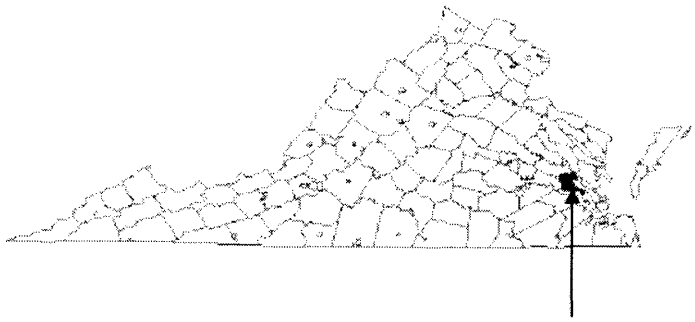
FLOOD INSURANCE STUDY

JAMES CITY COUNTY, VIRGINIA
AND INCORPORATED AREAS

Community Name	Community Number
JAMES CITY COUNTY	
(UNINCORPORATED AREAS)	510201
WILLIAMSBURG, CITY OF	510294



James City County

EFFECTIVE:
SEPTEMBER 28, 2007

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
51095CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Initial Countywide FIS Effective Date: September 28, 2007

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FLOOD INSURANCE STUDY
JAMES CITY COUNTY AND INCORPORATED AREAS, VIRGINIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of James City County, including the City of Williamsburg, Independent City, Virginia; and the unincorporated areas of James City County, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR 60.3.

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

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

GG3 produced a full digital conversion for James City County, Virginia. Base Map information such as the most up to date political boundaries, transportation lines, and water centerlines was obtained from the James City County GIS office. All other feature classes such as the BFEs (Base Flood Elevations), cross sections, flooding, and structures was fully digitalized and attributed from the effective FIRM (Flood Insurance Rate Map) panels.

1.2 Authority and Acknowledgments

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

The hydrologic and hydraulic analyses for the tidal flooding sources in James City County were performed by the Norfolk District of the U.S. Army Corps of Engineers (USACE) for the Federal Emergency Management Agency (FEMA), under Interagency Agreement No. EMW-87-E2509, Project Order No. 3, Amendment No. 1. This work was completed in September 1988. The hydrologic and hydraulic analyses for the riverine flooding sources presented in this study were prepared by the Soil Conservation Service during the preparation of a report entitled *Flood Hazard Analyses, Powhatan Creek and Tributaries.* This work was completed in December 1976.

In the City of Williamsburg, the hydrologic analysis for Queen Creek, an estuary to the York River; and College Creek, Paper Mill Creek and the outlet to Tutters Neck Pond, estuaries to the James River were obtained from the FISs for the unincorporated areas of James City County and York County (FEMA 1991 and FEMA 1988).

1.3 Coordination

The initial Consultation Coordination Office (CCO) meeting for James City County was held on June 17, 1986, and attended by representatives of FEMA, the county and the USACE (the study contractor). The purpose of an initial Consultation CCO meeting is to discuss the scope of the FIS.

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

The results of the study were reviewed at the final CCO meeting held on February 28, 1990, and attended by representatives of FEMA, the county and the study contractor to review the results of the study. The final meeting for the City of Williamsburg was held on April 5, 1993, with representatives of the City of Williamsburg, the USACE, Norfolk District and FEMA. All problems raised at these meetings have been addressed.

The results of the countywide FIS were reviewed at the final CCO meeting held on January 23, 2007, and attended by representatives of FEMA, the Commonwealth of Virginia, James City County, City of Williamsburg, and Greenhorne & O'Mara Inc. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of James City County, Virginia, including the incorporated community listed in Section 1.1. The areas studied by detailed

methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through James City County.

The following riverine sources were studies by detailed methods within James City County: Powhatan Creek, for its entire length within the community; Long Hill Swamp, from its confluence with Powhatan Creek to a point approximately 1.1 miles upstream of State Route 612; West Tributary to Long Hill Swamp, from its confluence with Long Hill Swamp to a point approximately 1.3 miles upstream of State Route 612; East Tributary to Chisel Run, from its confluence with Chisel Run to a point approximately 0.4 mile upstream; and Chisel Run, from its confluence with Powhatan Creek to a point approximately 0.6 mile upstream of State Route 612. Tidal flooding from the York, James and Chickahominy Rivers and their adjoining estuaries was studied by detailed methods. All areas within the county affected by tidal flooding were included in the detailed study. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

The following flooding sources within the City of Williamsburg were studies by detailed methods: Queen Creek, an estuary to the York River; and College Creek, Paper Mill Creek and the outlet to Tutters Neck Pond, estuaries to the James River, were studied by detailed methods. Limits of detailed study are indicated on the FIRM (Exhibit 1).

Approximate analyses were used to study those areas having low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and James City County.

All or portions of the following flooding sourced were studied by approximate methods: Barnes Swamp, Bird Swamp, Chisel Run, Diascund Creek Reservoir, Edwards Swamp, Little Creek Reservoir, Mill Creek, Richardson Mill Pond, Skiffles Creek Reservoir, Ware Creek, West Tributary to Long Hill Swamp, East Tributary to Chisel Run, Long Hill Swamp, Skimino Creek, Barlows Pond and an unnamed tributary to Chisel Run.

2.2 Community Description

James City County and the City of Williamsburg are located in southeastern Virginia. The county is bordered by the unincorporated areas of New Kent County to the north; the unincorporated areas of Gloucester County to the northeast; the unincorporated areas of Surry County to the south; the unincorporated areas of York County, the City of Williamsburg, and the City of Newport News to the east; and the unincorporated areas of Charles City County to the west. The following flooding sources also border the county: the York River to the east, the James River to the south and the Chickahominy River to the west.

James City County encompasses an area of approximately 148 square miles, of which 34 square miles are water (Commonwealth of Virginia, 1974).

The population of James City County was 48,102, and 11,998 for the City of Williamsburg in 2000 (U.S. Census Bureau, 2005). Many residents are employed in the tourism and trade industries, stimulated by the many historical attractions in James City County. The floodplains of the county consist of scattered residential structures, businesses, croplands and forests. With the county's many miles of shoreline, increased pressure for development of the floodplains is expected.

The Powhatan Creek watershed comprises approximately 23 square miles of the Coastal Plain peninsula between the James and York Rivers in southeast Virginia. The James River is the southernmost basin of the Water Resources Council Mid-Atlantic Region. Powhatan Creek rises northwest of the City of Williamsburg and flows generally towards the south approximately 21 miles to its confluence with the James River. The main stem floodplain comprises approximately 2.2 square miles of predominately wooded swamp and tidal marsh. Tributary floodplains comprise another 0.47 square miles; these are also on relatively flat gradients. The upper perimeter of the watershed follows approximately along the 100-foot contour.

