FLOOD INSURANCE STUDY

WICOMICO COUNTY, MARYLAND AND INCORPORATED AREAS

COMMUNITY NAME	CID NUMBER
Town of Delmar	240186
City of Fruitland	240139
Town of Hebron*	240143
Town of Mardela Springs	240079
Town of Pittsville*	240110
City of Salisbury	240080
Town of Sharptown	240081
Wicomico County (Unincorporated Areas)	240078
Town of Willards	240082

*No Special Flood Hazard Areas Identified

Please note this Revised Preliminary FIS report includes revised coastal data and riverine updates not included in the February 29, 2012 Revised Preliminary. All revised and unrevised components will appear in the final FIS Report.

REVISED PRELIMINARY - July 26, 2013

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

24045CV000A

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.

Selected Flood Insurance Rate Map panels for this community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways and cross sections). In addition, former flood insurance risk zone designations have been changed as follows.

Old Zone(s)	New Zone
A1 – A30	AE
V1 – V30	VE
B	X
C	X

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: TBD

Please note this Revised Preliminary FIS report includes revised coastal data and riverine updates not included in the February 29, 2012 Revised Preliminary. All revised and unrevised components will appear in the final FIS Report.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION **1**

1.1 Purpose of Study 1

1.2 Authority and Acknowledgements 1

1.3 Coordination 3

2.0 AREA STUDIED 4

2.1 Scope of Study 4

2.2 Community Description 5

2.3 Principal Flood Problems 6

2.4 Flood Protection Measures 7

3.0 ENGINEERING METHODS 8

3.1 Hydrologic Analyses 8

3.2 Hydraulic Analyses 14

3.3 Coastal Analysis 16

3.4 Vertical Datum 24

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS 24

4.1 Floodplain Boundaries 24

4.2 Floodways 25

5.0 INSURANCE APPLICATION 45

6.0 FLOOD INSURANCE RATE MAP 46

7.0 OTHER STUDIES 48

8.0 LOCATION OF DATA 48

9.0 BIBLIOGRAPHY AND REFERENCES 48

TABLE OF CONTENTS - CONTINUED

Page

FIGURES

Figure 1 – Transect Location Map……22
Figure 2 – Typical Transect Schematic……. 23
Figure 3 – Floodway Schematic…… 26

TABLES

Table 1 – Names of Flooding Sources Studied in Whole or Part by Detailed Methods….....4
Table 2 – Names of Flooding Sources Studied in Whole or Part by Approximate Methods…… 5
Table 3 – Eastern Coastal Plain Fixed Region Regression Equations……... 9
Table 4 – Summary of Discharges……10-14
Table 5 – Summary of Coastal Stillwater Elevations…… 18
Table 6 – Transect Descriptions…… 20-21
Table 7 – Floodway Data……...27-44
Table 8 – Community Map History……...47

EXHIBITS

Exhibit 1 – Flood Profiles

Beaglin Branch	Panels 01P – 02P
Beaverdam Creek	Panels 03P – 05P
Brewington Branch	Panels 06P – 07P
Connelly Mill Branch	Panels 08P – 09P
Coty Cox Branch	Panels 10P – 12P
Jackson Branch	Panel 13P
Leonard Pond Run	Panels 14P – 17P
Mayer Branch	Panels 18P – 19P
Middle Neck Branch	Panels 20P – 23P
Morris Prong	Panels 24P – 25P
North Prong (Leonard Pond) - Andrews Branch	Panels 26P – 27P
Owens Branch	Panel 28P
Peggy Branch	Panels 29P – 30P
Slab Bridge Creek	Panels 31P – 32P
South Prong	Panel 33P
Tonytank Creek	Panels 34P – 37P
Tuxents Branch	Panel 38P
Unnamed Tributary to Beaglin Branch	Panel 39P
Unnamed Tributary to South Prong	Panel 40P
Walston Branch	Panel 41P
White Marsh Creek	Panel 42P
Wood Creek	Panel 43P
North Prong Wicomico River	Panels 44P – 45P

Exhibit 2 – Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
WICOMICO COUNTY, MARYLAND AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Map (FIRM) for the Cities of Fruitland and Salisbury; the Towns of Delmar, Hebron, Mardela Springs, Pittsville, Sharptown, and Willards; and the Unincorporated Areas of Wicomico County (hereinafter referred to collectively as Wicomico 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. This information will also be used by D.C. to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that on the effective date of this study, the Towns of Hebron and Pittsville have no identified Special Flood Hazard Areas (SFHAs). This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (i.e. annexation of new lands) or the availability of new scientific or technical data about flood hazards

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

1.2 Authority and Acknowledgements

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 this study were performed by the U.S. Army Corps of Engineers (USACE) for Maryland Department of Environment (MDE) as part of the Federal Emergency Management Agency's (FEMA) Map Modernization Program (MMP) under Contract No. ICA-05-CRL-01. The MMP study was completed in March 2009. The USACE was tasked with converting the hard copy flood maps to a digital format. The USACE provided the value-added service of creating georeferenced hydraulic models for the detailed and approximate studies included in the existing FISs for Wicomico County. The hydrologic

analysis was provided to the USACE from Dr. Glenn E. Moglen of the Department of Civil and Environmental Engineering at the University of Maryland, and the hydraulic analyses utilized Light Detection And Ranging (LiDAR) and bridge inventory data received from MDE, along with the surveyed channel data from the previous HEC-2 studies for detailed studies, to create updated HEC-RAS hydraulic models. The existing tidal analysis was converted from the National Geodetic Vertical Datum of 1929 (NGVD29) to the North American Vertical Datum of 1988 (NAVD88) and remapped onto the update ground surface.

This countywide FIS is a revision and compilation of the following five existing FIS studies in Wicomico County, Maryland: the City of Fruitland, the City of Salisbury, the Town of Mardela Springs, the Town of Sharptown, and the Unincorporated Areas of Wicomico County (FEMA 1984, 1985). These FISs were prepared by the Flood Management Division of the Maryland Water Resources Administration of the State of Maryland for the Federal Insurance Administration under Contract No. EMW-C-274, and are dated November 15, 1985, September 27, 1985, March 28, 1984, September 27, 1985, and March 28, 1984, respectively.

There are no previous FIS reports published for the Towns of Delmar, Hebron, Pittsville, and Willards; therefore, the previous authority and acknowledgments for these communities are not included in this FIS.

For this revision, the FEMA Region III office initiated a study to update the coastal storm surge elevations within the States of Virginia, Maryland, and Delaware, and the District of Columbia including the Atlantic Ocean, the Chesapeake Bay (including its tributaries), and the Delaware Bay. This effort is one of the most extensive coastal storm surge analyses to date, encompassing coastal floodplains in three states and including the largest estuary in the world. The study replaces outdated coastal storm surge stillwater elevations for all FISs in the study area, and serves as the basis for new coastal hazard analysis and ultimately updated FIRMs. Study efforts were initiated in 2008 and concluded in 2011.

For this revision, the coastal analysis and mapping for Wicomico County was conducted by FEMA under contract No. HSFE03-09-0002. The coastal analysis involved transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave setup, wave height analysis and wave runup.

The base map information shown on this FIRM was produced in digital format by the National Agriculture Imagery Program (NAIP) in 2006. NAIP acquires digital ortho-imagery during the agricultural growing seasons in the continental U.S. at a scale of 1:40,000 for the purpose of producing natural color digital orthophotos at a 1 meter pixel resolution.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The horizontal datum was the North American Datum of 1983 (NAD83), GRS80 spheroid. Differences in datum, spheroid, projection or UTM 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 this FIRM.

1.3 Coordination

Coordination with local officials and Federal, State, and regional agencies produced information pertaining to floodplain regulations, community maps, flood history, and other hydrologic data.

The purpose of the initial Consultation Coordination Officer (CCO) meeting is to discuss the scope of the meeting. A final CCO meeting is held to review the results of the study.

On August 3, 1979, an initial CCO meeting for all of the studies was attended by representatives of FEMA, Wicomico County, local governments, and the study contractor. Further coordination occurred with USACE, the U.S. Geological Survey (USGS), the U.S. Department of Agriculture, Soil Conservation Service, and Wicomico County officials. The results of the previous studies were reviewed at final CCO meetings attended by representatives of the study contractor, FEMA, and the community. For the City of Salisbury and the unincorporated areas of Wicomico County, the final CCO meeting was held on September 21, 1983; for the Towns of Mardela Springs and Sharptown, the final CCO meeting was held on March 21, 1984; for the City of Fruitland, the final CCO meeting was held on June 1, 1984.

The initial CCO meeting for this countywide study was held on April 12, 2005 at the MDE offices and attended by representatives of MDE, FEMA, and USACE (study contractor for this study).

The results of the study were reviewed at an interim CCO meeting held on August 17, 2009 and attended by representatives of FEMA, the community, and the study contractor. All problems raised at that meeting have been addressed.

For the coastal storm surge analyses, the FEMA Region III office initiated a study in 2008 for the Atlantic Ocean, the Chesapeake Bay and its tributaries, and the Delaware Bay. Therefore, no initial CCO meeting for the coastal storm surge study was held.

For this revision which includes the coastal storm surge analyses, a final CCO meeting was held on _____, with representatives of FEMA, the study contractor, and Wicomico County.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Wicomico County, Maryland, including all unincorporated areas of the county; the Cities of Fruitland and Salisbury; and the Towns of Delmar, Hebron, Mardela Springs, Pittsville, Sharptown, and Willards.

All or portions of the flooding sources listed in Table 1 below were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

Table 1 - Names of Flooding Sources Studied in Whole or Part by Detailed Methods

Beaglin Branch	Owens Branch
Beaverdam Creek	Peggy Branch
Brewington Branch	Slab Bridge Creek
Connelly Mill Branch	South Prong (Leonard Pond)
Coty Cox Branch	Tonytank Creek
Jackson Branch	Tuxents Branch
Leonard Pond Run	Unnamed Tributary to Beaglin Branch
Mayer Branch	Unnamed Tributary to South Prong
Middle Neck Branch	Walston Branch
Morris Prong	White Marsh Creek
North Prong (Leonard Pond) - Andrews Branch	Wood Creek
North Prong Wicomico River	

The USACE's detailed methodology included comparing existing condition hydrology calculations to the results used in the effective FIS (refer to Section 3.1). New georeferenced hydraulic models were created for each stream studied in detail, and the resulting GIS layers (floodplains, cross-sections, floodways) were used in the development of the updated FIS mapping (refer to Section 3.2).

Flooding in parts of the community with low development potential or minimal flood hazard was studied by approximate methods in both the effective FIS and MMP. Table 2 below lists the streams studied in part or in whole by approximate methods.

Table 2 - Names of Flooding Sources Studied in Whole or Part by Approximate Methods

Adkins Race	North Prong Wicomico River
Andrews Branch	Pocomoke River
Barren Creek	Pryor Branch
Burnt Mill Branch	Quantico Creek
Gordys Branch	South Prong Wicomico River
Green Run	Tributary to Walston Branch
Horse Bridge Creek	Unnamed Creek
Little Burnt Branch	Widow Hawkins Branch
Nassawango Creek	

The USACE's methodology for approximate method streams included developing the 1-percent annual chance discharge for the stream (refer to Section 3.1), creating new georeferenced hydraulic models, and developing a resulting GIS layer for the 1-percent annual chance inundation area for updated FIS mapping.

For this revision, a new detailed coastal flood hazard analysis was developed for the Chesapeake Bay.

2.2 Community Description

Wicomico County is located on the Eastern Shore of Maryland and is bordered to the west-northwest by the Nanticoke River and Dorchester County, to the north by the State of Delaware, to the east-southeast by Worcester County, to the southwest by Somerset County and the Chesapeake Bay. According to U.S. Census Bureau, the population of Wicomico County was 98,733 in 2010 (Census, 2013). Salisbury is the county seat of Wicomico County. Local rural industries include agriculture, fishing and service trades. Wicomico County has a total area of 374 square miles (Census, 2013).

The continental climate of Wicomico County is moderated by effects from the Chesapeake Bay and the Atlantic Ocean. The highest temperature recorded in Salisbury was 106 degrees Fahrenheit (F.) and occurred in August 1918 and July 1930. The lowest temperature was -9 degrees F. and occurred in January 1918. The average annual temperature of Wicomico County is 57.6 degrees F. There are approximately 204 frost free days per year. The average annual rainfall is 45.97 inches (Maryland State Climatologist Office), with an average annual snowfall of 11.6 inches. The maximum rainfall record of 8.9 inches occurred in Salisbury on August 30, 1936 (Maryland Department of Economic and Community Development, 1977).

The underlying unconsolidated sediments slope gently toward the southeast at approximately 10 to 95 feet per mile. These unconsolidated deposits were the result of the deposition of sediment from melt water of the continental glaciers and the terracing effect of several sea level oscillations. Beneath the coastal plain sediments lie older Paleozoic crystalline rocks at an average depth of 2,500 feet. Abundant groundwater is available throughout Wicomico County with the water table depth generally less than 25 feet.

Major drainage basins in the county provide drainage directly into the Chesapeake Bay. The eastern one-third of the county drains south toward the Pocomoke River and its tributaries. The central portion of the county is drained by the Wicomico River which flows in a southwesterly orientation. The portion of the county west of a line extending from the Delaware state line south through Hebron to Nanticoke is drained by the Nanticoke River.

The maximum elevation for the Nanticoke River watershed is approximately 40 feet. The highest elevation of the Wicomico River and Pocomoke River watersheds in the county are 60 feet and 85 feet, respectively. The highest elevation in Wicomico County, 85 feet, is near the Town of Parsonsburg (USGS).

