,311	2,951 / 2,625	76,754	3.8	21.3	21.3	21.4	0.1
E	109,652	2,350 / 1,690	56,448	5.1	23.7	23.7	23.9	0.2
F	115,500	2,702 / 505	77,497	3.7	25.3	25.3	25.6	0.3
G	122,509	2,854 / 2,750	63,344	4.5	26.6	26.6	27.0	0.4
H	127,841	1,636 / 652	47,334	6.1	27.4	27.4	27.8	0.4
I	132,048	1,072 / 413	34,677	8.2	28.8	28.8	29.3	0.5
J	135,943	1,012 / 463	41,041	6.9	30.6	30.6	31.1	0.5
K	140,508	1,055 / 637	39,390	7.2	32.2	32.2	32.4	0.2
L	145,016	1,481 / 190	49,404	5.8	33.2	33.2	33.8	0.6
M	152,727	2,195 / 488	65,313	4.4	34.9	34.9	35.5	0.6
N	158,169	2,624 / 146	72,137	3.9	36.0	36.0	36.8	0.8
O	205,600	2,157 / 2,142	39,888	7.1	125.5	125.5	125.9	0.4
P	209,736	2,265 / 2,018	40,734	6.9	128.8	128.8	129.4	0.6
Q	216,099	2,110 / 2,078	42,334	6.6	132.9	132.9	133.8	0.9
R	226,320	3,039 / 3,024	64,027	4.4	139.0	139.0	139.8	0.8
S	233,044	3,637 / 2,759	69,360	4.0	141.3	141.3	142.1	0.8

[1] Feet above a point located approximately 20,500 feet upstream of Roxbury Road

[2] Total floodway width / width within jurisdiction

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: JAMES RIVER

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,104	222	1,610	2.9	160.9	160.9	161.8	0.9
B	4,112	269	1,570	3.0	163.0	163.0	163.9	0.9
C	6,111	57	929	3.8	181.5	181.5	181.6	0.1
D	6,575	49	670	5.2	181.7	181.7	181.9	0.2
E	7,103	80	983	3.6	184.6	184.6	184.9	0.3
F	8,091	79	1,021	3.0	185.4	185.4	185.8	0.4
G	8,755	67	715	4.3	185.5	185.5	186.2	0.7
H	9,525	86	732	3.9	188.8	188.8	189.4	0.6
I	10,097	68	529	5.4	189.3	189.3	190.3	1.0
J	10,770	63	494	5.7	191.1	191.1	191.9	0.8
K	12,429	41	458	5.2	199.8	199.8	199.9	0.1

[1] Feet above mouth

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,211	327 / 112	1,941	2.5	151.6	149.8[3]	150.7	0.9
B	3,147	416 / 34	1,754	2.8	152.1	152.1	153.0	0.9
C	4,820	504 / 201	2,873	1.7	156.0	156.0	156.7	0.7
D	6,587	460 / 208	2,985	1.6	158.4	158.4	159.2	0.8

[1] Feet above confluence with Tuckahoe Creek

[2] Total floodway width / width within jurisdiction

[3] Elevation computed without backwater effects from Tuckahoe Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: LITTLE TUCKAHOE CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A[3]	*	*	*	*	*	*	*	*
B	1,017	50	260	4.4	164.7	163.4[2]	164.2	0.8

[1] Feet above confluence with Little Tuckahoe Creek

[2] Elevation computed without consideration of backwater effects from Little Tuckahoe Creek

[3] Cross section is located in Goochland County

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: LITTLE TUCKAHOE CREEK TRIBUTARY 2