James City County and the City of Williamsburg both enjoy a temperate climate, with moderate seasonal changes characterized by warm summers and cool winters. In the warmest month, July, the average high temperature is 89 degrees Fahrenheit (°F) and the average low temperature is 67°F. In the coolest month, January, the average high temperature is 49°F and the average low temperature is 28°F. Annual precipitation over the area averages approximately 49 inches per year (The Weather Channel, 2005). There is some variation in the monthly averages; however, this rainfall is distributed uniformly throughout the year. Snowfall is infrequent, generally occurring in the light amounts and usually melting in a short period of time.

James City County is located in the Coastal Plain province between the York and James Rivers and is underlain primarily by clay, sand, marl and gravel strata. Elevations within the county range from sea level to approximately 140 feet.

2.3 Principal Flood Problems

Within the Powhatan Creek watershed, regularly spaced road fills act as dams and, in effect, convert portions of the floodplains into a series of floodwater-retarding reservoirs during the larger floods. Even moderate floods tend to cover the total floodplain in a network of shallow channels. Larger floods generally result in greater depths of flooding, with slight increases in the area inundated. Below State Route 31, approximately 3 miles upstream from the James River, tide stages rather than stream flows determine the maximum depth for a particular frequency.

The areas along the shoreline of James City County and the City of Williamsburg are vulnerable to tidal flooding from major storms, commonly referred to as hurricanes and northeasters. Both storms produce winds that push large volumes of water against the shore.

Hurricanes, with their high winds and heavy rainfall, are the most severe storms to which the county is subjected. The term "hurricane" is applied to an intense cyclonic storm originating in tropical or subtropical latitudes in the Atlantic Ocean just north of the equator. While hurricanes may affect the area from May through November, nearly 80 percent occur during the months of August, September and October with approximately 40 percent occurring during September. The most severe hurricane to strike the county occurred in August 1933.

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

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

The timing or coincidence of the maximum storm surge with the normal high tide is an important factor in the consideration of flooding from tidal sources. The mean range of tide in the York River at West Point is 2.8 feet; mean range of tide is 2 feet in the James River at Jamestown Island. The range of tide may be somewhat less in the connecting bays and inlets (U.S. Department of Commerce, 1987).

The area also contains estuaries of the York, James and Chickahominy Rivers that are subject to tidal flooding in their lower reaches but fluvial flooding on the upper reaches. Flooding on the upper reaches of these streams may be caused by heavy rains occurring at any time during the year. Flooding may also occur as a

result of intense rainfall produced by local thunderstorms or tropical disturbances such as hurricanes, which move into the area from the Gulf or Atlantic coasts.

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

The hurricane of August 23, 1933 was one of the most severe storms that ever occurred in the Middle Atlantic region. This tropical hurricane passed inland near Cape Hatteras on August 22, passed slightly west of Norfolk and continued towards the north accompanied by extreme high wind and tide. The storm surge in the bay and tidal estuaries were the highest of record and coincided with astronomical high tide, The water level reached a maximum of 8 feet in Hampton Roads (USACE, 1962).

Hurricane "Hazel," the second most destructive of recent hurricanes to strike the area, entered the mainland south of Wilmington, North Carolina, during the morning of October 15, 1954, and moved rapidly northward, passing over Norfolk and Fredericksburg in the early afternoon. The winds were from the east and southeast until the eye passed. When the eye passed, the winds shifted to the southwest with higher velocities. The hurricane surge was not as high as the August 1933 storm, although the tidal surge was superimposed on the normal high tide. In addition to the damage by tidal flooding, much damage was caused to roofs, communication lines and other structures by high wind. Damage of this nature is characteristic of that to be expected during hurricanes (USACE, 1962).

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

2.4 Flood Protection Measures

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

for nonresidential structures which may be floodproofed to that level" (Commonwealth of Virginia, 1973).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods 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 once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance (100-year) flood in any 50-year period is approximately 40 percent (4 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.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Hydrologic analyses for Powhatan Creek, Long Hill Swamp, Chisel Run, West Tributary to Long Hill Swamp and East Tributary to Chisel Run were taken from a report entitles *Flood Hazard Analysis, Powhatan Creek and Tributaries*, prepared by the SCS (U.S. Department of Agriculture, 1976).

Peak discharge-drainage area relationships for James City County are shown in Table 1, Summary of Discharges.

Table 1 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
POWHATAN CREEK At State Route 5	*	2,262	3,647	4,255	5,784
LONG HILL SWAMP A point approximately 2,500 feet upstream of confluence with Powhatan Creek	*	970	1,567	1,835	2,522
CHISEL RUN A point approximately 500 feet upstream of confluence with Powhatan Creek	*	788	1,240	1,434	1,903
WEST TRIBUTARY TO LONG HILL SWAMP At downstream side of State Route 612 bridge	*	413	674	787	1,073
EAST TRIBUTARY TO CHISEL RUN A point approximately 1,100 feet upstream of confluence with Chisel Run	*	251	375	430	562

*Data not available

Tide records for James City County and the City of Williamsburg are limited and by themselves are inadequate to establish a tide-frequency relationship. However, mean tide levels at several locations in the county and limited high-water data at West Point on the York River were correlated with mean tide levels and tide-frequency curves developed for both the Norfolk Harbor gage and the Gloucester Point gage. The Norfolk Harbor gage is located approximately 10 miles inside the Chesapeake Bay, while the Gloucester Point gage is located near the mouth of the York River. Historical accounts of tidal flooding are available for nearly 300 years, but a reasonably accurate indication of the heights reached in Norfolk Harbor is available only since 1908 and a complete record since 1928. The Gloucester Point gage was established in 1950.

The adopted tide-frequency curve for the York River and its estuaries in James City County is based on the Norfolk Harbor gage. To develop the tidal frequencies for the Norfolk Harbor, a statistical analysis was performed in accordance with procedures outlines in U.S. Geological Survey (USGS) Bulletin 17B (USGS, 1981). The Pearson Type III methodology, without the logs, was incorporated for the selected period of record, 1928 through 1978. Consideration was given to separating hurricane and non-hurricane events. Although objective statistical approaches are available for incomplete samples (a hurricane-related tide exists for

less than 50 percent of the years on record), they do not always provide reasonable results. Therefore, all tropical and extratropical events were included together in the analysis of the annual maximum tides.