The irregular shoreline is a result of drowned river valleys formed by the gradually sinking land mass. This has led to a change in the overall drainage pattern due to widening rivers and creeks. Extensive estuaries and tidal basins have resulted, producing a myriad of waterways.

Floodplain development in Wicomico County is primarily single-family residential homes. Some commercial and industrial development is present on the Wicomico River.

2.3 Principal Flood Problems

The low lying, relatively undisturbed topography, high seasonal water tables, poor drainage and high runoff characteristics of the soils combine to provide a high flooding potential. When heavy rainfall and a high river discharge combine with storm tides, low lying areas adjacent to rivers and estuaries become inundated with saltwater. Major floods in the Wicomico County area have occurred in 1876, 1933, 1935, 1954, 1955, 1967, 1972, 1975 1984, 1999, 2003, 2006, 2011, and 2012. Few detailed records of historical flood damage are available.

Little is known of the 1876 flood which is known locally as the Centennial Storm. Senator J.S. Shepard stated in 1933 that the Centennial Storm resulted in severe damage to the lower sections of Dorchester and Wicomico Counties where thousands of acres were ruined by saltwater flooding. Wicomico County experienced tides running five feet higher than the normal high tide which at that time was the highest ever experienced (The Cambridge Record, 1933).

On August 17, 1955, Hurricane Diane brought tides 1.5 to 2.5 feet above normal.

The full force of the hurricane missed the Delmarva Peninsula and Wicomico County (The Banner, 1972).

Hurricane Donna struck on September 16, 1960 causing minor wind and water damage (Star Democrat, 1960). No tidal information can be found for this storm.

Tropical Storm Agnes brought winds up to 55 miles per hour during late June 1972 (The Banner, 1972). Some local flooding occurred but damage was primarily restricted to crops.

Heavy rains caused statewide flooding and intense coastal erosion, especially along the lower Chesapeake Bay on March 28–29, 1984 (MDE).

Hurricane Floyd caused widespread flooding on the northern portion of the Eastern Shores on September 16, 1999 (MDE).

Remnants of Hurricane Isabel caused widespread tidal surge flooding on September 18-19, 2003 (MDE).

A large storm event in June 2006 dropped 3 to 6 inches of rain in most of Wicomico County between June 22 and June 30, 2006, which caused widespread flooding (National Oceanic and Atmospheric Administration, National Climatic Data Center).

In September 2011, Hurricane Irene hit the eastern coast and caused substantial damage. On September 16, 2011, President Barack Obama declared the entire eastern portion of the State of Maryland as a disaster area, which allowed residents affected by the hurricane to apply for federal aid.

In October 2012, Hurricane Sandy made landfall north of the State of Maryland, but caused substantial damage in Maryland. President Barack Obama declared the entire State of Maryland as a disaster area, which allowed residents affected by the hurricane to apply for federal aid.

2.4 Flood Protection Measures

The State of Maryland Department of Natural Resources has established rules and regulations governing construction near nontidal waters and in designated floodplain areas. It restricts development in, obstructions to, and encroachment on the 1-percent annual chance (100-year) floodplain.

Wicomico County has incorporated a number of flood protection measures into its ordinances and regulations. Adopted within the county are subdivision regulations which include the right to deny development in floodprone areas, requirements of storm drainage systems satisfactory to the Department of Public Works, and requirements for the formation of a homeowners association for the purpose of assigning responsibility for maintenance of stormwater systems. The county has

the right to enforce maintenance through assessment of costs against property owners.

The county has also adopted a stormwater management ordinance which requires the onsite detention of stormwater runoff in excess of that which would occur on undeveloped land based on a 25-year storm (Wicomico County).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community (Table 1), 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 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 the peak discharge-frequency relationships for each flooding source studied in detail affecting Wicomico County.

Information on the methods used to determine peak discharge-frequency relationships for the streams studied by detailed methods is shown below.

Countywide Analyses

The effective FISs for Wicomico County included hydrologic analyses for the areas studied in detail. The objectives of the hydrologic portions of the FIS update are to calculate revised 10-, 2-, 1-and 0.2-percent annual chance flows, along with an ultimate 1-percent annual chance flow, based on regression equations produced by Dr. Glenn E. Moglen of the Department of Civil and Environmental Engineering at the University of Maryland. The ultimate 1-percent annual chance flow was based on floods that can be anticipated when the watershed land use changes to a future “ultimate development” condition. The methods of the updated hydrologic analyses are presented below.

The current regional regression equations being used by the Maryland State Highway Administration were developed by Mr. Jonathan Dillow, a hydrologist for the USGS. Mr. Dillow defined regression equations for five hydrologic fixed regions: Appalachian Plateaus and Allegheny Ridges, Blue Ridge and Great Valley, Piedmont, Western Coastal Plain and Eastern Coastal Plain (Dillow, 1996).

Dr. Moglen developed a new set of regression equations, called the fixed region regression equations, for the State of Maryland. The fixed region method used in his study is based on the predefined regions of Mr. Dillow since these regions are based on physiographic regions. Wicomico County is located entirely in the Eastern Coastal Plain Region.

The region regression equations for the Eastern Coastal Plain Region (as shown as follows in Table 3) are based on 15 stations in Maryland and 9 stations in Delaware with drainage area (DA) ranging from 2.27 to 112.20 square miles, basin relief (BR) ranging from 5.1 to 43.5 feet, and percent A soils (S_A) ranging from 0.0 to 49.4 percent. Basin relief is not statistically significant for discharges less than the 5-yr event but is included in the equations for consistency. The standard errors range from 33.7 percent (0.142 log units) for Q_{1_50} to 50.8 percent (0.208 log units) for Q_{500}.

Table 3 - Eastern Coastal Plain Fixed Region Regression Equations

Eastern Coastal Plain Fixed Region Regression Equation	Standard error (percent)	Equivalent years of record
$Q_{1.25} = 19.85\ DA^{0.796}\ BR^{0.066}\ (S_A+1)^{-0.106}$	34.2	4.5
$Q_{1.50} = 20.48\ DA^{0.795}\ BR^{0.156}\ (S_A+1)^{-0.140}$	33.7	4.1
$Q_{1.75} = 20.81\ DA^{0.799}\ BR^{0.197}\ (S_A+1)^{-0.146}$	34.2	4.1
$Q_{2} = 20.95\ DA^{0.803}\ BR^{0.222}\ (S_A+1)^{-0.144}$	34.9	4.1
$Q_{5} = 25.82\ DA^{0.793}\ BR^{0.368}\ (S_A+1)^{-0.190}$	36.9	6.8
$Q_{10} = 31.17\ DA^{0.777}\ BR^{0.439}\ (S_A+1)^{-0.215}$	38.2	9.5
$Q_{25} = 40.26\ DA^{0.751}\ BR^{0.511}\ (S_A+1)^{-0.242}$	40.0	13
$Q_{50} = 50.00\ DA^{0.732}\ BR^{0.549}\ (S_A+1)^{-0.261}$	41.7	16
$Q_{100} = 63.44\ DA^{0.711}\ BR^{0.576}\ (S_A+1)^{-0.279}$	44.0	18
$Q_{200} = 79.81\ DA^{0.689}\ BR^{0.601}\ (S_A+1)^{-0.296}$	46.5	19
$Q_{500} = 108.7\ DA^{0.660}\ BR^{0.628}\ (S_A+1)^{-0.316}$	50.8	21

All calculations using the fixed region regression equations were preformed with GISHydro2000. GISHydro is a computer program used to assemble and evaluate hydrologic models for watershed analysis. Originally developed in the mid-1980s, the program combines a database of terrain, land use, and soils data with specialized GIS tools for assembling data and extracting model parameters. The primary purpose of the GISHydro program is to assist engineers in performing watershed analyses in the State of Maryland. In the Fall of 1997, a new collaborative project between the Department of Civil and Environmental Engineering at the University of Maryland and the Maryland State Highway Administration began to update and enhance GISHydro into GISHydro2000.

It should also be emphasized that these regression equations, although not developed by the USGS, provide better standard error performance than the current USGS regression equations for Maryland, and also apply not just to rural but to both rural and urban watershed conditions. These equations were endorsed for use in Maryland by the Maryland Hydrology Panel, as documented in their report, 'Application of Hydrologic Methods in Maryland' which can be obtained from the Maryland State Highway Administration or from the following URL: http://www.gishydro.umd.edu/HydroPanel/panel_report_103106.pdf (University of Maryland 2006).

The City of Salisbury requested the analyses for Brewington Branch and Middle Neck Branch use the previous effective hydrology determined from TR-20 that accounts for storage.

This Countywide Revision

No new detailed hydrologic analyses were carried out for this countywide study.

Results of Dr. Moglen's hydrologic analysis are listed as follows in Table 4.

Table 4 – Summary of Discharges

Flooding Source and Location	Drainage Area (Mi²)	Exceedance Probability Discharge (cfs)				
		10% Annual Chance	2% Annual Chance	1 % Annual Chance	1% Annual Chance Ultimate*	0.2 % Annual Chance
Beaglin Branch						
At confluence with Beaverdam Creek	2.00	91	166	211	211	354
Beaverdam Creek						
Upstream of Main Street	22.03	2,565	3,826	4,633	4,633	6,661
Approximately 800 feet upstream of Beaglin Park Drive	18.92	788	1,430	1,790	1,790	2,870

Table 4 – Summary of Discharges - continued

Flooding Source and Location	Drainage Area (Mi²)	Exceedance Probability Discharge (cfs) 10% Annual Chance	2% Annual Chance	1 % Annual Chance	1% Annual Chance Ultimate*	0.2 % Annual Chance
Brewington Branch						
At Conrail Bridge	4.7	207	230	234	n/a	242
At Northwood Drive	4.5	207	230	234	n/a	242
At Salisbury Corporate Limits	4.3	391	575	685	n/a	917
At U.S. 13/Salisbury Bypass	2.3	235	361	428	n/a	568
Connelly Mill Branch						
At confluence with Leonard Pond Run	4.59	229	431	548	548	923
Coty Cox Branch						
Approximately 450 feet upstream of Booth Street	1.84	80	145	183	183	308
Approximately 250 feet upstream of North Lake Park Drive	1.72	73	132	167	167	281
Jackson Branch						
At confluence with North Prong (Leonard Pond)	1.19	54	98	125	125	216
Leonard Pond Run						
At confluence with Johnson Pond	26.43	991	1,770	2,180	2,180	3,420
Upstream of Naylor Mill Road	25.10	969	1,740	2,160	2,160	3,390
Approximately 900 feet upstream of Naylor Mill Road	20.22	819	1,480	1,850	1,850	2,940
At Conrail Railroad	14.95	513	887	1,100	1,100	1,730
Downstream of confluence of Wood Creek	14.66	420	716	881	881	1,354
Upstream of confluence of Wood Creek	12.73	223	404	514	869	869
Mayer Branch						
At confluence with Andrews Branch (Williams Mill Pond)	1.93	103	194	252	252	443

Table 4 – Summary of Discharges - continued

Flooding Source and Location	Drainage Area (Mi²)	Exceedance Probability Discharge (cfs) 10% Annual Chance	2% Annual Chance	1 % Annual Chance	1% Annual Chance Ultimate*	0.2 % Annual Chance
Middle Neck Branch						
At Emerson Avenue[1]	6.1	390	440	470	n/a	560
At City of Salisbury corporate limits[1]	5.1	500	670	720	n/a	970
Morris Prong						
At confluence with Slab Bridge Creek	3.83	139	273	355	355	630
North Prong (Leonard Pond)						
At confluence with Leonard Pond	8.24	345	621	784	784	1,290
Upstream of Williams Millpond Road	6.64	220	404	515	515	871
Owens Branch						
Upstream of Fitzwater Street	3.16	215	432	564	564	1,010
Downstream of Nanticoke Road	2.84	209	428	564	564	1,020
Approximately 2,600 feet upstream of Nanticoke Road	1.06	82	168	223	223	415
Peggy Branch						
At confluence with Middle Neck Branch	2.88	139	259	330	n/a	556
Slab Bridge Creek						
At confluence with Tonytank Creek	5.11	297	580	747	747	1,290
South Prong						
Approximately 700 feet downstream of confluence of Unnamed Tributary to South Prong	3.80	169	306	389	389	653
Upstream of Rum Ridge Road	1.45	139	249	314	314	514

Table 4 – Summary of Discharges - continued

Flooding Source and Location	Drainage Area (Mi²)	Exceedance Probability Discharge (cfs) 10% Annual Chance	2% Annual Chance	1 % Annual Chance	1% Annual Chance Ultimate*	0.2 % Annual Chance
Tonytank Creek						
Approximately 250 feet downstream of confluence of Tuxents Branch	13.81	586	1,070	1,340	1,340	2,150
Upstream of Salisbury Boulevard	5.60	263	488	618	618	1,030
Approximately 2,000 feet downstream of South Division Street	5.02	233	430	545	545	910
Just downstream of White Marsh Creek	2.88	220	416	531	531	902
Just downstream of Nutters Cross Road	1.23	87	169	221	221	398
Tuxents Branch						
Upstream of Covered Bridge Road	1.17	56	103	131	131	224
Downstream of Camden Avenue	1.02	43	77	98	98	166
Downstream of Clyde Avenue	.51	22	39	50	50	86
Unnamed Tributary to Beaglin Branch						
At confluence with Beaglin Branch	0.66	94	181	237	237	424
Unnamed Tributary to South Prong						
At confluence with South Prong	0.49	30	57	75	75	139
Walston Branch						
At Salisbury Bypass	6.82	263	461	579	579	950
Approximately 1.29 miles upstream of Ward Road	1.0	56	146	191	n/a	342
Approximately 1.98 miles upstream of Ward Road	0.4	22	58	76	n/a	138