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	25	283	2,559	1.8	186.9	185.4[2]	186.4	1.0
B	577	260	2,215	2.0	190.6	190.6	191.5	0.9
C	891	280	3,284	1.3	191.1	191.1	191.9	0.8
D	1,295	250	2,303	1.9	191.2	191.2	192.1	0.9
E	2,992	330	5,972	0.7	205.8	205.8	206.7	0.9
F	3,792	360	6,493	0.7	205.8	205.8	206.8	1.0
G	4,117	340	4,568	0.9	205.8	205.8	206.8	1.0
H	4,483	300	5,020	0.8	205.9	205.9	206.8	0.9
I	5,024	356	5,747	0.7	206.1	206.1	207.1	1.0
J	5,474	341	4,839	0.8	206.1	206.1	207.1	1.0
K	6,155	220	2,210	1.8	206.1	206.1	207.0	1.0
L	6,400	208	1,789	2.2	206.3	206.3	207.2	0.9
M	6,925	170	1,541	2.5	207.0	207.0	207.8	0.8
N	7,442	170	1,147	3.4	208.1	208.1	208.9	0.8
O	8,041	165	1,288	3.0	210.7	210.7	211.3	0.6
P	8,545	200	1,571	2.4	212.5	212.5	213.2	0.7
Q	9,013	205	1,460	2.2	213.5	213.5	214.4	0.9
R	9,389	210	1,564	2.1	214.4	214.4	215.3	0.9
S	9,887	200	1,151	2.8	216.3	216.3	216.7	0.4
T	10,394	170	685	4.7	219.6	219.6	219.6	0.0
U	10,919	140	980	3.3	223.6	223.6	223.6	0.0
V	11,286	150	1,298	2.5	224.7	224.7	224.9	0.2
W	11,698	160	1295	2.5	225.1	225.1	225.9	0.8
X	12,060	155	1118	2.3	226.4	226.4	226.8	0.4

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Chickahominy River

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: MEREDITH BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Y	12,380	170	1,067	2.4	227.1	227.1	227.6	0.5
Z	12,871	150	1,052	2.4	228.4	228.4	229.2	0.8
AA	13,583	140	900	2.2	230.3	230.3	231.1	0.8

[1] Feet above mouth

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	900	370	2,652	4.7	121.1	121.1	122.0	0.9
B	1,300	235	2,630	4.7	122.0	122.0	122.5	0.5
C	2,100	276	3,222	3.9	122.5	122.5	123.2	0.7
D	2,432	165	1,809	6.9	122.5	122.5	123.2	0.7
E	3,400	273	4,045	3.1	133.8	133.8	133.8	0.0
F	3,992	300	3,340	3.7	134.1	134.1	134.1	0.0
G	4,820	280	2,045	6.1	134.2	134.2	134.3	0.1
H	5,905	270	3,057	4.0	141.5	141.5	141.7	0.2
I	6,980	200	1,872	6.2	142.9	142.9	143.1	0.2
J	8,230	180	2,045	5.9	146.2	146.2	146.4	0.2
K	9,380	130	1,798	6.9	148.7	148.7	149.0	0.3
L	10,780	130	1,717	6.0	151.8	151.8	152.5	0.7
M	11,530	190	2,479	3.8	153.0	153.0	153.8	0.8
N	12,430	130	1,717	5.5	153.8	153.8	154.7	0.9
O	13,080	150	1,475	3.8	154.9	154.9	154.9	0.0
P	14,300	134	1,375	4.0	157.2	157.2	157.9	0.7
Q	16,300	74	715	7.7	159.4	159.4	160.1	0.7
R	18,300	153	1,312	4.3	162.5	162.5	163.3	0.8
S	19,300	156	1,385	4.0	165.2	165.2	166.2	1.0
T	20,020	83	737	7.5	165.8	165.8	166.7	0.9
U	21,100	150	1,493	3.7	170.7	170.7	171.7	1.0
V	22,450	98	903	5.8	173.9	173.9	174.4	0.5
W	24,840	96	672	4.8	177.9	177.9	178.5	0.6
X	26,020	188	1,402	2.1	181.0	181.0	181.7	0.7