The analysis of the 51 years of systematic record indicated that the 1933 and 1936 events could be high outliers. However, assuming that the true distribution is defined by the computed (non-adjusted) statistics, the estimated recurrence interval for the 1933 event is 10 years. It has been determined that, with 51 years of record, the probability of an event of this magnitude being exceeded is 40 percent. Since the risk is so high and it is known that several events as large if not larger than the 1933 event have historically occurred, the 1933 event (and any less severe events) was not considered to be a high outlier.

Historical accounts indicate that tides have occurred in Norfolk Harbor at approximately 8 feet in 1667 and 1785 and approximately 7.9 feet in 1846. There has been a gradual rise in sea level over the investigated period of record at Norfolk Harbor. There was some question as to the amount of adjustment that should be made to the historic events. To avoid overestimating the impact of sea level rise, the historic events were increased by only 0.5 foot (approximately the same adjustment for the 1924 to 1942 period). The analysis based on a historical period of 312 years resulted in a slight move to the left of the upper portion of the frequency curve when compared to the systematic record. Since the adjustment was not very large and there is some question as to the reliability of the historical data, the computed statistics based on the 51 years of systematic record were adopted.

The lower portion of the statistical curve was adjusted with a partial duration analysis using plotting positions in accordance with Weibul (USGS, 1981). It included all elevations above 4.26 feet.

Tidal flood-frequency elevations used in this study for the James and Chickahominy Rivers and their estuaries were taken from the Flood Insurance Study for the City of Norfolk (FEMA, 1984).

The Stillwater elevation for the 10-, 50-, 100-and 500-year floods have been determined for the York, James, and Chickahominy Rivers are summarized in Table 2, "Summary of Stillwater Elevations."

Table 2 - Summary of Stillwater Elevations

Flooding Source and Location	Elevation (feet NAVD88) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
YORK RIVER AND ESTUARIES				
Shoreline from confluence of Skimino Creek to confluence of Ware Creek	4.0	5.5	6.3	8.3
Shoreline along Ware Creek	5.0	6.4	7.0	8.4
JAMES RIVER AND ESTUARIES				
Entire shoreline within community	5.4	6.8	7.5	8.8
CHICKAHOMINY RIVER AND ESTUARIES				
Entire shoreline within community	5.4	6.8	7.5	8.8

3.2 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. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Table in the FIS report. 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.

Hydraulic analyses for Powhatan Creek, Long Hill Swamp, Chisel Run, West Tributary to Long Hill Swamp and East Tributary to Chisel Run were taken from a report entitled *Flood Hazard Analysis, Powhatan Creek and Tributaries*, prepared by the SCS (U.S. Department of Agriculture, 1976).

Cross section data for the backwater analyses were obtained by either field survey for from topographic maps furnished by James City County. Only limited surveys were conducted to determine elevations and dimensions of bridge openings, culverts and channels.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of land use conditions of the drainage area.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

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

Special consideration was given to the vulnerability of James City County to wave attack along shorelines of the York and James Rivers during severe hurricanes and northeasters. Areas of shoreline subjected to significant wave attack are referred to as coastal high hazard zones. Methods have been developed to determine which sections of a shoreline fall into this category (USGS). The factors considered for such a determination include: choice of a suitable fetch, its length and width, sustained wind velocities, coastal water depths and physical features of the shoreline that would appreciably affect wave propagation. All of these factors are analyzed to determine if a wave with a height of 3 feet could be generated. The 3 foot wave has been determined to be the minimum size wave capable of causing major damage to conventional wood frame or brick veneer structures. This criterion has been adopted by FEMA for the determination of V zones. Based on the above criteria, the shoreline of James City County is not exposed to severe wave attack and has not been designated as part of a coastal high hazard zone.

3.3 Vertical Datum

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

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Effective information was converted from NGVD29 to NAVD88. The average conversion factor of -0.978 feet was applied to convert all effective Base Flood Elevations (BFEs). Structure and ground elevations in the

community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in BFEs across the corporate limits between the communities.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring, Maryland 20910. (Internet address http://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 Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data Table, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-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 topographic maps. For the tidal flooding sources studied in detail, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using topographic maps at scales of 1:24,000 and 1"=200' with contour intervals of 5 and 10 feet (USGS and James City County, 1988).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain

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

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 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 this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 3, Floodway Data). 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.

Floodway data shown in Table 3 were taken from a report entitled *Flood Hazard Analyses, Powhatan Creek and Tributaries* (Commonwealth of Virginia, 1973). Information shown in Table 3 represents all available floodway data contained in the above-mentioned report; due to the scope of this study, no additional floodway data were calculated for the streams studied by detailed methods.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
POWHATAN CREEK								
A	19,250[1]	1,080	*	*	9.6	9.6	*	*
B	25,000[1]	331	*	*	12.4	12.4	*	*
C	25,080[1]	943	*	*	16.2	16.2	*	*
D	28,630[1]	957	*	*	16.6	16.6	*	*
E	34,800[1]	487	*	*	18.9	18.9	*	*
F	39,780[1]	520	*	*	22.0	22.0	*	*
G	39,900[1]	564	*	*	24.2	24.2	*	*
H	44,530[1]	923	*	*	24.9	24.9	*	*
I	48,340[1]	844	*	*	25.7	25.7	*	*
J	50,760[1]	338	*	*	29.2	29.2	*	*
LONG HILL SWAMP								
A	2,430[2]	209	*	*	31.7	31.7	*	*
B	4,400[2]	311	*	*	33.9	33.9	*	*
C	6,460[2]	287	*	*	37.1	37.1	*	*
D	6,580[2]	536	*	*	44.0	44.0	*	*
E	8,080[2]	180	*	*	44.3	44.3	*	*
F	10,390[2]	120	*	*	46.6	46.6	*	*
G	12,670[2]	131	*	*	51.7	51.7	*	*

[1]Feet above confluence with James River
[2]Feet above confluence with Powhatan Creek
*Data not available