Table 4 – Summary of Discharges - continued

Flooding Source and Location	Drainage Area (Mi²)	Exceedance Probability Discharge (cfs) 10% Annual Chance	2% Annual Chance	1 % Annual Chance	1% Annual Chance Ultimate*	0.2 % Annual Chance
White Marsh Creek						
Approximately 150 feet upstream of confluence with Tonytank Creek	1.46	76	141	182	182	320
Wood Creek						
Approximately 2,225 feet upstream of confluence with Leonard Pond Run	1.92	93	171	219	219	376

* 1% Ultimate Exceedence Probability Discharge
[1] Discharges from the FIS report for the City of Salisbury (FEMA, 1984)

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 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 (Exhibit 1 and Table 7). 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 us the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

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

Countywide Analyses

A triangulated irregular network (TIN), which is a 3-D model of a ground surface, was created from LiDAR provided by the Maryland Department of Natural Resources. Cross sections for the backwater analyses were obtained from this TIN. The below-water portions of the cross sections were either obtained from the effective hydraulic models, which were originally obtained by field survey or from sounding maps, or estimated from the thalweg on the Flood Profile panel in the effective FIS if the effective hydraulic model was not found. Locations of selected

cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

All bridges and culverts in the original hydraulic models were surveyed to obtain elevation data and structural geometry. In an effort to identify any bridges that had been modified since the original FIS had been conducted, USACE contacted the MDE and Wicomico County to acquire the most recent data on all bridges and culverts. The data from MDE and Wicomico County were compared to the effective hydraulic models and if a difference existed, the bridge data were replaced with the more recent information. There were several bridges and culverts for which MDE or Wicomico County did not have data. For these crossings, USACE conducted a field survey to acquire the data required to model the bridge or culvert. (Note: There are some bridges and culverts that have been built since the previous study for which USACE could not obtain any information. No information on these new stream crossings was available from either MDE or Wicomico County, and USACE could not gain access to the bridges or culverts due to fences around private property, or due to safety concerns. Notes have been added to the hydraulic models for any stream with this situation.)

Water-surface elevations for floods of the selected recurrence intervals were computed through use of the USACE Hydrologic Engineering Centers River Analysis System (HEC-RAS version 3.1.3) step-backwater computer program. HEC-RAS version 4.0 is used for the hydraulic analysis for Brewington Branch, Middle Neck Branch, and Tonytank Creek.

Starting water-surface elevations were calculated using the slope-area method for most detailed study streams. Where the detailed study began at an existing structure, the headwater elevation for each frequency flood was acquired from the effective FIS and used as the starting water surface elevation in the hydraulic analysis.

Channel and overbank roughness factors (Manning's "n" values) used in the original hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. Roughness values for the main channel of the streams in Wicomico County ranged from 0.03 to 0.05, while floodplain roughness ranged from 0.05 to 0.16 for all floods.

The hydraulic analysis for this study was based on unobstructed flow. The flood elevations are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

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

This Countywide Revision

No new detailed hydrologic analyses were carried out for this countywide study.

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

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

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

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

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

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

3.3 Coastal Analysis

Coastal analysis, 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 the shoreline. Users of the FIRM should be aware that coastal flood elevations are provided in Table 5, 'Summary of Coastal Stillwater Elevations' in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup, and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

Residential and agricultural development, as well as wildlife management areas, encompass much of the shoreline within Wicomico County with the exception of a few isolated commercial areas. Shorelines are primarily low marshes, with some low bluffs between 2 to 10 feet in height NAVD88, along the lower reaches of the Nanticoke and Wicomico Rivers. Behind the shoreline, the ground slopes gently upward into open woodlands or agricultural areas.

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

The storm surge study was conducted for FEMA by the USACE and its project partners under Project HSFE03-06-X-0023, "NFIP Coastal Storm Surge Model for Region III" and Project HSFE03-09-X-1108, "Phase II Coastal Storm Surge Model for FEMA Region III". The work was performed by the Coastal Processes Branch (HF-C) of the Flood and Storm Protection Division (HF), U.S. Army Engineer Research and Development Center – Coastal & Hydraulics Laboratory (ERDC-CHL).

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

The tidal surge for those estuarine areas affected by the Chesapeake Bay affect the entire shoreline within Wicomico County. The entire open coastline, from the confluence with the Nanticoke River to the Wicomico River, is more prone to damaging wave action during high wind events due to the significant fetch over which winds can operate. Inland from the mouths of these water bodies, as well as Wetipquin, Quantico, Rewastico, Broad, Wicomico, and Tonytank Creeks, river widths narrow considerably as they converge with non-tidal tributaries. In this area, the fetch over which winds can operate for wave generation is significantly less.

The Stillwater elevations for the 10-, 2-, 1-, and 0.2-percent annual chance floods were determined for the Chesapeake Bay are shown in Table 5, "Summary of Coastal Stillwater Elevations." The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects.

TABLE 5 - SUMMARY OF COASTAL STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD88*)			
	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
CHESAPEAKE BAY				
Nanticoke River at Stump Point	4.0	5.0	5.2	5.8
Nanticoke River at Roaring Point	4.1	4.9	5.1	5.8
Nanticoke River at Chapter Point	4.3	5.5	5.8	6.6
Wicomico River at Mollies Point	4.1	5.1	5.3	6.0
Wicomico River at Deep Point	4.4	5.8	6.0	6.6

*North American Vertical Datum of 1988

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (NAS, 1977). This method is based on three major concepts. First, depth-limited waves in shallow water reach maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in NAS Report. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

The coastal analysis and mapping for Wicomico County was conducted for FEMA by RAMPP under contract No. HSFEHQ-09-D-0369, Task Order HSFE03-09-0002. The coastal analysis involved transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave setup, wave height analysis and wave runup.

Wave heights were computed across transects that were located along coastal areas of Wicomico County, as illustrated on the FIRMs. Transects are located with

consideration given to existing transect locations and to the physical and cultural characteristics of the land so that they would closely represent conditions in the locality.

Each transect was taken perpendicular to the shoreline and extended inland to a point where coastal flooding ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for a 1% annual chance event were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the Zone VE (area with velocity wave action) was computed at each transect. Along the open coast, the Zone VE designation applies to all areas seaward of the landward toe of the primary frontal dune system. The primary frontal due is defined as the point where the ground profile changes from relatively steep to relatively mild.

Due to the low marshy nature, dune erosion was not taken into account along the Chesapeake Bay coastline. A review of the geology and shoreline type in Wicomico County was made to determine the applicability of standard erosion methods, and FEMA's standard erosion methodology for coastal areas having primary frontal dunes, referred to as the "540 rule," was used (FEMA, 2007a). This methodology first evaluates the dune's cross-sectional profile to determine whether the dune has a reservoir of material that is greater or less than 540 square feet. If the reservoir is greater than 540 square feet, the "retreat" erosion method is employed and approximately 540 square feet of the dune is eroded using a standardized eroded profile, as specified in FEMA guidelines. If the reservoir is less than 540 square feet, the "remove" erosion method is employed where the dune is removed for subsequent analysis, again using a standard eroded profile. The storm surge study provided the return period stillwater elevations required for erosion analyses. Each cross-shore transect was analyzed for erosion, when applicable.

Wave height calculations used in this study follow the methodologies described in the FEMA guidance for coastal mapping (FEMA, 2007). Wave setup results in an increased water level at the shoreline due to the breaking of waves and transfer of momentum to the water column during hurricanes and severe storms. For the Wicomico County study, wave setup was determined directly from the coupled wave and storm surge model The total stillwater elevation (SWEL) with wave setup was then used for simulations of inland wave propagation conducted using FEMA's Wave Height Analysis for Flood Insurance Studies (WHAFIS) model Version 4.0 (FEMA, 2007). WHAFIS is a one-dimensional model that was applied to each transect in the study area. The model uses the specified SWEL, the computed wave setup, and the starting wave conditions as input. Simulations of wave transformations were then conducted with WHAFIS taking into account the storm-induced erosion and overland features of each transect. Output from the model includes the combined SWEL and wave height along each cross-shore

transect allowing for the establishment of base flood elevations (BFEs) and flood zones from the shoreline to points inland within the study area.

Wave runup is defined as the maximum vertical extent of wave uprush on a beach or structure. FEMA's 2007 Guidelines and Specifications require the 2% wave runup level be computed for the coastal feature being evaluated (cliff, coastal bluff, dune, or structure) (FEMA, 2007a). The 2% runup level is the highest 2 percent of wave runup affecting the shoreline during the 1-percent annual chance flood event. Each transect defined within the Region III study area was evaluated for the applicability of wave runup, and if necessary, the appropriate runup methodology was selected and applied to each transect. Runup elevations were then compared to WHAFIS results to determine the dominant process affecting BFEs and associated flood hazard levels. Based on wave runup rates, wave overtopping was computed following the FEMA 2007 Guidelines and Specifications. In Wicomico County, no transects required runup methodology to be applied.

Computed controlling wave heights at the shoreline range from 2.7 feet at embayments where the fetch is short to 3.9 feet at the southern end where the fetch is longer. The corresponding wave elevation at the shoreline varies from 7.6 feet NAVD88 at the northern end to 8.7 feet NAVD88 at the southern end.

Between transects, elevations were interpolated using topographic maps, land-use and land cover data, and engineering judgment to determine the aerial extent of flooding. The results of the calculations are accurate until local topography, vegetation, or cultural development within the community undergoes major changes. The transect data table, Table 6 below, provides the Chesapeake Bay 10%, 2%, 1% and 0.2% annual chance stillwater elevations and the starting wave conditions for each transect. Figure 1, 'Transect Location Map', provides an illustration of the transect locations for the county.

Table 6 – Transect Descriptions

Flooding Source	Transect Number	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (feet NAVD88)			
		Coordinates	Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Wicomico River	1	N 38.261862 W -75.821771	2.56	3.14	4.4	5.7	6.0	6.6
Wicomico River	2	N 37.258059 W -75.841786	2.79	3.21	4.3	5.6	5.9	6.5
Wicomico River	3	N 38.247949 W -75.860690	3.46	3.70	4.2	5.4	5.7	6.3

Table 6 – Transect Descriptions - continued								
		Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (feet NAVD88)			
Flooding Source	Transect Number	Coordinates	Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Nanticoke River	4	N 38.228192 W -75.893156	4.05	3.90	4.0	5.0	5.2	5.9
Nanticoke River	5	N 38.238010 W -75.902798	4.16	4.00	4.0	5.0	5.2	5.9
Nanticoke River	6	N 38.250831 W -75.907439	4.25	3.84	4.0	4.9	5.1	5.8
Nanticoke River	7	N 38.257629 W -75.910419	4.11	3.92	4.1	4.9	5.1	5.9
Nanticoke River	8	N 38.268768 W -75.912152	3.17	3.75	4.1	4.9	5.2	5.9
Nanticoke River	9	N 38.276949 W -75.906077	3.26	3.53	4.1	5.0	5.3	5.9
Nanticoke River	10	N 38.284287 W -75.90161	3.05	3.38	4.1	5.1	5.3	6.0
Nanticoke River	11	N 38.291901 W -75.908245	3.05	3.38	4.1	5.0	5.3	6.0
Nanticoke River	12	N 38.305257 W -75.896895	3.04	3.47	4.2	5.2	5.4	6.2
Nanticoke River	13	N 38.317194 W -75.888846	3.01	3.59	4.2	5.3	5.5	6.3
Nanticoke River	14	N 38.333964 W -75.873954	2.80	3.52	4.3	5.4	5.6	6.4
Nanticoke River	15	N 37.350057 W -75.855993	2.45	3.24	4.3	5.5	5.8	6.5
Nanticoke River	16	N 37.366561 W -75.850826	2.56	3.32	4.3	5.5	5.8	6.6

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MARYLAND AND INCORPORATED AREAS

0 0.5 1 2 3 4 Miles

TRANSECT LOCATION MAP

Areas of coastline subject to significant wave attack are referred to as coastal high hazard zones. The USACE has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high hazard zones (USACE, 1975). The 3-foot wave has been determined the minimum size wave capable of causing major damage to conventional wood frame of brick veneer structures. The one exception to the 3-foot wave criteria is where a primary frontal dune exists. The limit the coastal high hazard area then becomes the landward toe of the primary frontal dune or where a 3-foot or greater breaking wave exists, whichever is most landward. The coastal high hazard zone is depicted on the FIRMs as Zone VE, where the delineated flood hazard includes wave heights equal to or greater than three feet. Zone AE is depicted on the FIRMs where the delineated flood hazard includes wave heights less than three feet. A depiction of how the Zones VE and AE are mapped is shown in Figure 2, 'Typical Transect Schematic'.