[1] Feet above mouth

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: NORTH RUN

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Y	26,880	385	2,543	1.2	181.5	181.5	182.3	0.8
Z	27,940	197	1,540	1.9	184.3	184.3	185.2	0.9
AA	29,300	329	2,199	1.3	184.9	184.9	185.8	0.9
AB	30,010	231	1,790	1.6	185.2	185.2	186.1	0.9

[1] Feet above mouth

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: NORTH RUN

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	400	107	950	4.4	150.1	147.5[2]	148.3	0.8
B	1,000	242	4,315	1.0	163.0	163.0	163.8	0.8
C	1,600	362	6,331	0.7	163.0	163.0	163.8	0.8
D	3,650	145	545	7.3	174.1	174.1	174.8	0.7
E	4,470	100	596	6.6	178.7	178.7	179.6	0.9
F	6,175	153	863	4.6	183.2	183.2	184.0	0.8
G	7,443	309	3,449	0.8	200.0	200.0	201.0	1.0
H	8,772	202	1,636	2.0	201.8	201.8	202.8	1.0
I	9,702	101	355	9.0	203.0	203.0	203.7	0.7
J	10,562	170	586	4.8	210.6	210.6	210.6	0.0
K	11,262	100	447	6.3	212.5	212.5	213.5	1.0

[1] Feet above confluence with North Run

[2] Elevation computed without consideration of backwater effects from North Run

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: ROCKY BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	7,159	139	939	2.2	224.2	224.2	224.4	0.2
B	7,338	211	1,272	1.6	224.3	224.3	224.5	0.2
C	7,665	109	658	3.2	228.6	228.6	229.4	0.8
D	8,221	145	917	2.1	230.7	230.7	231.7	1.0
E	8,536	150	824	2.3	231.6	231.6	232.6	1.0
F	8,899	127	799	2.2	232.9	232.9	233.8	0.9
G	9,071	148	766	2.3	233.0	233.0	234.0	1.0

[1] Feet above mouth

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: ROOTY BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,310	59	230	10.2	154.5	154.5	155.4	0.9
B	2,840	106	865	2.7	163.8	163.8	164.8	1.0
C	4,740	170	449	5.2	171.4	171.4	171.7	0.3
D	5,640	220	1,264	1.9	174.9	174.9	175.9	1.0
E	6,400	85	376	5.3	176.4	176.4	177.4	1.0
F	7,370	175	735	2.7	181.6	181.6	182.6	1.0
G	7,900	270	1,175	1.7	182.7	182.7	183.7	1.0
H	8,360	108	423	4.7	183.7	183.7	184.6	0.9
I	8,910	87	410	4.9	188.1	188.1	189.0	0.9
J	9,460	75	363	5.5	192.5	192.5	193.4	0.9
K	10,230	223	661	3.0	200.6	200.6	200.7	0.1
L	10,630	52	251	8.0	202.9	202.9	203.9	1.0

[1] Feet above confluence with Deep Run

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,129	119	507	7.6	50.5	50.5	50.8	0.3
B	4,773	123	880	4.4	77.9	77.9	78.5	0.6
C	5,514	75	365	10.2	81.2	81.2	81.4	0.2
D	6,211	70	696	5.3	87.2	87.2	87.2	0.0
E	6,561	167	1,894	1.9	95.2	95.2	95.2	0.0
F	7,425	60	881	4.2	105.2	105.2	105.7	0.5
G	7,774	65	694	5.3	105.2	105.2	105.9	0.7
H	8,401	160	1,227	2.5	106.3	106.3	107.0	0.7
I	9,933	135	459	6.3	108.5	108.5	109.3	0.8