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA
AND INCORPORATED AREAS

FLOODWAY DATA

POWHATAN CREEK / LONG HILL SWAMP

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CHISEL RUN								
A	930[1]	285	*	*	31.3	31.3	*	*
B	3,680[1]	230	*	*	33.1	33.1	*	*
C	3,770[1]	220	*	*	33.3	33.3	*	*
D	4,450[1]	205	*	*	33.3	33.3	*	*
E	4,540[1]	233	*	*	33.5	33.5	*	*
F	5,930[1]	267	*	*	34.3	34.3	*	*
G	9,280[1]	113	*	*	41.5	41.5	*	*
H	9,400[1]	270	*	*	44.6	44.6	*	*
I	12,760[1]	84	*	*	52.2	52.2	*	*
WEST TRIBUTARY TO LONG HILL SWAMP								
A	1,200[2]	164	*	*	35.5	35.5	*	*
B	1,300[2]	317	*	*	42.4	42.4	*	*
C	3,880[2]	186	*	*	43.6	43.6	*	*
D	5,440[2]	136	*	*	46.8	46.8	*	*
E	8,000[2]	69	*	*	54.9	54.9	*	*
			*	*			*	*
EAST TRIBUTARY TO CHISEL RUN								
A	2,340[3]	130	*	*	40.9	40.9	*	*

[1]Feet above confluence with Powhatan Creek
[2]Feet above confluence with Long Hill Swamp
[3]Feet above confluence with Chisel Run
*Data not available

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA
AND INCORPORATED AREAS

FLOODWAY DATA

CHISEL RUN / WEST TRIBUTARY TO LONG HILL SWAMP / EAST TRIBUTARY TO CHISEL RUN

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that 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 1.

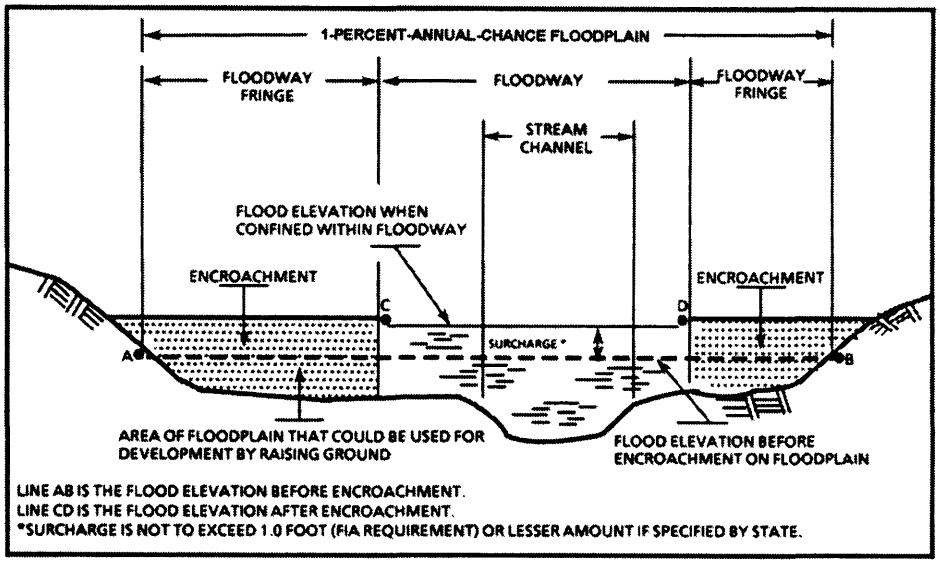

Figure 1 - Floodway Schematic

5.0 INSURANCE APPLICATIONS

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

Zone A

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

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Zone AR is the flood insurance risk zone that corresponds to an area of special flood hazard formerly protected from the 1-percent-annual-chance flood event 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-percent-annual-chance or greater flood event.

Zone A99

Zone A99 is the flood insurance risk zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

Zone V

Zone V is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

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

Zone X (Future Base Flood)

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

Zone D

Zone D is the flood insurance risk zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

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

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

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

The countywide FIRM presents flooding information for the entire geographic area of James City County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 4, "Community Map History."

7.0 OTHER STUDIES

This report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

Flood Insurance Studies have been prepared for the unincorporated areas of New Kent County, the unincorporated areas of Surry County, the unincorporated areas of Charles City County, the unincorporated areas of York County, the unincorporated areas of Gloucester County and the City of Newport News (FEMA, 1990; FEMA, 1990; FEMA. 1990; FEMA 1988; FEMA, 1987; FEMA 1986). The results of this study are in complete agreement with the results of those studies.

A report entitled *Flood Hazard Analysis, Powhatan Creek and Tributaries* has been prepared by the Soil Conservation Service (U.S. Department of Agriculture, 1976). The results of this study are in complete agreement with the results of that study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Federal Regional Center, 615 Chestnut Street, Philadelphia, PA, 19106.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FIRM EFFECTIVE DATE	FIRM REVISION DATE
JAMES CITY COUNTY	July 18, 1975	September 24, 1982	February 6, 1991	
CITY OF WILLIAMSBURG	March 28, 1975	None	November 20, 1981	March 2, 1994

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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http://www.weather.com/activities/other/other/weather/climo-monthly-graph.html?locid=USVA0832&from=search, Accessed 26 January 2005.