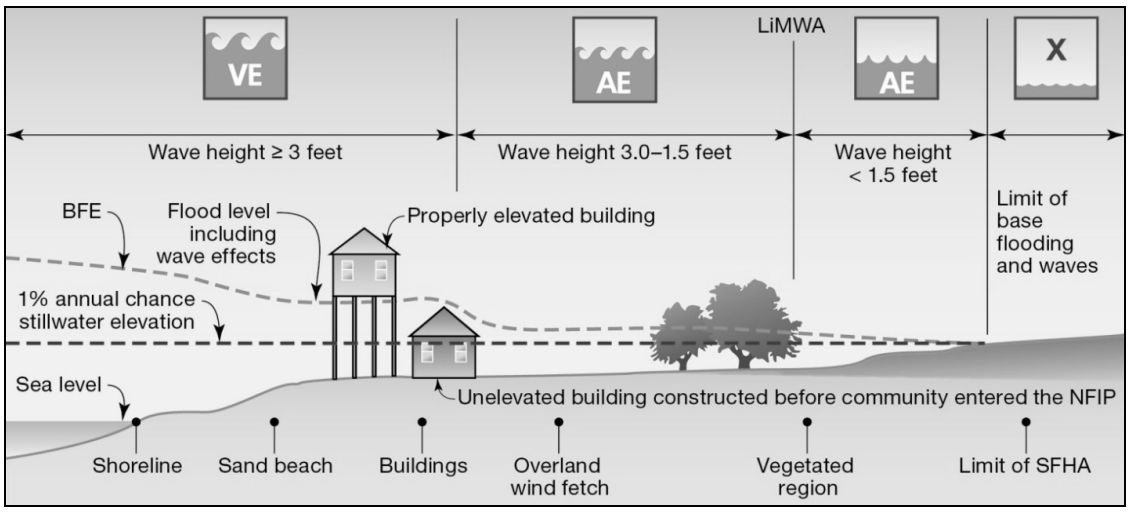


Figure 2 – Typical Transect Schematic

Post-storm field visits and laboratory tests have confirmed that wave heights as small as 1.5 feet can cause significant damage to structures when constructed without consideration to the coastal hazards. Additional flood hazards associated with coastal waves include floating debris, high velocity flow, erosion, and scour which can cause damage to Zone AE-type construction in these coastal areas. To help community officials and property owners recognize this increased potential for damage due to wave action in the AE zone, FEMA issued guidance in December 2008 on identifying and mapping the 1.5-foot wave height line, referred to as the Limit of Moderate Wave Action (LiMWA). While FEMA does not impose floodplain management requirements based on the LiMWA, the LiMWA is provided to help communicate the higher risk that exists in that area. Consequently, it is important to be aware of the area between this inland limit and the Zone VE boundary as it still poses a high risk, though not as high of a risk as Zone VE (see Figure 2, Typical Transect Schematic).

3.4 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 NGVD29. With the finalization of the NAVD88, many FIS reports and FIRMs are being prepared using the NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. Structure and ground elevations in the community must, therefore, be referenced to the NAVD88. It is important to note that adjacent communities may be referenced to the NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities. The vertical datum conversion factor from the NGVD29 to the NAVD88 for Wicomico County is –0.83 feet.

For more information on the NAVD88, see FEMA publication entitled, Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the National Geodetic Survey online (http://www.ngs.noaa.gov) or at the following address:

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages state and local governments to adopt sound floodplain management programs. Therefore, each FIS produces maps designed to assist communities in developing floodplain management measures.

4.1 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 risk in the community. For each stream studied in detail, 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 the TIN discussed in

Section 3.2. The 1-percent annual chance floodplain boundary is shown on the FIRM (Exhibit 1).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRMs (Exhibit 2). In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to the limitations of the map scale.

For the streams studied by approximate methods only the 1-percent annual chance floodplain boundary is shown.

4.2 Floodways

Encroachment of floodplains, such as structures and fill, reduces the flood carrying capacity, increases the 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 1.0 foot, provided that hazardous velocities are not produced.

The following streams had floodway analyses conducted as part of a previous FIS: Beaglin Branch, Beaverdam Creek, Brewington Branch, Connelly Mill Branch, Coty Cox Branch, Jackson Branch, Leonard Pond Run, Mayer Branch, Middle Neck Branch, Morris Prong, North Prong (Leonard Pond) – Andrews Branch, Peggy Branch, Slab Bridge Creek, South Prong, Tonytank Creek, Tuxents Branch, Unnamed Tributary to Beaglin Branch, Unnamed Tributary to South Prong, Walston Branch, White Marsh Creek, and Wood Creek. The floodways presented in the FIS were computed on the basis of equal conveyance reduction from each side of the floodplain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed and are presented in Table 7. No floodway was computed for Owens Branch.

As shown on the updated FIRMs (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 1-percent annual chance flood are either too close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe thus 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 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3, 'Floodway Schematic'.

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.

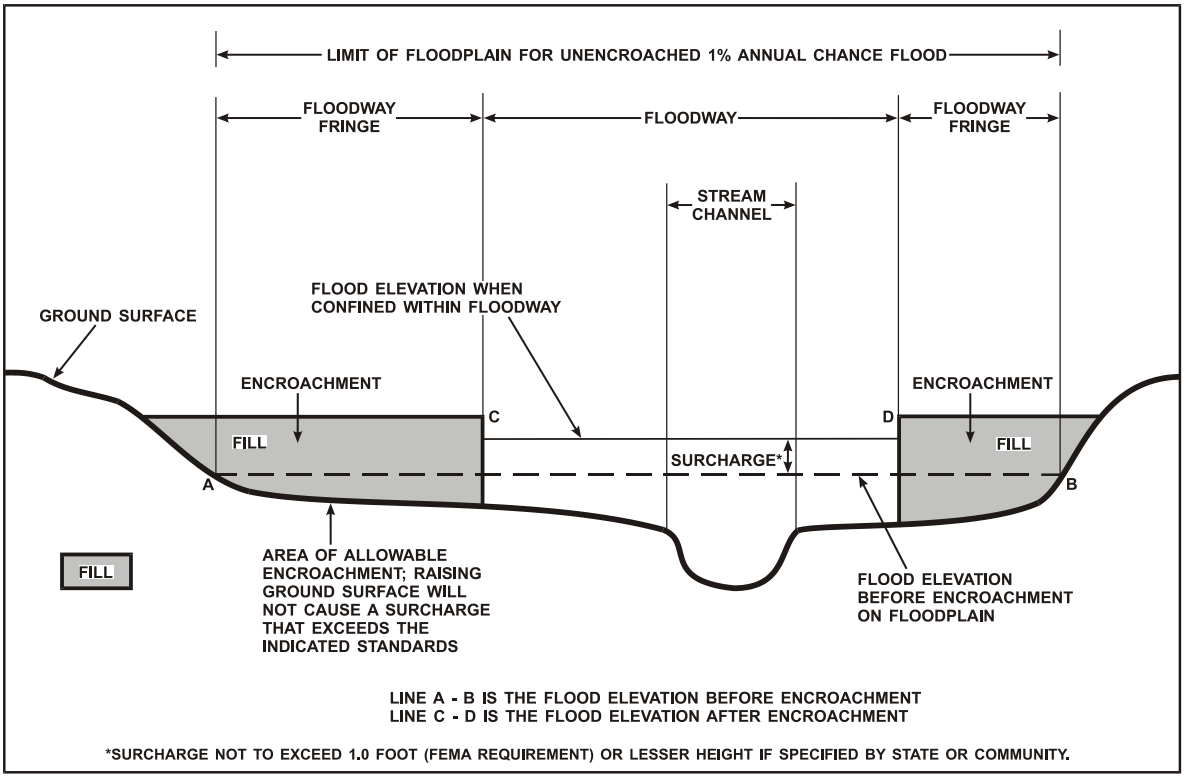


Figure 3 - Floodway Schematic

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
Beaverdam Creek								
A	197[1]	220	2,185	2.1	11.9	11.1[3]	12.1	1.0
B	4,146[1]	705	3,849	1.2	12.5	12.5	13.4	0.9
C	5,832[1]	297	1,988	2.3	13.3	13.3	14.2	0.9
D	7,736[1]	191	1,251	3.7	16.1	16.1	16.9	0.8
E	10,597[1]	559	4,232	0.4	23.6	23.6	24.0	0.4
F	12,832[1]	248	1,210	1.5	23.7	23.7	24.0	0.3
G	14,814[1]	248	1,553	1.2	24.5	24.5	25.1	0.6
H	16,112[1]	252	1,320	1.4	25.0	25.0	25.8	0.8
Brewington Branch								
A	1,790[2]	120	285	0.8	13.4	13.4	13.5	0.1
B	1,991[2]	128	448	0.5	13.4	13.4	13.5	0.1

[1]Stream distance in feet above Tidal Weir
[2]Stream distance in feet above confluence with Johnson Pond
[3]Elevation computed without consideration of backwater effects from North Prong Wicomico River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERDAM CREEK – BREWINGTON BRANCH

FLOODING SOURCE		FLOODWAY			BASE 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
Brewington Branch (continued)	.							
C	2,291[1]	104	387	0.6	13.4	13.4	13.5	0.1
D	2,474[1]	87	339	0.7	13.4	13.4	13.5	0.1
E	2,962[1]	82	737	0.3	19.0	19.0	19.0	0.0
F	3,435[1]	125	1,126	0.2	24.1	24.1	24.1	0.0
G	3,690[1]	51	462	0.5	24.1	24.1	24.1	0.0
H	4,009[1]	217	2,833	0.2	27.8	27.8	27.8	0.0
I	5,173[1]	143	1,656	0.4	27.8	27.8	27.8	0.0
J	5,416[1]	173	1,349	0.5	27.8	27.8	27.8	0.0
K	5,488[1]	154	1,651	0.4	27.8	27.8	27.8	0.0
L	6,192[1]	135	1,237	0.6	27.8	27.8	27.8	0.0
M	6,645[1]	95	735	0.6	27.8	27.8	27.8	0.0
N	7,245[1]	67	297	1.4	27.9	27.9	27.9	0.0
O	7,409[1]	38	423	1.0	31.0	31.0	31.3	0.3
P	7,610[1]	67	703	0.6	31.3	31.3	31.6	0.3
Q	7,914[1]	103	940	0.5	31.3	31.3	31.6	0.3
R	9,118[1]	112	964	0.4	31.3	31.3	31.6	0.3
S	9,902[1]	45	328	1.3	31.3	31.3	31.6	0.3
Connelly Mill Branch								
A	707.6[2]	188	457	1.2	18.6	17.8[3]	18.7	0.9

[1] Stream distance in feet above confluence with Johnson Pond
[2] Stream distance in feet above confluence with Leonard Pond Run
[3] Elevation computed without consideration of backwater effects from Leonard Pond Run

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD AND INCORPORATED AREAS

FLOODWAY DATA

BREWINGTON BRANCH – CONNELLY MILL BRANCH

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
Jackson Branch (Continued)								
B	990.2[1]	61	106	1.2	36.4	34.3[3]	35.3	1.0
C	1384.9[1]	10	26	4.8	36.4	35.3[3]	36.0	0.7
D	2038.6[1]	28	88	1.4	36.9	36.9	37.8	0.9
E	2405.0[1]	27	88	1.4	37.2	37.2	38.1	0.9
F	2834.0[1]	21	64	2.0	37.7	37.7	38.6	0.9
G	3261.9[1]	19	449	0.3	39.2	39.2	39.4	0.2
H	3369.9[1]	21	134	0.9	40.9	40.9	41.4	0.5
I	4389.3[1]	23	129	1.0	40.9	40.9	41.6	0.7
J	5236.4[1]	23	132	0.9	40.9	40.9	41.7	0.8
K	5382.1[1]	22	109	1.2	41.0	41.0	41.8	0.8
L	5620.8[1]	21	84	1.5	41.0	41.0	41.9	0.9
Leonard Pond Run								
A	9139.9[2]	300	1311	1.7	15.0	15.0	15.1	0.1
B	10650.5[2]	296	1514	1.4	15.4	15.4	15.8	0.4
C	11476.4[2]	235	1102	2.0	15.6	15.6	16.1	0.5
D	12502.0[2]	250	1127	1.9	16.2	16.2	16.8	0.6
E	13265.1[2]	290	1219	1.8	16.5	16.5	17.3	0.8
F	13658.5[2]	255	1080	2.0	16.7	16.7	17.5	0.8
G	14199.1[2]	60	469	4.6	16.9	16.9	17.8	0.9

[1]Stream distance in feet above confluence with North Prong (Leonard Pond)
[2]Stream distance in feet above Johnson Pond Dam
[3]Elevation computed without consideration of backwater effects from North Prong (Leonard Pond)

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

FLOODWAY DATA

JACKSON BRANCH - LEONARD POND RUN

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
Leonard Pond Run (continued)								
H	15636.0[1]	317	1613	0.7	18.5	18.5	19.2	0.7
I	16505.6[1]	309	1448	0.8	18.6	18.6	19.3	0.7
J	17636.7[1]	147	661	1.7	18.8	18.8	19.5	0.7
K	18148.5[1]	164	772	1.4	19.0	19.0	19.8	0.8
L	19004.8[1]	235	917	1.2	19.2	19.2	20.0	0.8
M	19828.4[1]	225	785	1.4	19.6	19.6	20.3	0.7
N	20270.4[1]	210	532	2.1	20.0	20.0	20.6	0.6
O	20542.5[1]	56	230	4.8	20.6	20.6	21.0	0.4
P	21163.9[1]	125	901	1.0	25.0	25.0	25.0	0.0
Q	22591.6[1]	214	1177	0.8	25.0	25.0	25.1	0.1
R	23999.7[1]	229	889	0.6	25.1	25.1	25.2	0.1
S	24433[1]	125	423	1.2	25.1	25.1	25.3	0.2
T	24818.9[1]	131	371	1.4	25.2	25.2	25.3	0.1
U	26044.9[1]	33	142	3.6	25.6	25.6	25.7	0.1
Mayer Branch								
A	275.1[2]	84	396	0.6	39.3	39.0[3]	39.4	0.4
B	460.8[2]	130	609	0.4	39.3	39.0[3]	39.4	0.4
C	1,291.4[2]	114	520	0.5	39.3	39.1[3]	39.5	0.4
D	1,598.7[2]	173	705	0.4	39.3	39.1[3]	39.5	0.4