[1] Feet above confluence with Gillies Creek

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,200	36	130	7.7	148.6	148.6	149.6	1.0
B	2,600	81	420	2.2	169.6	169.6	170.4	0.8
C	3,000	45	161	5.3	169.9	169.9	170.6	0.7
D	3,500	54	136	5.8	173.2	173.2	173.6	0.4
E	4,500	90	309	2.1	181.4	181.4	182.4	1.0
F	5,220	30	75	8.8	185.1	185.1	185.4	0.3
G	6,160	55	165	4.0	192.9	192.9	193.9	1.0
H	6,600	40	230	2.2	197.6	197.6	197.7	0.1
I	7,480	30	48	7.3	199.5	199.5	199.7	0.2
J	8,530	30	81	4.3	204.3	204.3	204.5	0.2
K	8,865	18	71	4.9	205.3	205.3	206.3	1.0

[1] Feet above confluence with North Run

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: THORPE BRANCH

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	59	53	239	2.0	145.4	144.3[2]	145.3	1.0
B	523	40	175	2.8	145.6	145.6	146.5	1.0
C	801	60	230	2.1	146.6	146.6	147.4	0.8
D	988	60	165	2.9	149.0	149.0	149.2	0.3
E	1,255	60	245	1.3	149.8	149.8	150.6	0.8
F	1,497	80	264	1.2	150.0	150.0	151.0	1.0
G	1,876	45	99	3.3	151.4	151.4	151.9	0.5
H	2,170	24	108	3.0	153.5	153.5	154.4	0.9
I	2,503	23	120	2.7	154.1	154.1	155.0	0.9
J	2,760	19	72	4.4	154.6	154.6	155.4	0.8
K	3,319	19	81	4.0	157.5	157.5	157.6	0.1

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Gillies Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: TRIBUTARY A TO GILLIES CREEK TRIBUTARY 1

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	171	26	70	2.5	149.6	147.6[2]	148.6	1.0
B	428	26	44	4.0	149.6	149.6[2]	149.6	0.0
C	817	26	48	3.6	152.9	152.9	153.0	0.1
D	1,148	48	50	3.5	156.1	156.1	156.1	0.0
E	1,496	42	62	2.8	158.8	158.8	158.8	0.0
F	1,834	50	92	1.9	159.7	159.7	159.8	0.1

[1] Feet above mouth

[2] Elevation computed without consideration of backwater effects from Tributary A to Gillies Creek Tributary 1

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: TRIBUTARY A TO GILLIES CREEK TRIBUTARY 1 TRIBUTARY

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	8,096	519 / 301	10,992	2.0	142.7	142.7	143.4	0.7
B	19,036	730 / 403	15,675	1.4	144.1	144.1	144.9	0.8
C	19,989	635 / 248	9,916	2.2	144.2	144.2	145.1	0.9
D	21,744	1,053 / 975	20,118	1.0	144.4	144.4	145.3	0.9
E	28,042	855 / 688	13,660	1.0	144.8	144.8	145.8	1.0
F	30,042	1,502 / 793	21,367	0.7	144.9	144.9	145.9	1.0
G	34,542	985 / 227	11,911	1.2	145.1	145.1	146.1	1.0
H	36,544	934 / 811	10,281	1.3	145.4	145.4	146.4	1.0
I	38,544	733 / 727	7,183	1.9	145.9	145.9	146.8	0.9