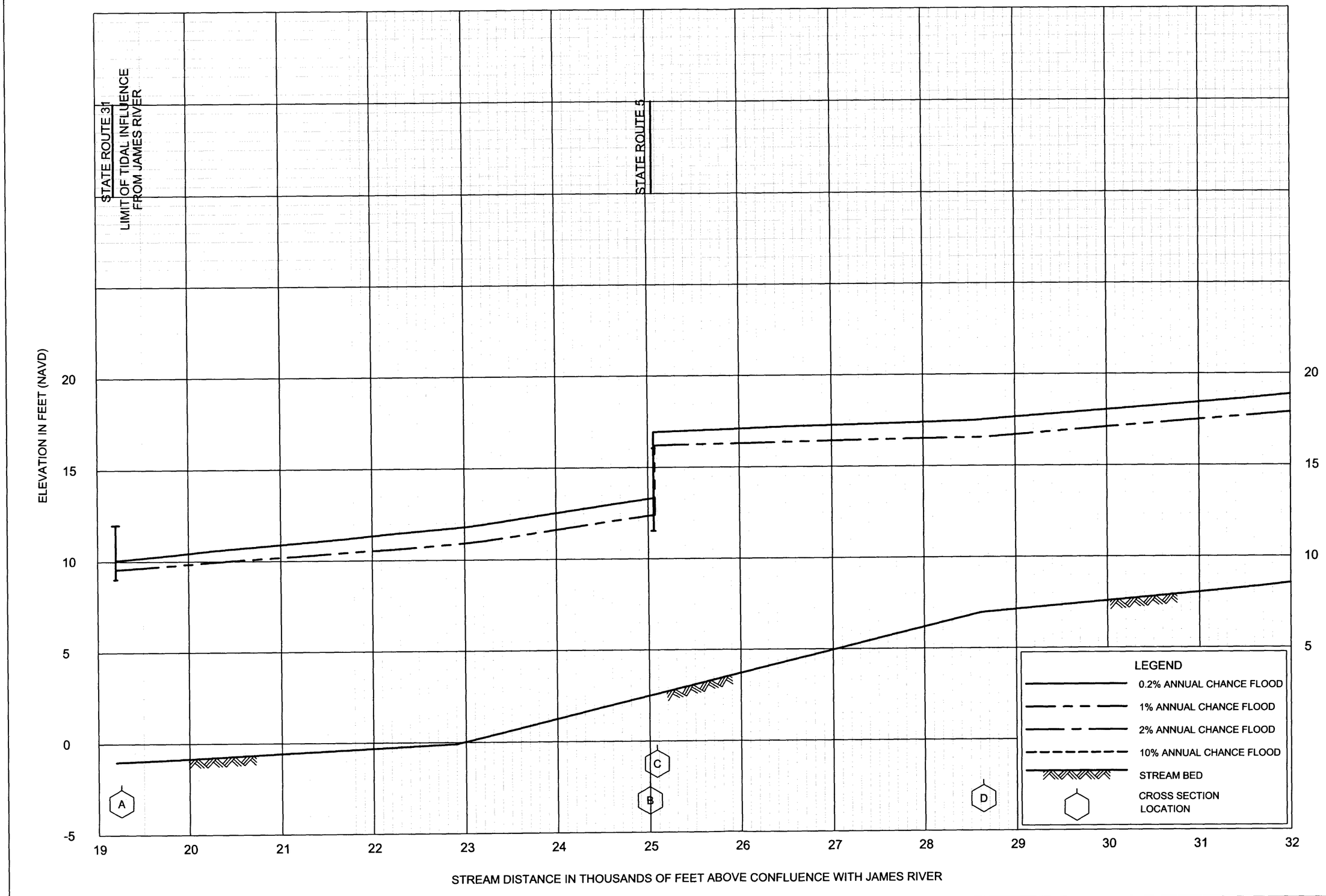
10.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original FIS and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report. All users are advised to contact the Community Map Repository at the address below to obtain the most up-to-date flood hazard data.

Building E. Department of Code Compliance
101 East Mounts Bay Road
Williamsburg, VA 23187

10.1 First Revision

The March 2, 1994 revision for the City of Williamsburg updated the corporate limits, added base flood elevations to change special flood hazard areas, changed zone designations, update map format and add special flood hazard areas previously shown on the Unincorporated Areas of James City County, Virginia Flood Insurance Rate Map dated February 6, 1991.



FLOOD PROFILES

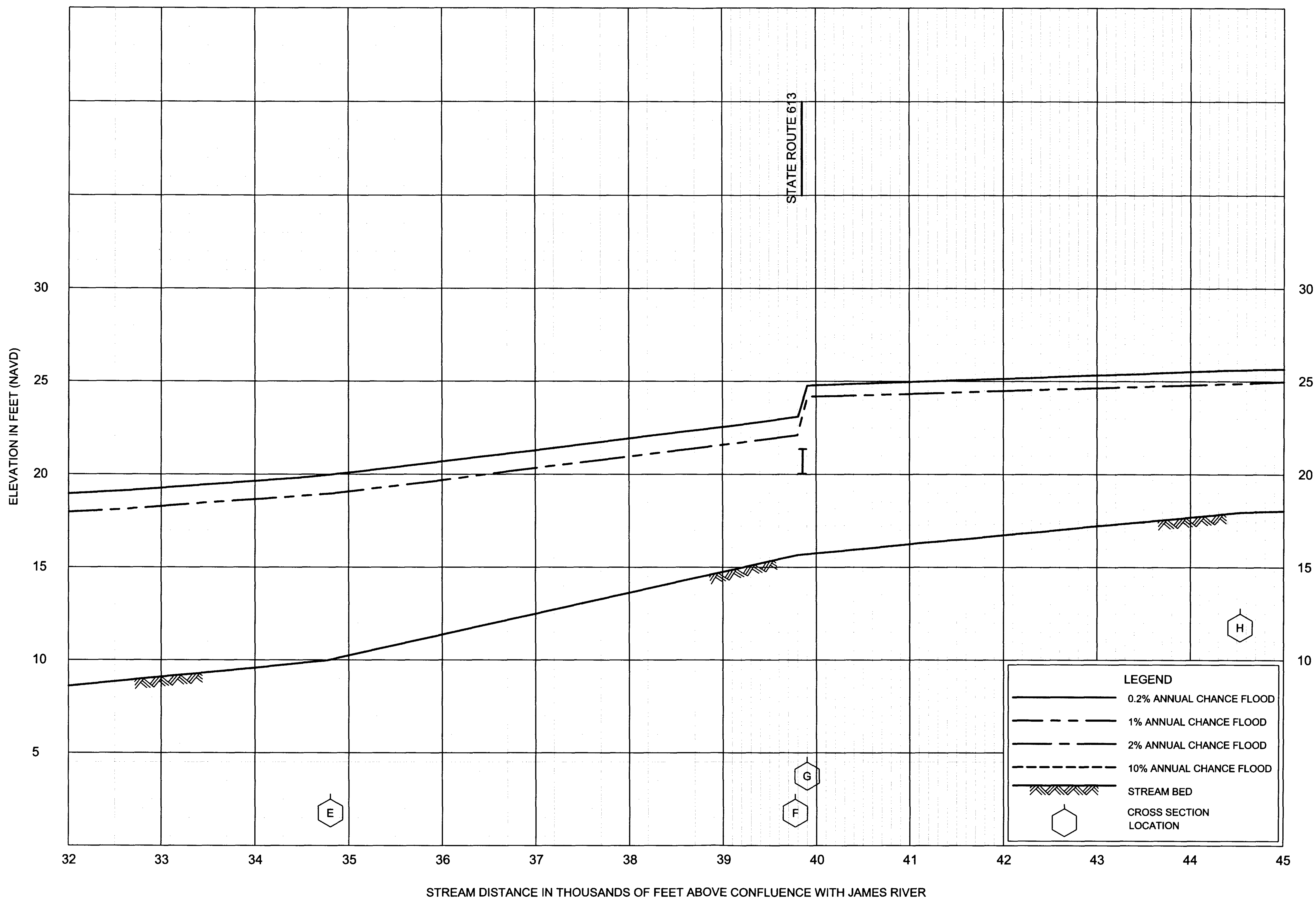
POWHATAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