[1] Stream distance in feet above Johnson Pond Dam

[2] Stream distance in feet above confluence with Andrews Branch

[3] Elevation computed without consideration of backwater effects from Andrews Branch

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

FLOODWAY DATA

LEONARD POND RUN – MAYER BRANCH

FLOODING SOURCE		FLOODWAY			BASE 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
Mayer Branch (continued)	.							
E	2,365.4[1]	149	583	0.4	39.3	39.1[3]	39.6	0.4
F	3,106.9[1]	122	458	0.6	39.3	39.2[3]	39.6	0.4
G	3,902.1[1]	109	375	0.7	39.3	39.3	39.8	0.5
H	5,132.2[1]	186	438	0.6	39.5	39.5	40.0	0.5
I	5,354.8[1]	178	447	0.6	39.7	39.7	40.1	0.4
J	5,479.6[1]	167	355	0.7	39.8	39.8	40.2	0.4
K	5,832.3[1]	32	139	1.8	42.4	42.4	42.9	0.5
Middle Neck Branch								
A	2,695[2]	55	153	3.1	13.3	13.3	13.3	0.0
B	3,215[2]	148	854	0.6	18.5	18.5	18.5	0.0
C	3,866[2]	100	1,382	0.3	28.5	28.5	28.6	0.1
D	4,631[2]	100	1,018	0.5	28.6	28.6	28.6	0.0
E	5,023[2]	92	1,045	0.5	28.6	28.6	28.6	0.0
F	5,394[2]	167	1,745	0.3	28.6	28.6	28.6	0.0
G	5,856[2]	201	2,467	0.2	28.6	28.6	28.6	0.0
H	6,314[2]	217	2,491	0.2	28.6	28.6	28.6	0.0
I	6,774[2]	189	2,218	0.2	28.6	28.6	28.6	0.0
J	7,194[2]	256	2,456	0.2	28.6	28.6	28.6	0.0
K	7,479[2]	243	2,289	0.2	28.6	28.6	28.6	0.0
L	7,935[2]	156	1,610	0.3	28.6	28.6	28.6	0.0

[1] Stream distance in feet above confluence with Andrews Branch
[2] Stream distance in feet above confluence with Johnson Pond
[3] Elevation computed without consideration of backwater effects from Andrews Branch

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD AND INCORPORATED AREAS

FLOODWAY DATA

MAYER BRANCH – MIDDLE NECK BRANCH

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
South Prong Leonard Pond								
A	1,117.2[1]	198	598	0.7	35.4	35.4	36.4	1.0
B	1,882.7[1]	175	501	0.8	35.6	35.6	36.6	1.0
C	2,459.6[1]	197	875	0.4	35.7	35.7	36.7	1.0
D	2,663.5[1]	170	725	0.5	35.7	35.7	36.7	1.0
E	2,793.9[1]	170	712.2	0.6	35.7	35.7	36.7	1.0
F	2,878.6[1]	184	735.9	0.5	35.7	35.7	36.7	1.0
G	2,994.6[1]	178	665.5	0.6	35.7	35.7	36.7	1.0
H	3,469.5[1]	148	691.8	0.5	35.8	35.8	36.8	1.0
I	3,840.4[1]	165	745.0	0.4	35.8	35.8	36.8	1.0
J	4,412.8[1]	219	959.5	0.3	35.8	35.8	36.8	1.0
K	4,949.8[1]	81	321.7	1.0	35.9	35.9	36.9	1.0
Tonytank Creek								
A	9,732[2]	161	1,402	0.4	15.6	15.6	16.2	0.6
B	10,888[2]	162	1,229	0.4	15.7	15.7	16.3	0.6
C	12,134[2]	253	886	0.6	15.8	15.8	16.5	0.7
D	15,116[2]	271	1,036	0.5	22.0	22.0	22.0	0.0
E	16,381[2]	167	720	0.7	22.1	22.1	22.1	0.0
F	17,364[2]	112	404	1.3	22.3	22.3	22.7	0.4
G	17,568[2]	23	64	8.3	23.9	23.9	23.9	0.0

[1]Stream distance in feet above confluence with Leonard Pond Run

[2]Stream distance in feet above confluence with Wicomico River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH PRONG LEONARD POND – TONYTANK CREEK

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
Tonytank Creek (continued)								
H	17,841[1]	130	1,056	0.5	28.9	28.9	28.9	0.0
I	18,587[1]	131	1,165	0.5	28.9	28.9	29.0	0.1
J	20,891[1]	148	831	0.6	29.1	29.1	29.4	0.3
K	23,018[1]	139	500	1.1	29.9	29.9	30.8	0.9
L	24,256[1]	14	36	6.2	31.5	31.5	31.7	0.2
M	25,022[1]	115	681	0.3	39.7	39.7	39.7	0.0
Tuxents Branch								
A	1,267.5[2]	67	133	1.0	6.0	5.4[3]	5.4	0.0
B	1,742.2[2]	25	24	5.4	6.0	6.0	6.2	0.2
C	1,960.5[2]	39	54	2.4	7.4	7.4	7.7	0.3
D	2,159.2[2]	35	37	4.0	8.0	8.0	8.2	0.2
E	2,232.7[2]	31	170	0.8	13.3	13.3	13.4	0.1
F	2,317.9[2]	34	173	0.8	13.3	13.3	13.4	0.1
G	2,778.9[2]	30	93	1.1	13.3	13.3	13.5	0.2
H	3,496.8[2]	24	35	2.8	13.9	13.9	14.0	0.1
I	3,949.0[2]	12	24	4.0	15.8	15.8	15.8	0.0
J	4,150.8[2]	17	34	2.9	16.6	16.6	16.6	0.0
K	4,239.7[2]	34	94	0.9	19.4	19.4	19.4	0.0

[1]Stream distance in feet above confluence with Wicomico River
[2]Stream distance in feet above confluence with Tonytank Creek
[3]Elevation computed without consideration of backwater effects from Tonytank Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

FLOODWAY DATA

TONYTANK CREEK – TUXENTS BRANCH

5.0 INSURANCE APPLICATION

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 base flood elevations (BFEs) 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.

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. In the 1-percent annual chance floodplains that were studied by detailed methods, the FIRM 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 current FIRM presents flooding information for the entire geographic area of Wicomico County. Previously, separate FIRMs were prepared for each identified flood-prone incorporated community and for the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 8, ‘Community Map History.’

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Wicomico County (Unincorporated Areas)	August 19, 1977	September 16, 1977	September 28, 1984	June 16, 1992
Delmar, Town of				
Fruitland, Town of	January 28, 1977	None	November 15, 1985	
Hebron*, Town of				
Mardela Springs, Town of	December 13, 1974	None	September 27, 1985	
Pittsville*, Town of				
Salisbury, City of	October 18, 1974	May 21, 1976	September 28, 1984	
Sharptown, Town of	August 9, 1974	December 26, 1975	September 27, 1985	
Willards, Town of	January 21, 1977	None	May 1, 1985	

*No Special Flood Hazard Areas Identified

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

FISs have been prepared for Dorchester County, Maryland (FEMA, 2011), which borders Wicomico County on the west-northwest, Sussex County, Delaware (FEMA, 2005), which borders Wicomico County on the north, Somerset County, Maryland (FEMA, 2011), which borders Wicomico County on the southwest, and Worcester County, Maryland (FEMA, 1983), which borders Wicomico County on the east-southeast. Revisions to the aforementioned FISs are currently being prepared.

This FIS 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.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, One Independence Mall, 6th floor, 615 Chestnut Street, Philadelphia, PA, 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

"The Banner", Cambridge, Maryland, August 17-18, 1955; June 23, 1972; June 26-27, 1972.

"The Cambridge Record", Cambridge, Maryland, Page 1, August 24, 1933; Pages 1 and 2, August 25, 1933.

Census, "State and County QuickFacts: Wicomico County, Maryland." U.S. Census Bureau: State and County QuickFacts, Internet version last revised: 10-Jan-2013 http://quickfacts.census.gov/qfd/states/24/24045.html.

Dillow, J.J.A., 1996. Technique for estimating magnitude and frequency of peak flows in Maryland: U.S. Geological Survey Water-Resources Investigations Report, 95-4154, 55 pages.

FEMA, June 1992. Datum conversion.

FEMA (2011), "Flood Insurance Study, Dorchester County, Maryland and Incorporated Areas, May 24, 2011", Federal Emergency Management Agency.

FEMA (2011), "Flood Insurance Study, Somerset County, Maryland and Incorporated Areas, March 3, 2011", Federal Emergency Management Agency.

FEMA (2007), "Atlantic Ocean and Gulf of Mexico Update Coastal Guidelines Update", Washington, DC.

FEMA (August 2007), "Wave Height Analysis for Flood Insurance Studies (WHAFIS)", Version 4.0, Washington, DC.

FEMA (2005), "Flood Insurance Study, Sussex County, Delaware and Incorporated Areas, January 6, 2005", Federal Emergency Management Agency.

FEMA (2003), "Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix C: Guidance for Coastal Flooding Analyses and Mapping", 2003 http://www.fema.gov/pdf/fhm/frm_gsad.pdf.

FEMA (2003), "Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix C: Guidance for Riverine Flooding Analyses and Mapping", 2003 http://www.fema.gov/pdf/fhm/frm_gsac.pdf.

FEMA (1985), "Flood Insurance Study, City of Fruitland, Maryland, Wicomico County, November 15, 1985", Federal Emergency Management Agency.

FEMA (1985), "Flood Insurance Study, Town of Mardela Springs, Maryland, Wicomico County, September 27, 1985", Federal Emergency Management Agency.

FEMA (1985), "Flood Insurance Study, Town of Sharptown, Maryland, Wicomico County, September 27, 1985", Federal Emergency Management Agency.

FEMA (1984), "Flood Insurance Study, City of Salisbury, Maryland, Wicomico County, March 28, 1984", Federal Emergency Management Agency.

FEMA (1984), "Flood Insurance Study, Wicomico County, Maryland (Unincorporated Areas), March 28, 1984", Federal Emergency Management Agency.

Luettich, R.A. and J.J. Westerink, February 6, 2008. "A (Parallel) Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC), Version 45.12", University of North Carolina at Chapel Hill, Institute of Marine Sciences, Morehead City, North Carolina.

Maryland Department of Economic and Community Development, "Wicomico County Community Economic Inventory", June 1977.

Maryland Department of the Environment, Flood Hazard Mitigation Section, "An Assessment of Maryland's Vulnerability to Flood Damage", John M. Joyce and Michael S. Scott, PhD, August 2005.

Maryland Department of Natural Resources, Flood Management Division, "Topographic Maps", Scale 1:7,200, Contour Interval two feet, 1981.

Maryland State Climatologist Office, Department of Atmospheric and Oceanic Science, University of Maryland, College Park, Wicomico County, "Monthly and Annual Normals" & "Days Below 32 Degrees, Above 90 Degrees, and Growing Season Information", http://www.atmos.umd.edu/~climate/.

National Academy of Sciences, "Methodology for Calculating Wave Action Effects Associated with Storm Surges", Washington, DC, 1977.

National Oceanic and Atmospheric Administration, National Climatic Data Center, http://www.ncdc.noaa.gov/

"Star Democrat", Easton, Maryland, Pages 1 and 3, September 16, 1960.

USACE (1975), "Hydrologic Study, Tropical Storm Agnes", Washington, DC.

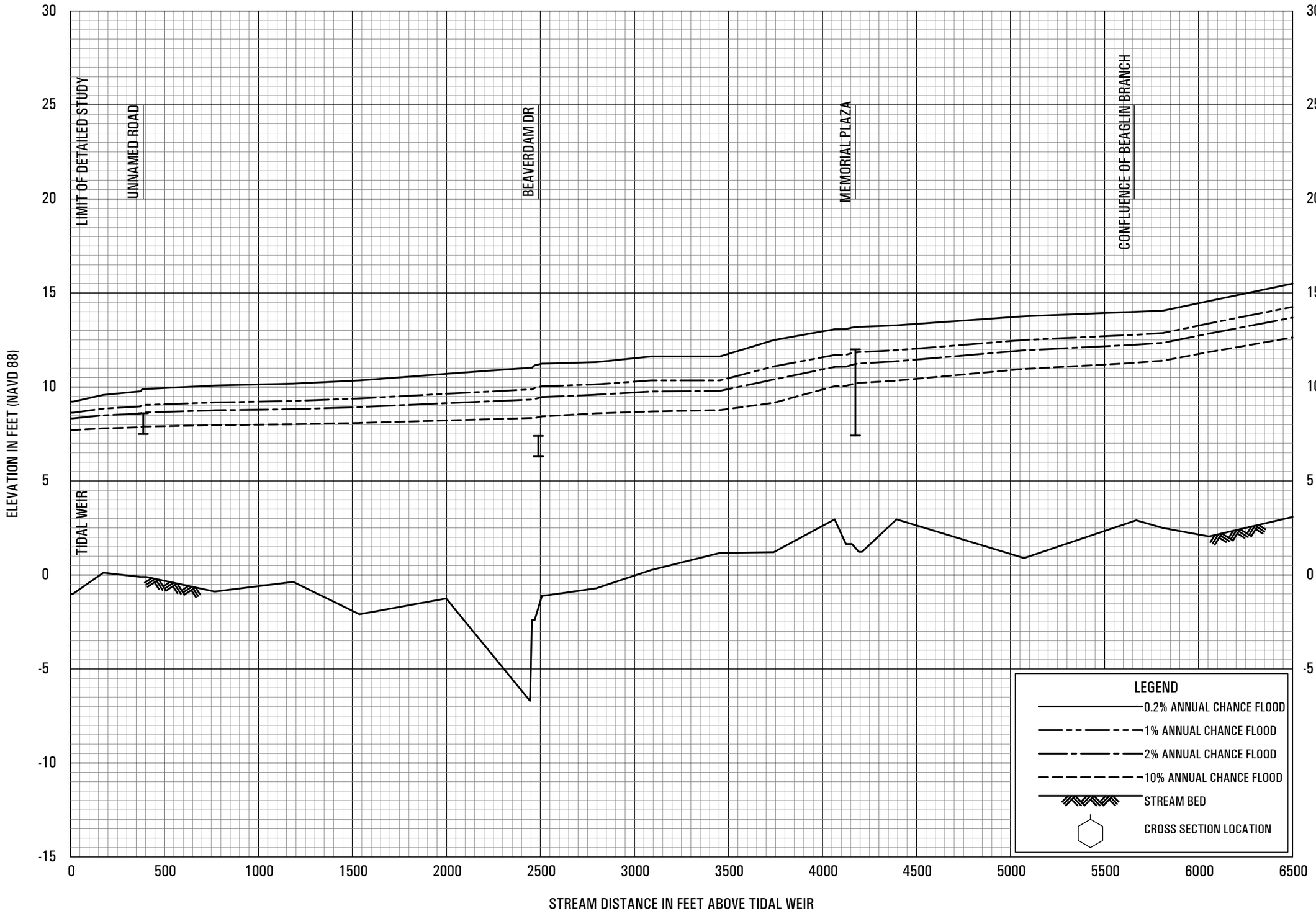
USACE (2012), "ERDC/CHL TR11-X, FEMA Region 3 Storm Surge Study Coastal Storm Surge Analysis: Modeling System Validation Submission No. 2"