[1] Feet above confluence with James River

[2] Total Floodway width / width within jurisdiction

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: TUCKAHOE CREEK

Table 23: Floodway Data (continued)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET / SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	4,420	2,292	25,938	0.5	99.6	99.6	100.6	1.0
B	5,800	1,313	11,680	1.2	99.8	99.8	100.8	1.0
C	8,160	1,420	14,090	1.0	102.3	102.3	103.3	1.0
D	12,580	1,440	9,027	1.6	104.9	104.9	105.8	0.9
E	14,505	1,314	13,932	1.1	113.4	113.4	113.7	0.3
F	15,410	1,105	10,728	1.5	113.5	113.5	113.8	0.3
G	17,895	337	2,616	6.0	114.0	114.0	114.3	0.3
H	20,300	310	4,780	1.9	122.1	122.1	123.0	0.9
I	22,860	528	6,522	1.4	123.2	123.2	124.1	0.9
J	25,550	714	5,507	1.6	126.1	126.1	127.1	1.0
K	28,660	227	1,678	5.2	130.0	130.0	130.8	0.8
L	31,055	170 / 0[2]	1,863	4.7	139.0	139.0	139.8	0.8
M	35,100	200	2,337	2.1	157.1	157.1	158.1	1.0
N	36,795	95	785	6.4	159.1	159.1	159.9	0.8
O	37,755	138	1,374	3.6	162.9	162.9	163.8	0.9
P	39,205	379	5,526	0.9	173.7	173.7	174.6	0.9
Q	40,608	200	2,649	1.3	181.4	181.4	182.3	0.9
R	41,703	130	1,199	2.9	182.2	182.2	183.1	0.9
S	43,608	276	1,782	2.0	186.5	186.5	187.4	0.9
T	45,368	123	948	3.7	191.0	191.0	191.9	0.9
U	46,258	172	1,283	2.7	193.1	193.1	194.0	0.9
V	47,408	142	926	3.8	195.7	195.7	196.7	1.0

[1] Feet above mouth

[2] Total Floodway width / width within jurisdiction

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

HENRICO COUNTY, VIRGINIA

(ALL JURISDICTIONS)

FLOODWAY DATA

FLOODING SOURCE: UPHAM BROOK

Table 24: Flood Hazard and Non-Encroachment Data for Selected Streams

[Not Applicable to this Flood Risk Project]

6.4 Coastal Flood Hazard Mapping

This section is not applicable to this Flood Risk Project.

Table 25: Summary of Coastal Transect Mapping Considerations

[Not Applicable to this Flood Risk Project]

6.5 FIRM Revisions

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 30, "Map Repositories").

6.5.1 Letters of Map Amendment

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

To obtain an application for a LOMA, visit www.fema.gov/flood-maps/change-your-flood-zone and download the form "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill". Visit the "Flood Map-Related Fees" section to determine the cost, if any, of applying for a LOMA.

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

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

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states

FEMA's determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

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

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

6.5.3 Letters of Map Revision

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

To obtain an application for a LOMR, visit www.fema.gov/media-library/assets/documents/1343 and download the form "MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision". Visit the "Flood Map-Related Fees" section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Henrico County FIRM are listed in Table 26.

Table 26: Incorporated Letters of Map Change

Case Number	Effective Date	Flooding Source	FIRM Panel(s)
20-03-0873P	02/08/2021	Little Tuckahoe Creek Tributary 2	51087C0017D
13-03-1863P	04/07/2014	Jordans Branch	51087C0109D, 51087C0128D
12-03-0257P	12/12/2012	North Run	51087C0061D, 51087C0063D
09-03-0224P	07/17/2009	Cabin Branch	51087C0101D, 51087C0102D
09-03-0224P	07/17/2009	Cabin Branch Tributary 1	51087C0101D

6.5.4 Physical Map Revisions

A Physical Map Revision (PMR) is an official republication of a community's NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of

structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

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

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

6.5.5 Contracted Restudies

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

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Henrico County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 27, "Community Map History." A description of each of the column headings and the source of the date is also listed below.

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

- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or "pending" (for Preliminary FIS Reports) is shown. If the community is listed in Table 27 but not identified on the map, the community is treated as if it were unmapped.

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

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

The initial effective date for the Henrico County FIRMs in countywide format was 02/04/1981.

Table 27: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Henrico County Unincorporated Areas	11/22/1974	11/22/1974	05/14/1976	12/18/2007	04/25/2024 12/18/2007

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 28 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 28: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Allens Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Cabin Branch	07/17/2009	FEMA	09-03-0224P	July 17, 2009	Henrico County, Unincorporated Areas
Cabin Branch Tributary 1	07/17/2009	FEMA	09-03-0224P	July 17, 2009	Henrico County, Unincorporated Areas

Table 28: Summary of Contracted Studies Included in this FIS Report (continued)