01P



FLOOD PROFILES

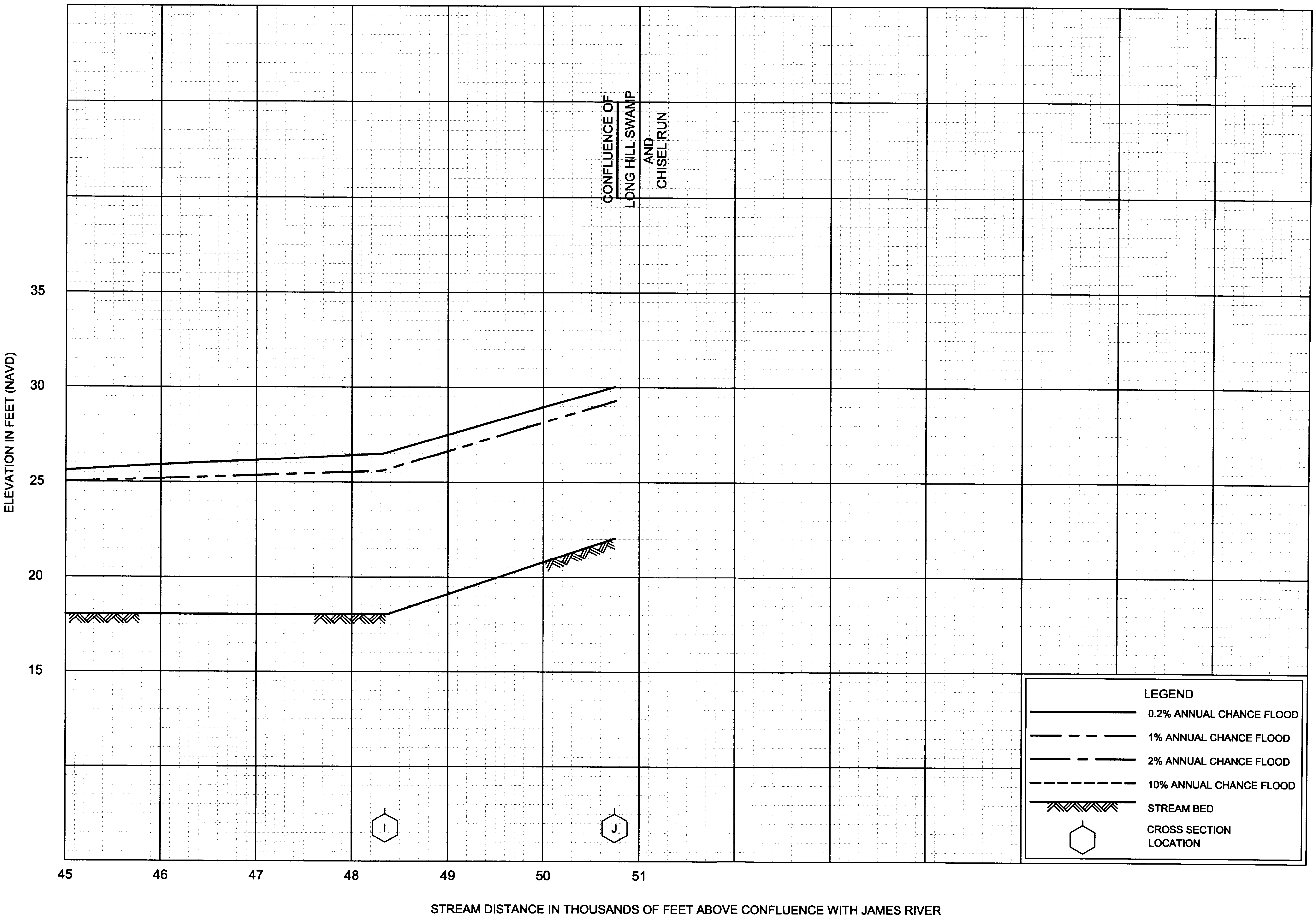
POWHATAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

02P



FLOOD PROFILES

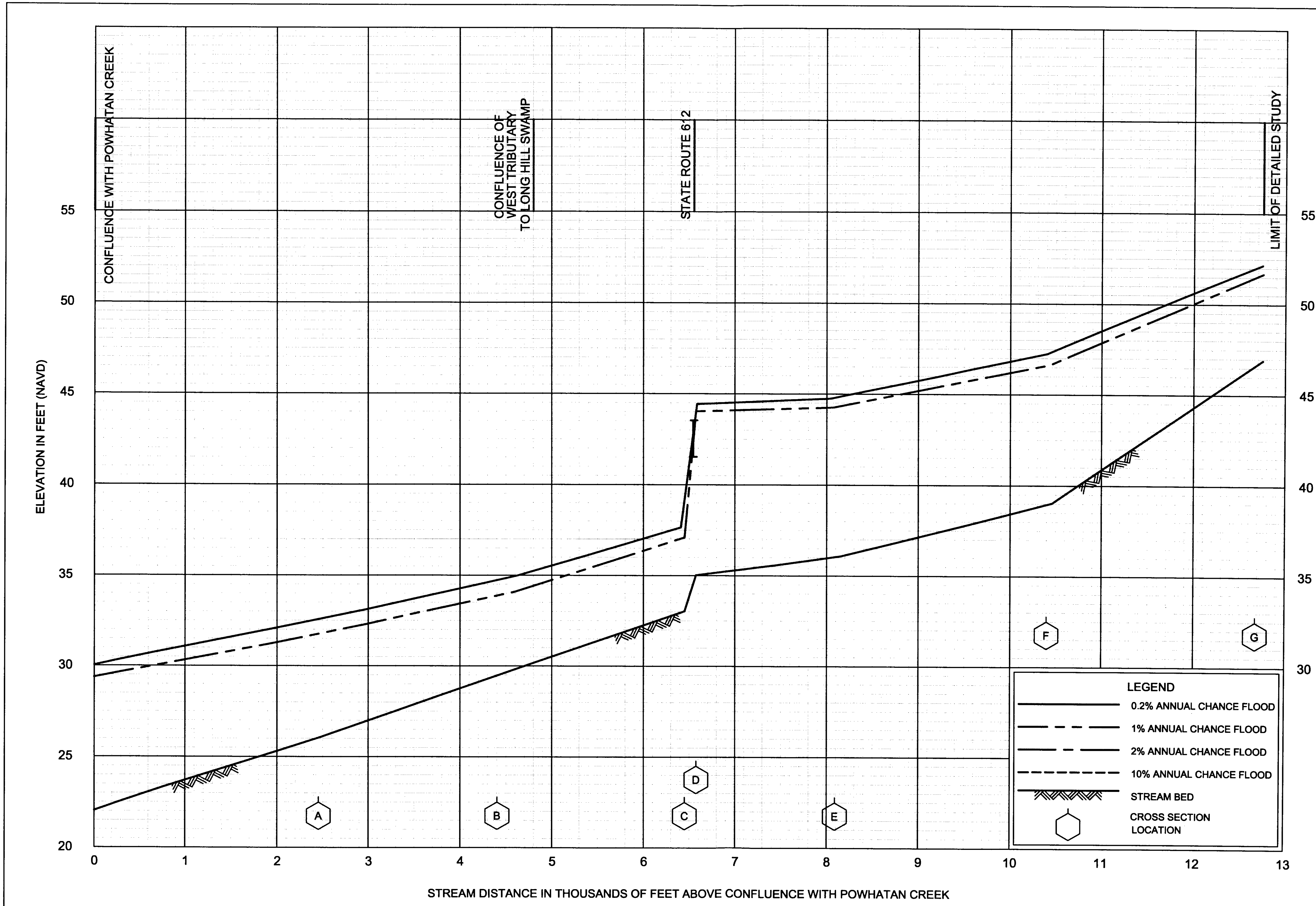
POWHATAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