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS, River Analysis System v 3.1.3, Davis, California, May 2005

U.S. Army Corps of Engineers, Galveston District, "Guidelines for Identifying Coastal High Hazard Zones, Galveston, Texas, June 1975

U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 feet, Wicomico County

Wicomico County, Department of Planning, Zoning, and Community Development



FLOOD PROFILES

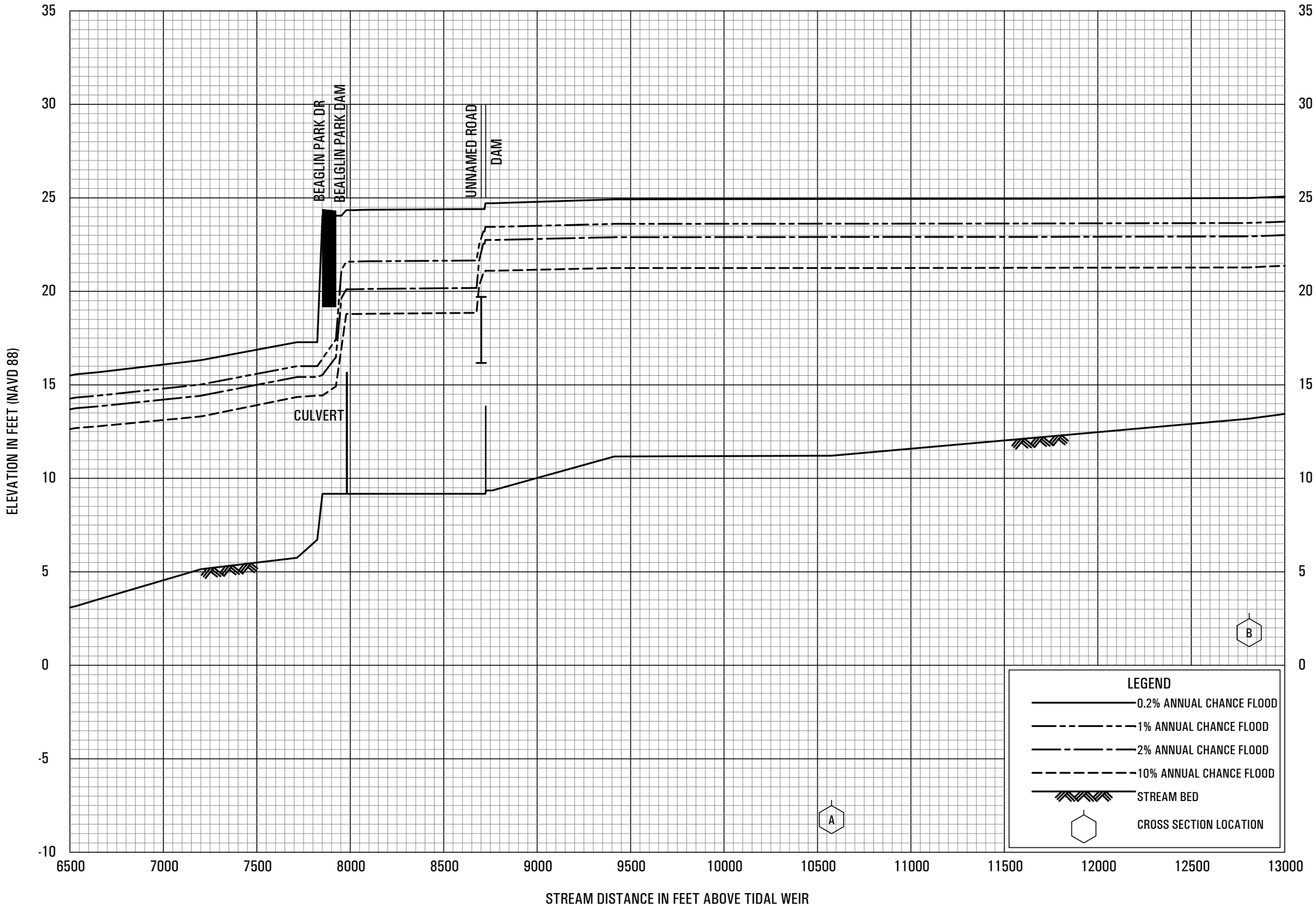
BEAVERDAM CREK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS

03P



FLOOD PROFILES

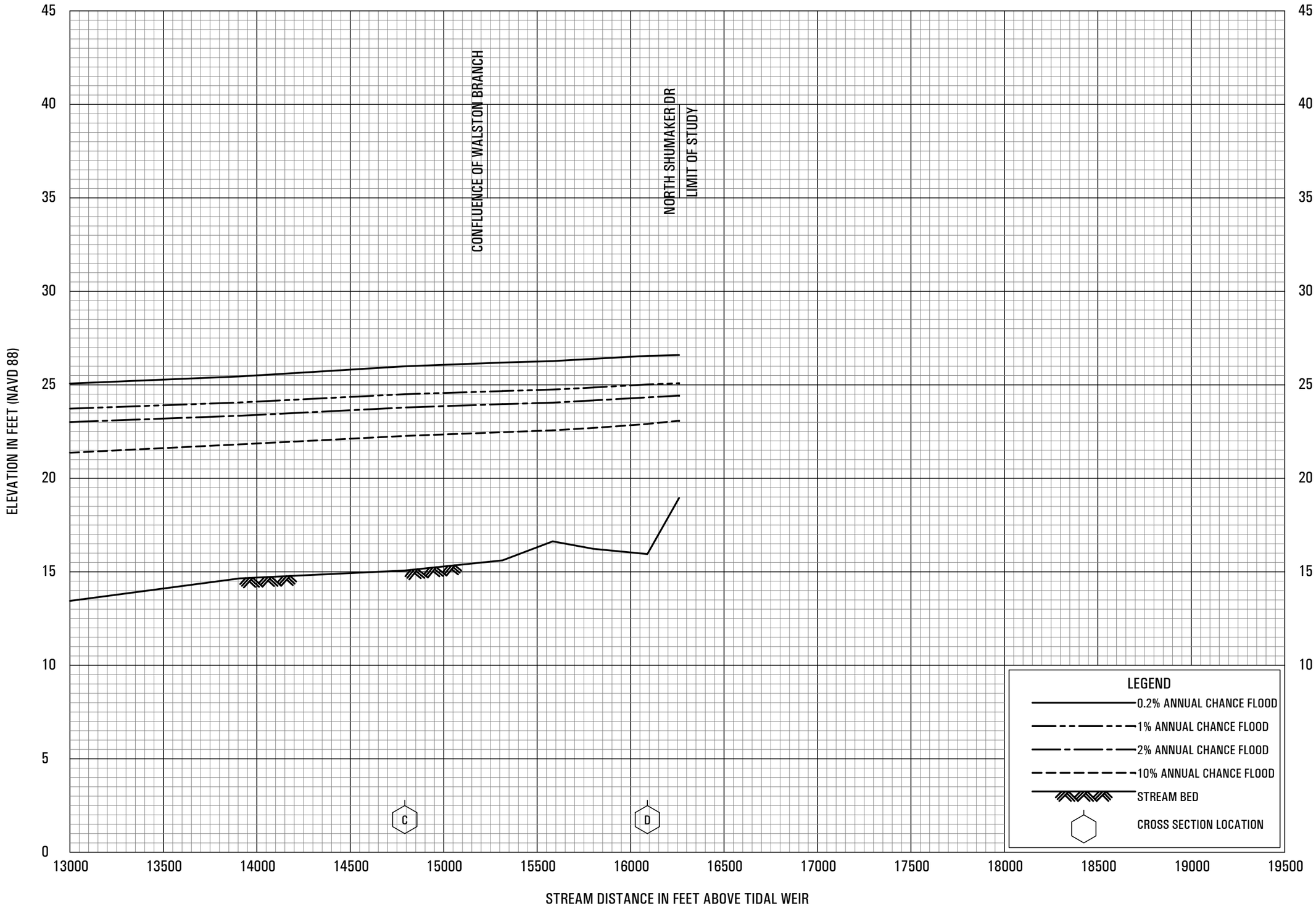
BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS

04P



FLOOD PROFILES

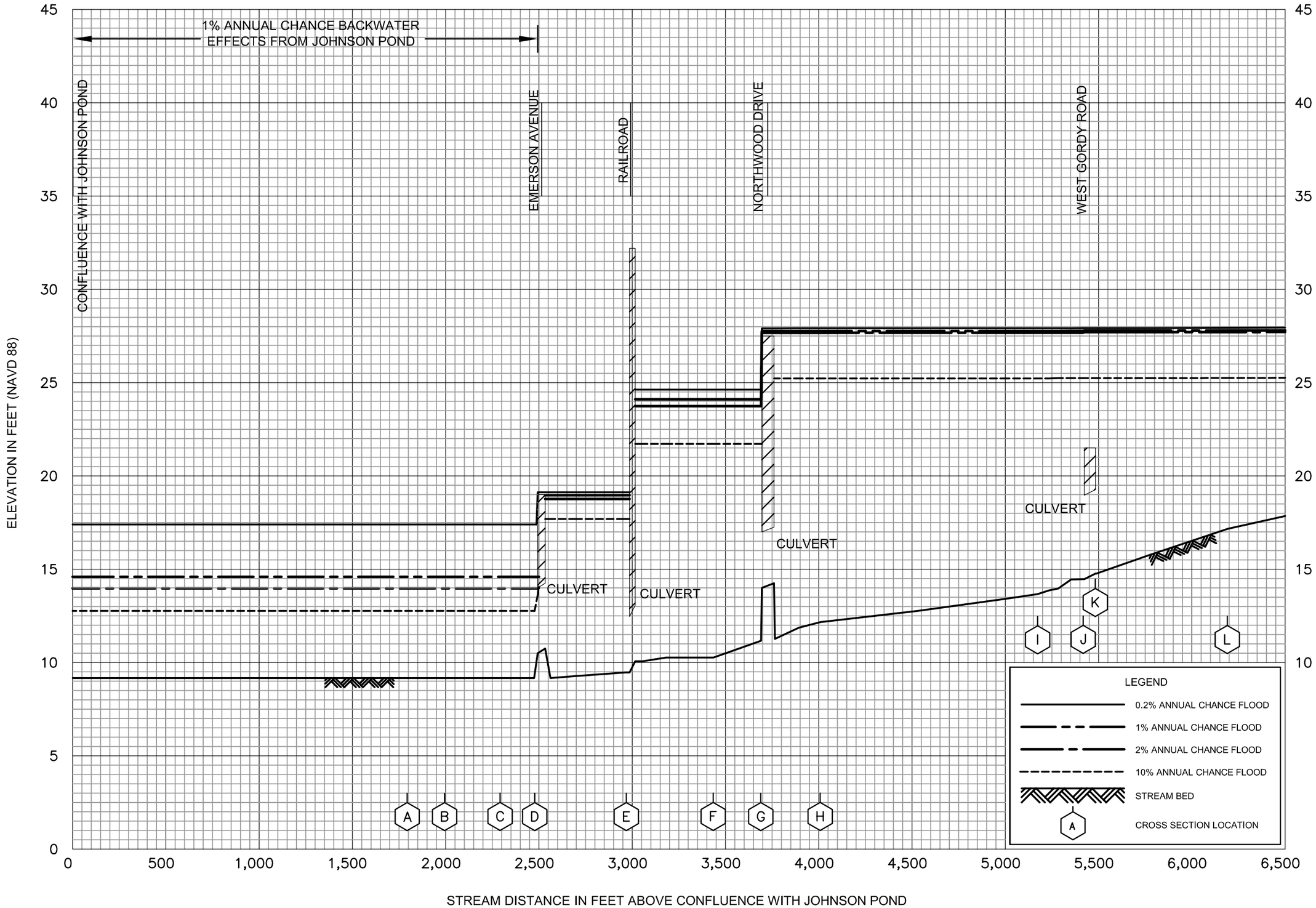
BEAVERDAM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS

05P

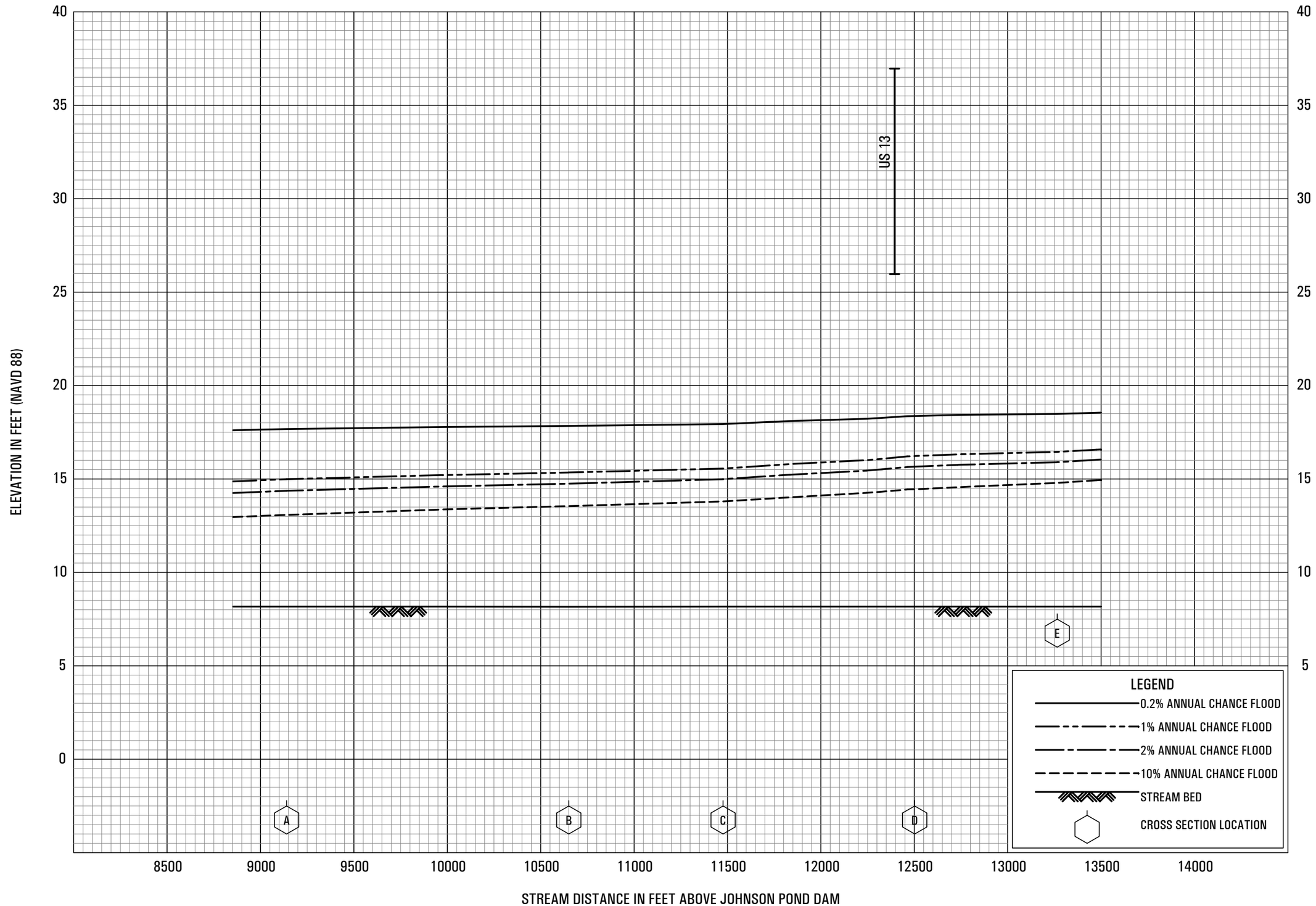


FLOOD PROFILES

BREWINGTON BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD
AND INCORPORATED AREAS