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Chickahominy River	04/25/2024	STARR II; STARRII	HSFE60-15-D-0005; HSFE03-16-J-0205	May 31, 2018	Henrico County, Unincorporated Areas
Chickahominy River	04/25/2024	STARR II	HSFE60-15-D-0005	November 20, 2020	Henrico County, Unincorporated Areas
Copperas Creek	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Copperas Creek Tributary 2	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Cosby Parcel Branch	04/25/2024	STARR II	HSFE60-15-D-0005	January 13, 2021	Henrico County, Unincorporated Areas
Deep Run	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Fourmile Creek	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Gillies Creek	04/25/2024	STARR II	HSFE60-15-D-0005	March 25, 2020	Henrico County, Unincorporated Areas
Gillies Creek	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Gillies Creek Tributary 1	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Harding Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Harding Branch Tributary 1	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Heckler Village Tributary 1	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Heckler Village Tributary 2	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas

Table 28: Summary of Contracted Studies Included in this FIS Report (continued)

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Horsepen Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Hungary Creek	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
James River	04/25/2024	STARR II	HSFE60-15-D-0005	March 25, 2020	Henrico County, Unincorporated Areas
James River	04/25/2024	STARR II	HSFE60-15-D-0005	August 31, 2020	Henrico County, Unincorporated Areas
Jordans Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Jordans Branch	04/25/2024	FEMA	13-03-1863P	April 07, 2014	Henrico County, Unincorporated Areas
Little Tuckahoe Creek	04/25/2024	STARR II	HSFE60-15-D-0005; HSFE60-15-D-0000	August 31, 2020	Henrico County, Unincorporated Areas
Little Tuckahoe Creek Tributary 2	02/08/2021	FEMA	N/A	February 08, 2021	Henrico County, Unincorporated Areas
Meredith Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
North Run	04/25/2024	STARR II	HSFE60-15-D-0005	June 2005	Henrico County, Unincorporated Areas
North Run	12/12/2012	FEMA	12-03-0257P	December 12, 2012	Henrico County, Unincorporated Areas
Rocky Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Rooty Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Shockoe Creek	04/25/2024	STARR II	HSFE60-15-D-0005	June 15, 2021	Henrico County, Unincorporated Areas

Table 28: Summary of Contracted Studies Included in this FIS Report (continued)

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Stoney Run	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Stony Run	04/25/2024	STARR II	HSFE60-15-D-0005	March 25, 2020	Henrico County, Unincorporated Areas
Thorpe Branch	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Tributary A To Gillies Creek Tributary 1	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Tributary A To Gillies Creek Tributary 1 Tributary	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Tuckahoe Creek	04/25/2024	STARR II	HSFE60-15-D-0005; HSFE60-15-D-0000	August 31, 2020	Henrico County, Unincorporated Areas
Upham Brook	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Upham Brook	12/18/2007	Michael Baker Jr. Inc.	N/A	June 2005	Henrico County, Unincorporated Areas
Zone A Reaches In HUC 02080205	04/25/2024	STARR II	HSFE60-15-D-0005	March 25, 2020	Henrico County, Unincorporated Areas
Zone A reaches in HUC 02080206 not otherwise listed	04/25/2024	STARR II	HSFE60-15-D-0005	March 25, 2020	Henrico County, Unincorporated Areas

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and previous Flood Risk Projects are shown in Table 29. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

Table 29: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Henrico County, Unincorporated Areas	04/25/2024	08/25/2016	Project Discovery	Representatives of COMPASS, FEMA, Henrico County, VA, Henrico Department of Public Works, US Army Corps of Engineers, Virginia Department of Conservation and Recreation, Virginia Department of Emergency Management
		04/27/2021	Flood Risk Review	Representatives of FEMA, Resilience Action Partners, STARR II, Virginia
		12/09/2023	Final CCO	Representatives of FEMA, STARR II, Henrico County, VA, Henrico Department of Public Works, US Army Corps of Engineers, Virginia Department of Conservation and Recreation