03P



FLOOD PROFILES

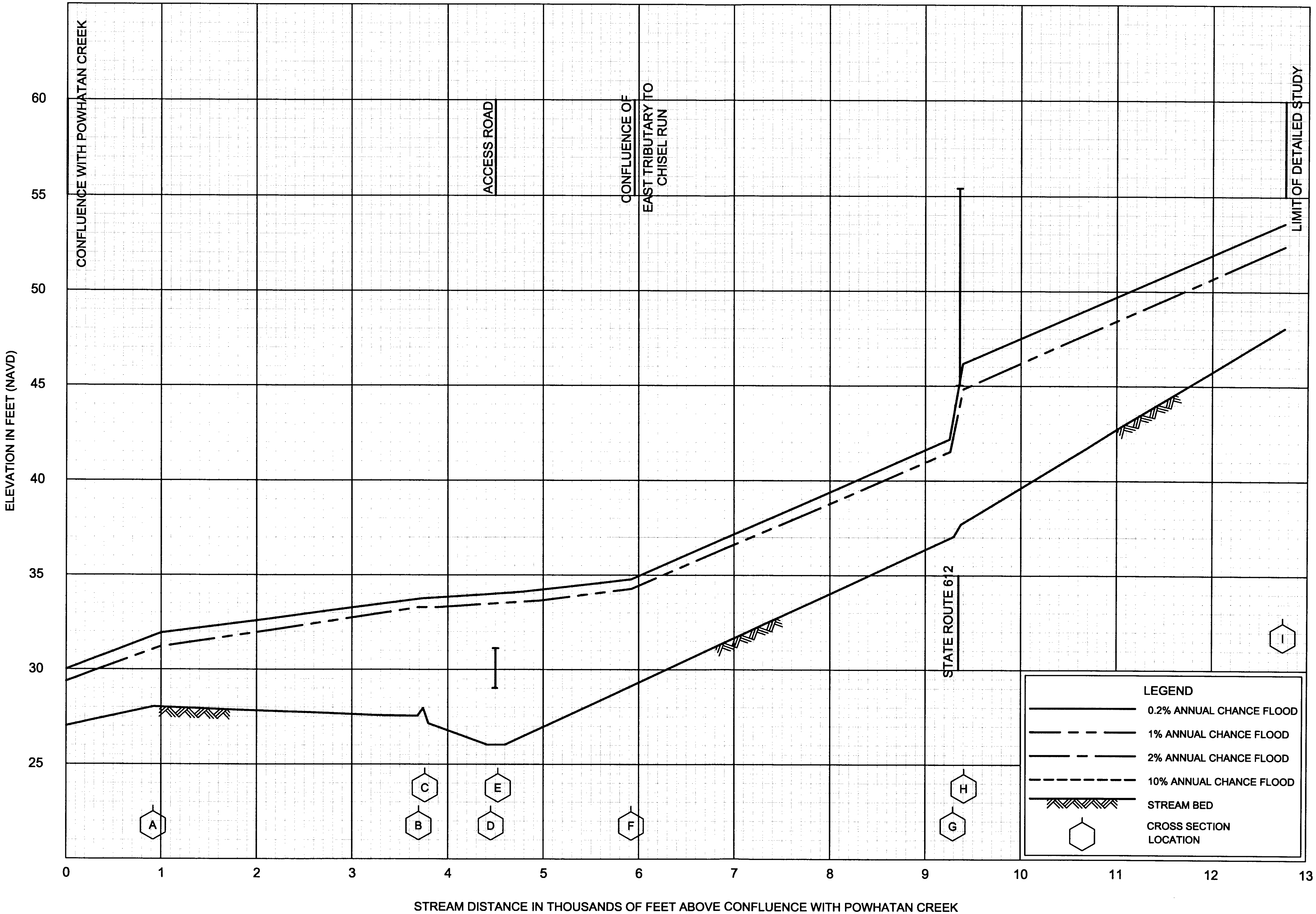
LONG HILL SWAMP

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

04P



FLOOD PROFILES

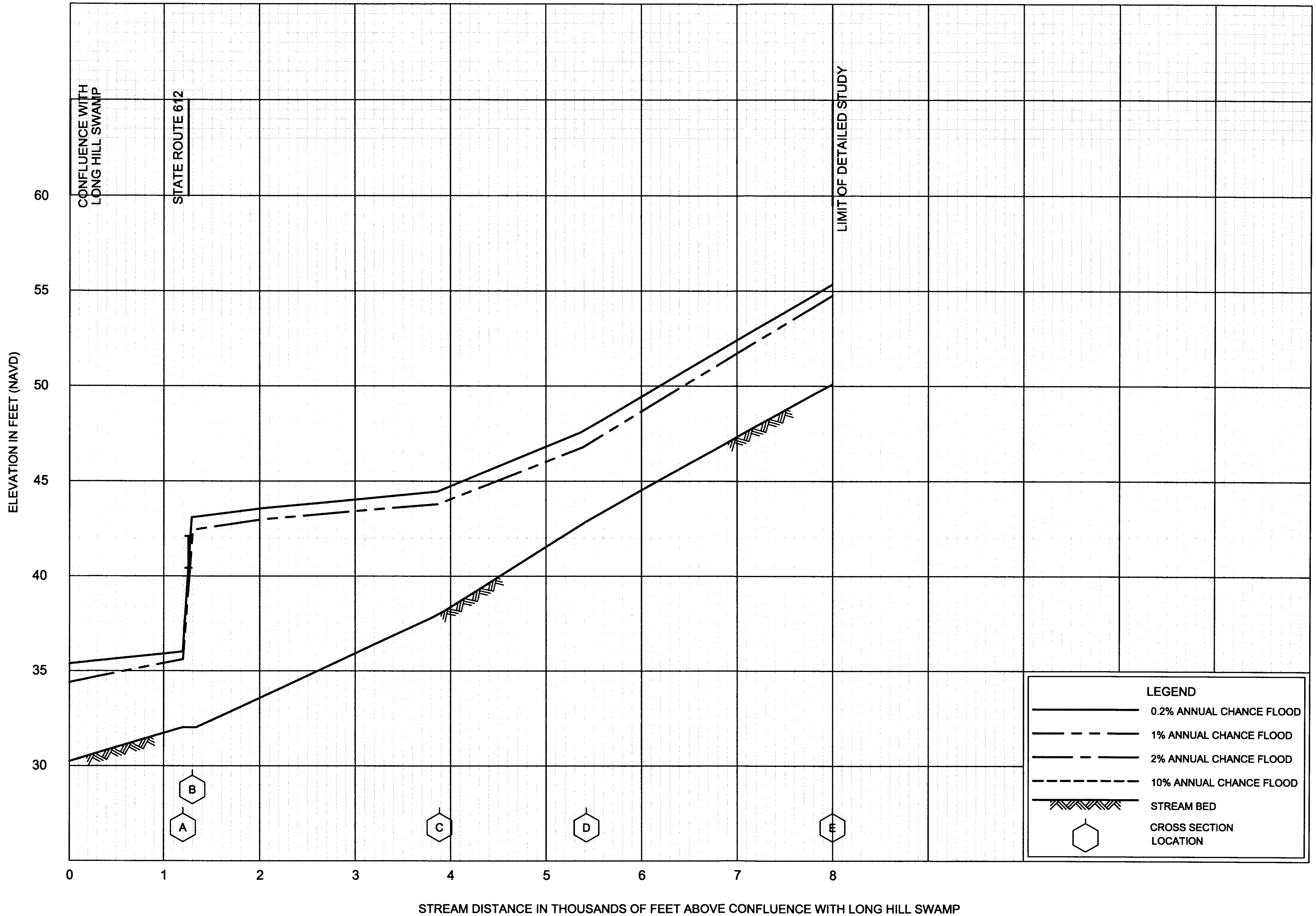
CHISEL RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

05P



FLOOD PROFILES

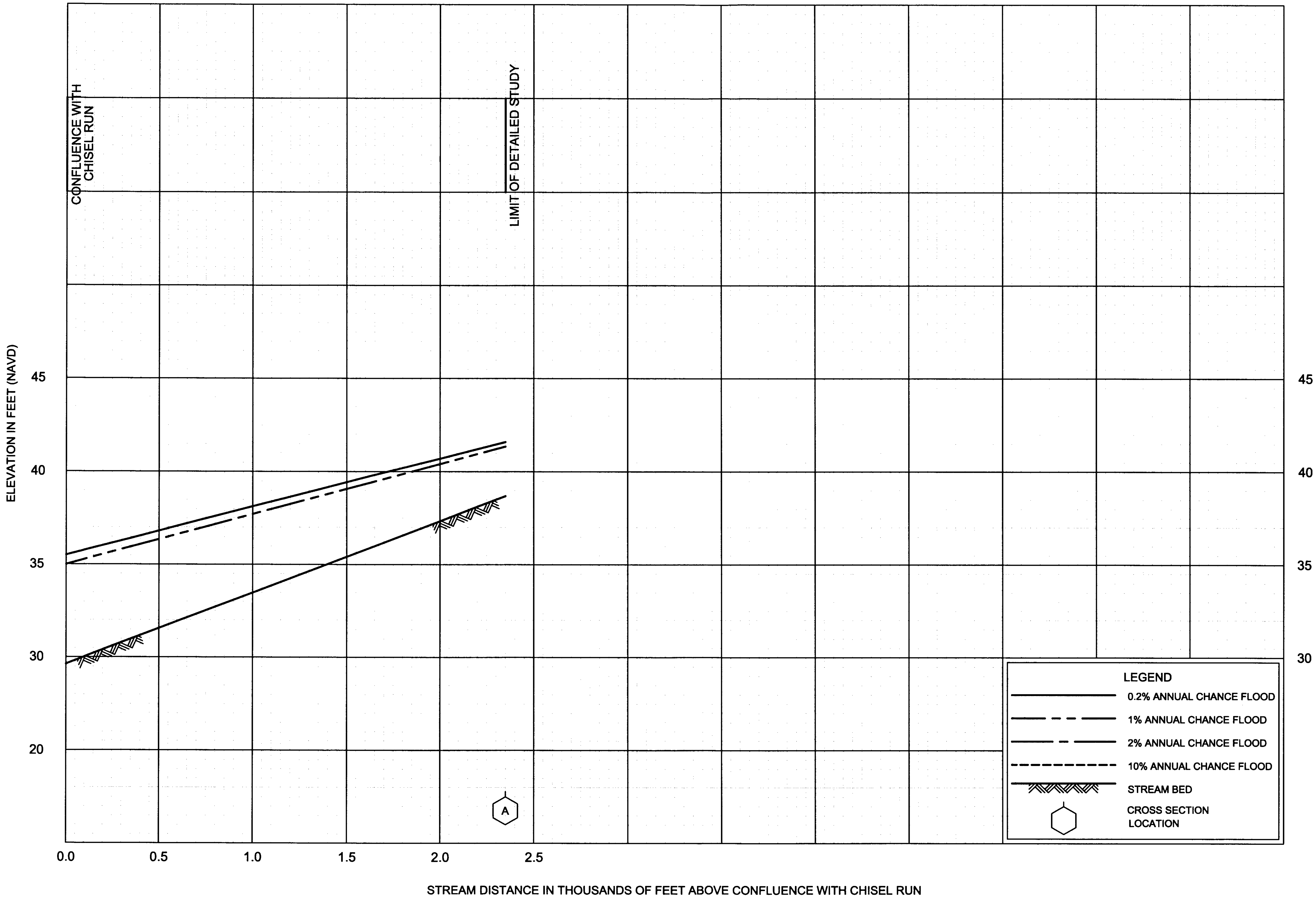
WEST TRIBUTARY TO LONG HILL SWAMP

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

06P



FLOOD PROFILES

EAST TRIBUTARY TO CHISEL RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

JAMES CITY COUNTY, VA

AND INCORPORATED AREAS

07P