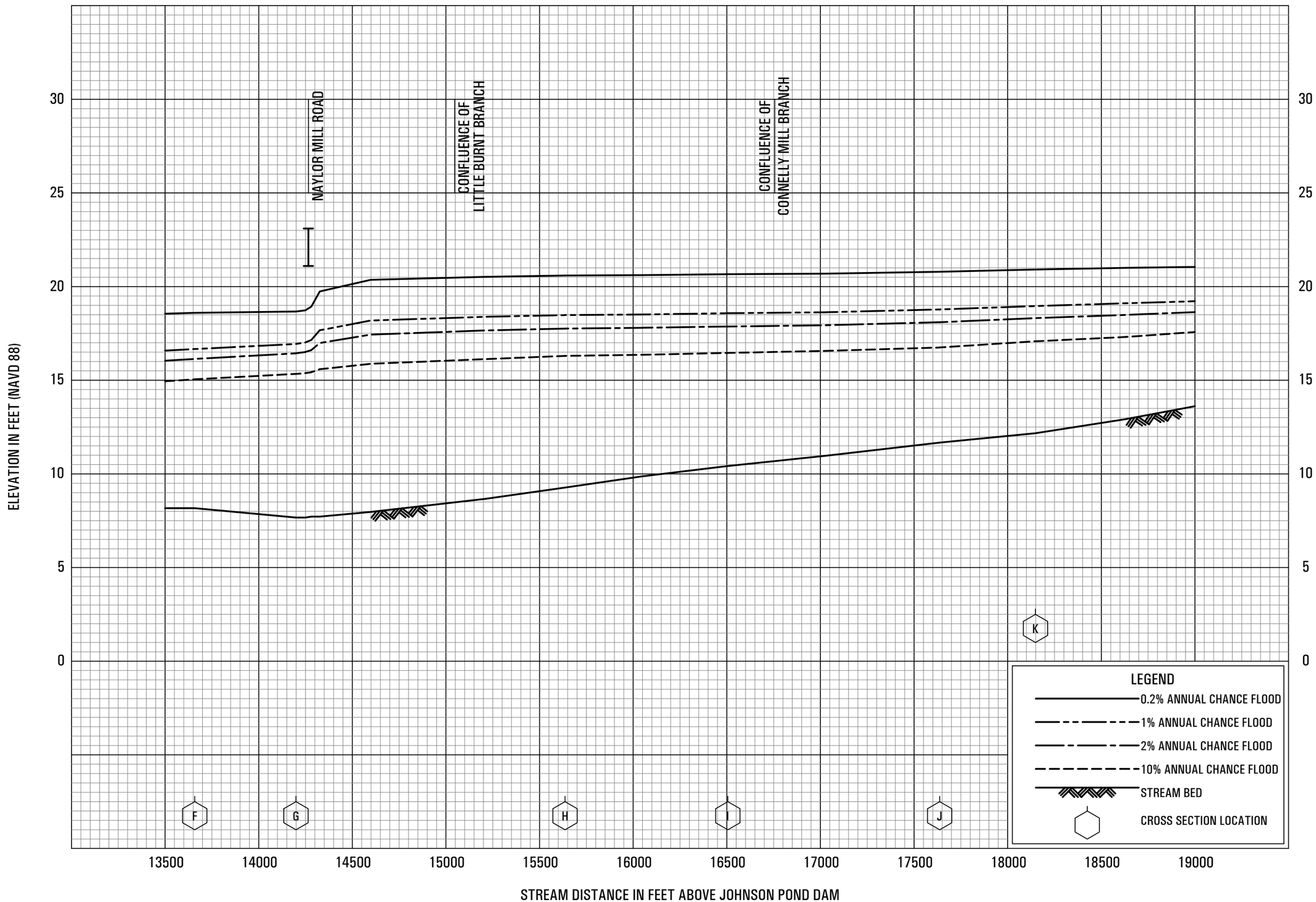
FLOOD PROFILES

LEONARD POND RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



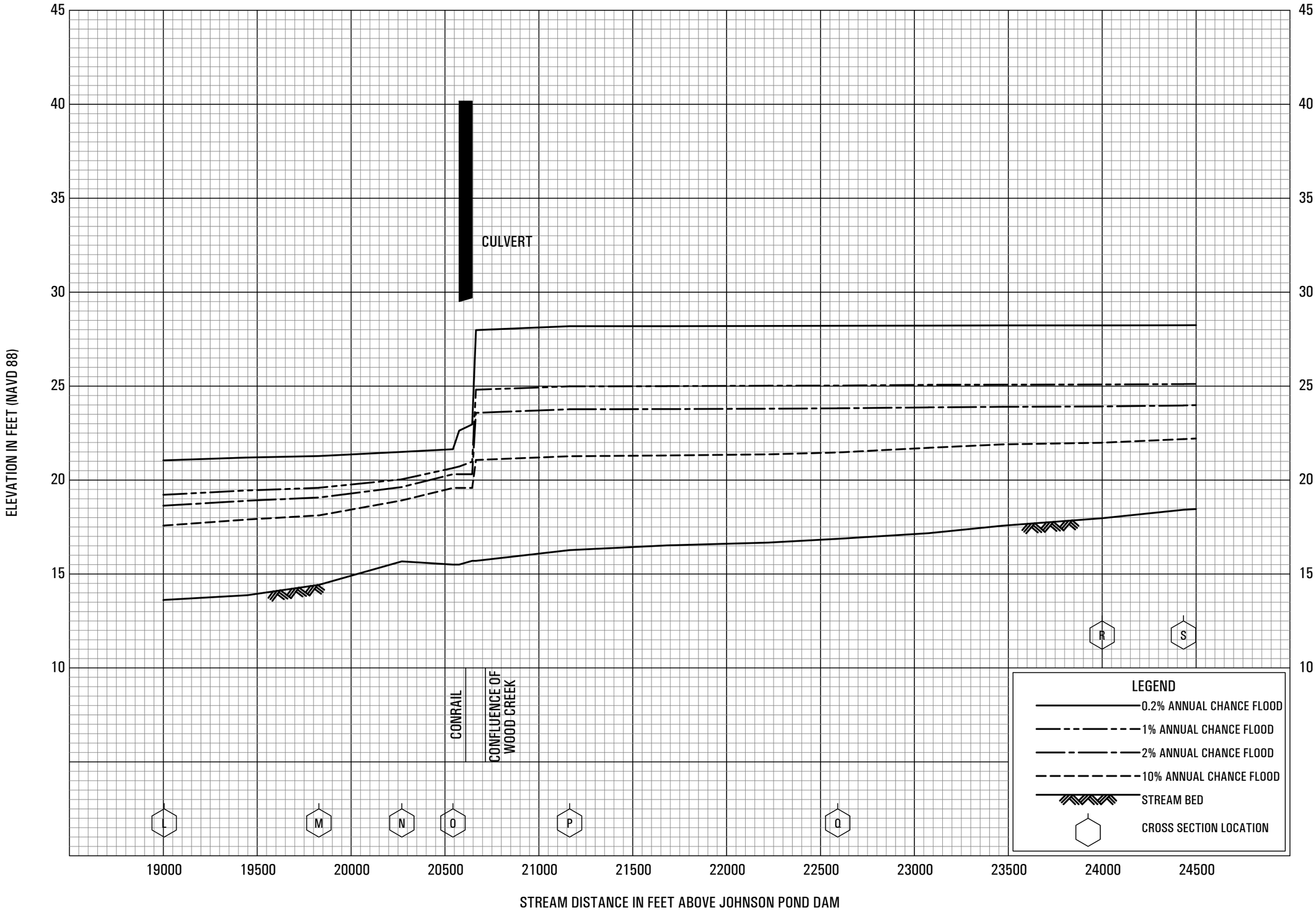
FLOOD PROFILES

LEONARD POND RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



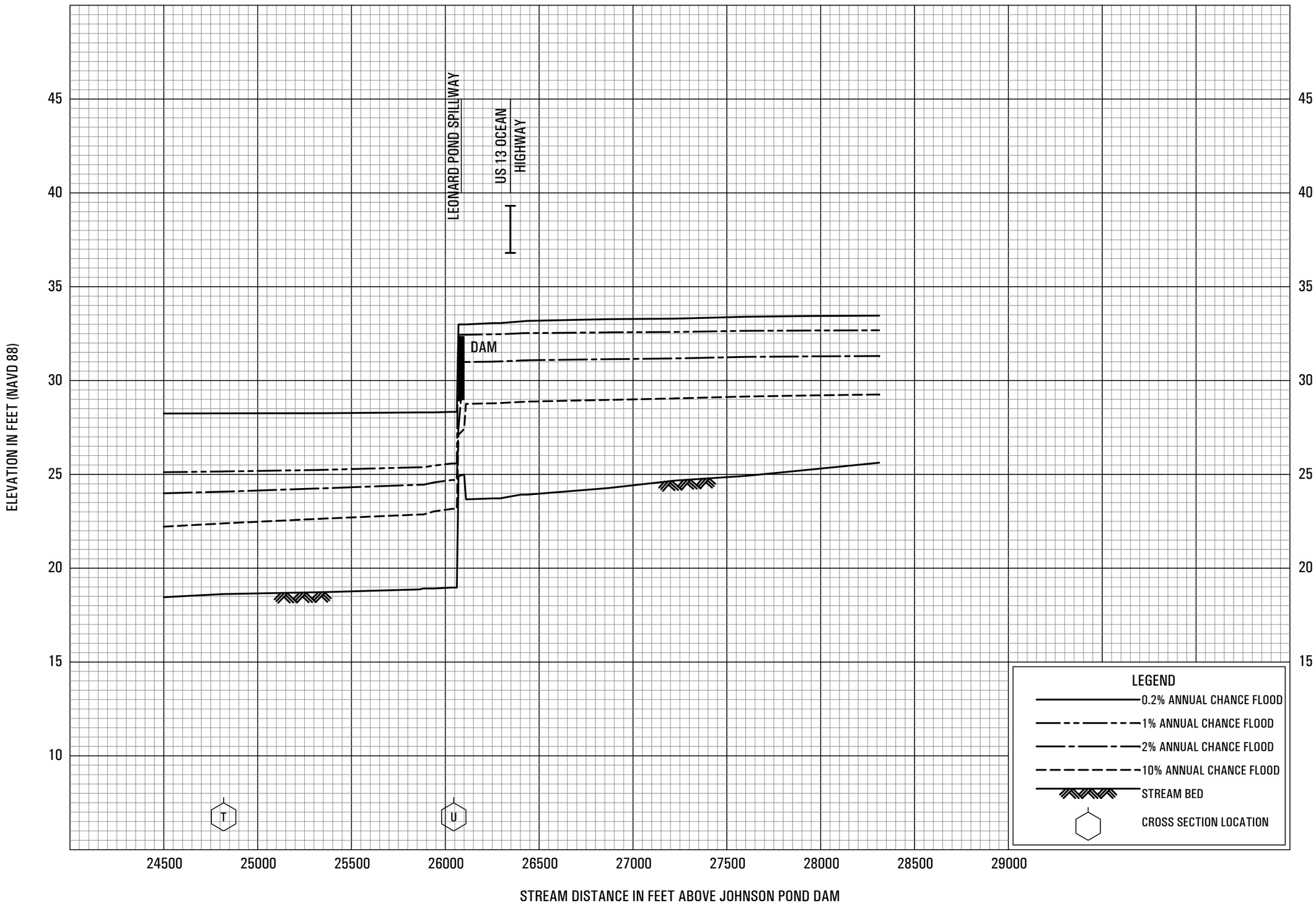
FLOOD PROFILES

LEONARD POND RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



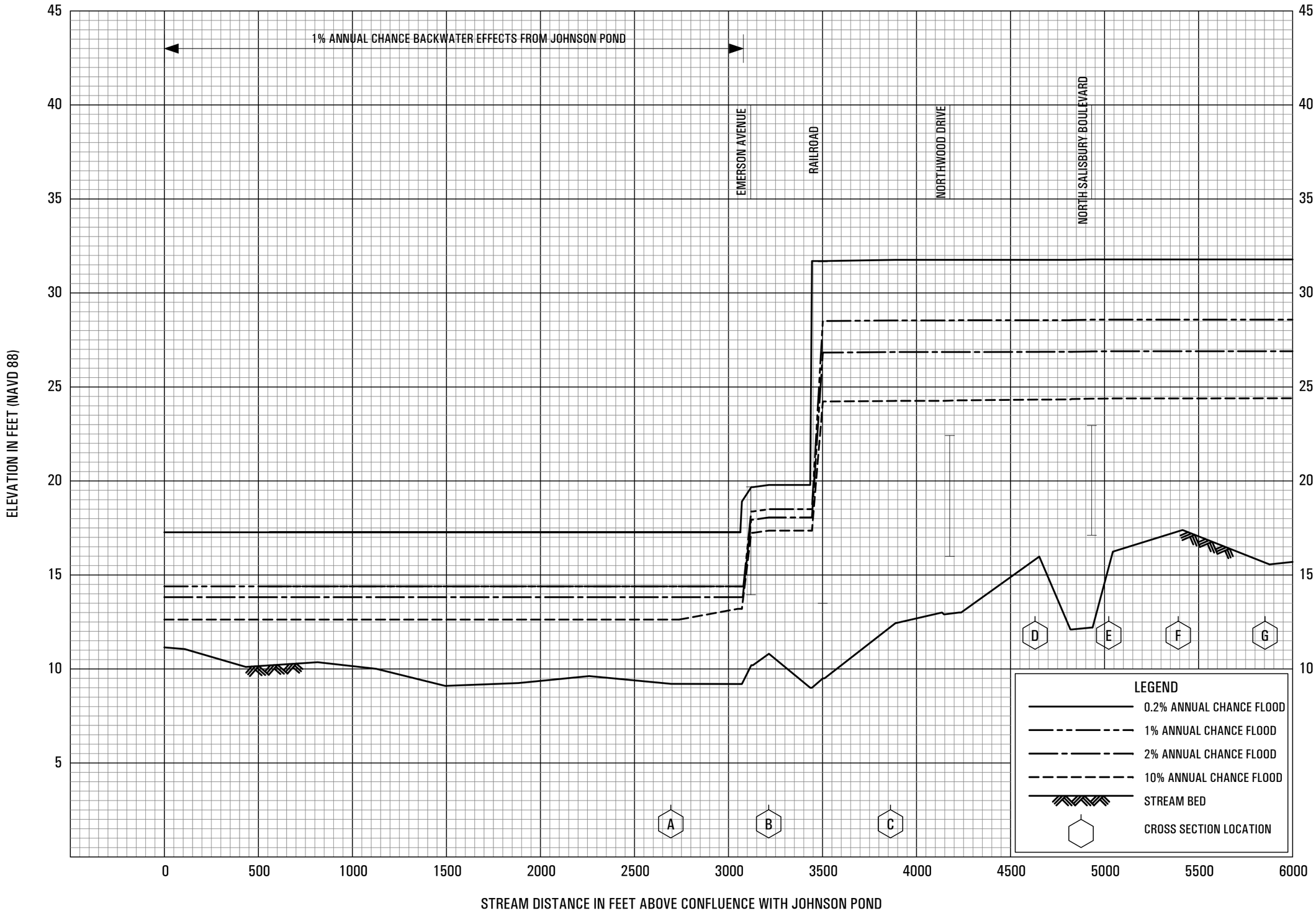
FLOOD PROFILES

LEONARD POND RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



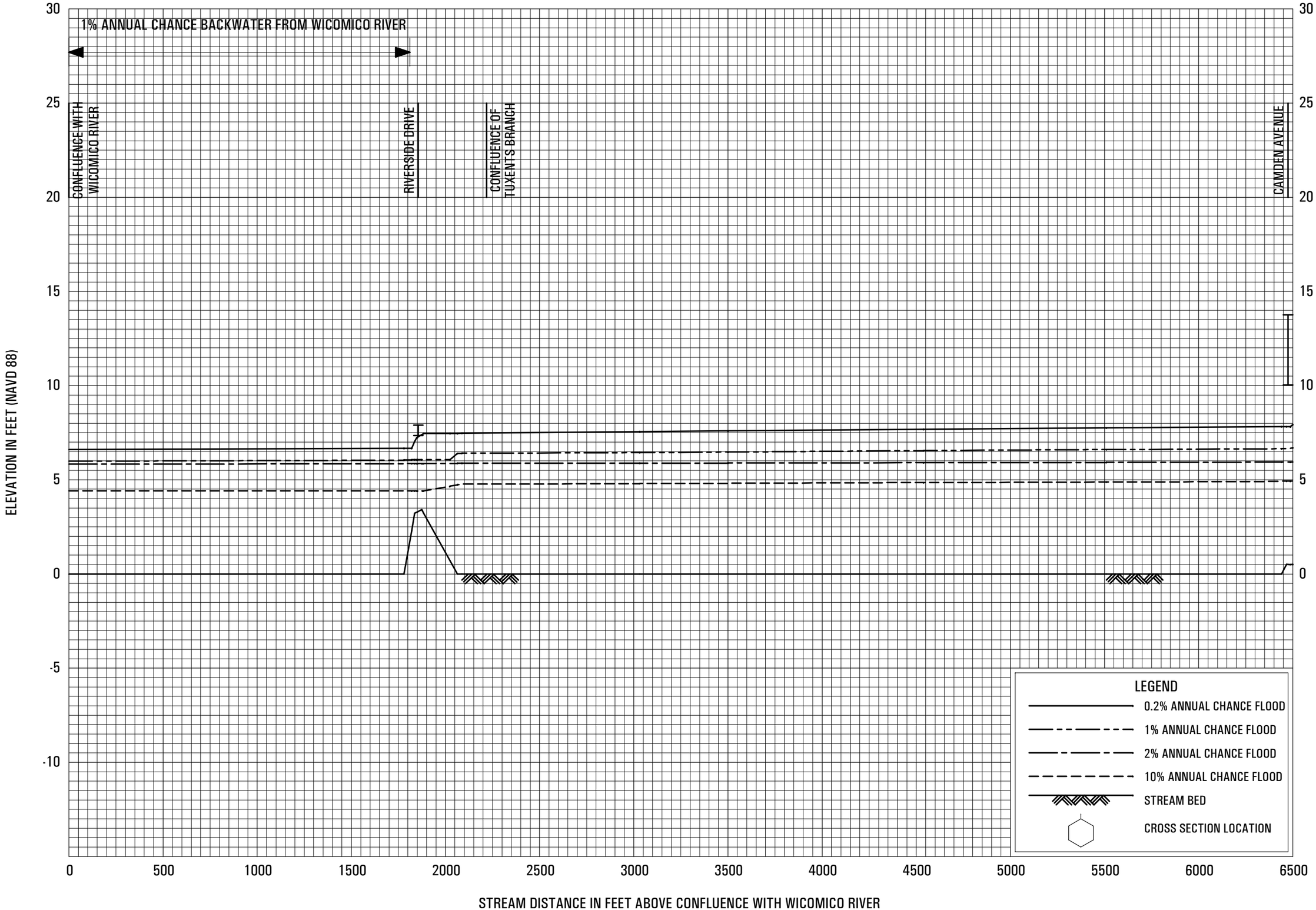
FLOOD PROFILES

MIDDLE NECK BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



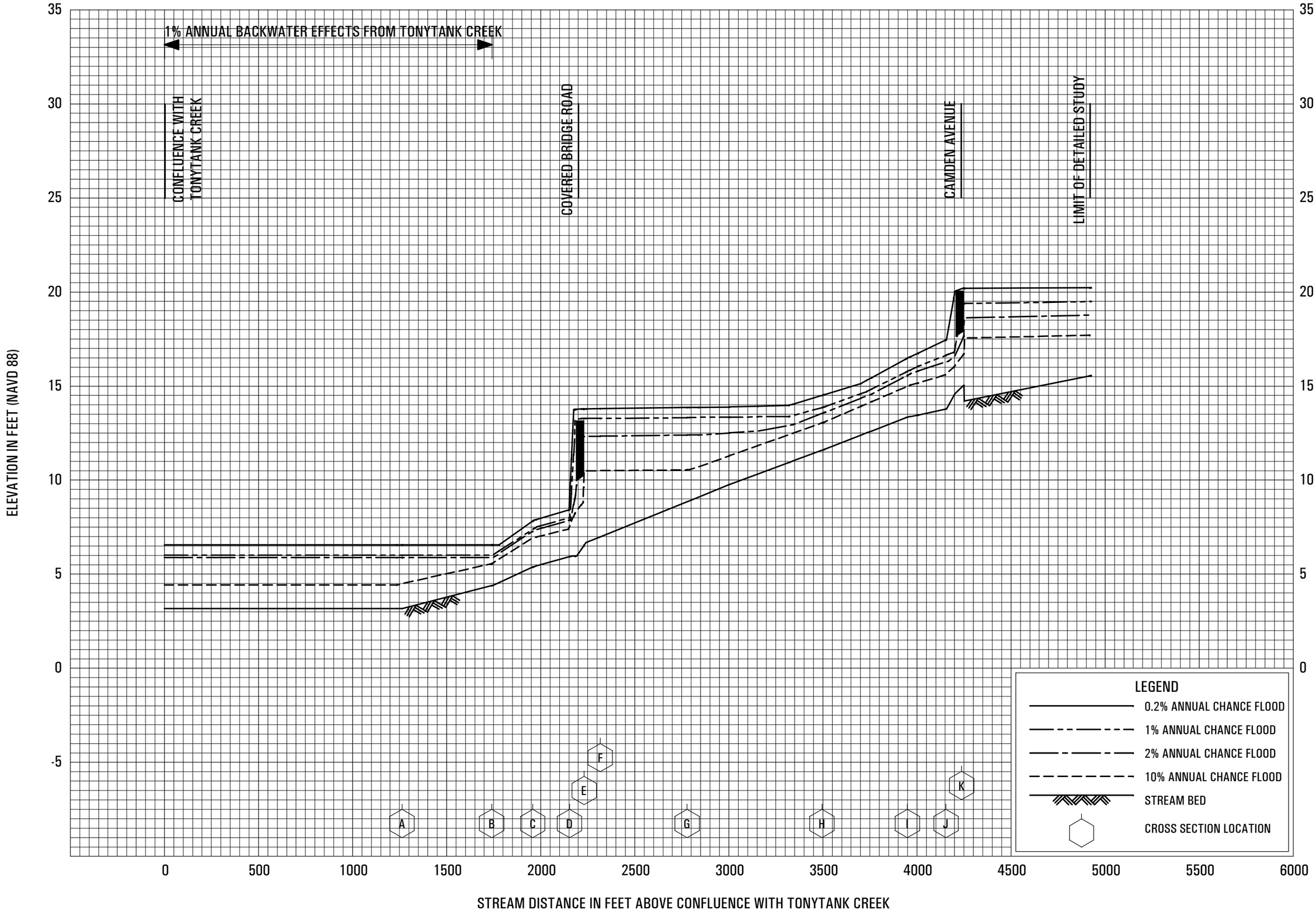
FLOOD PROFILES

TONYTANK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



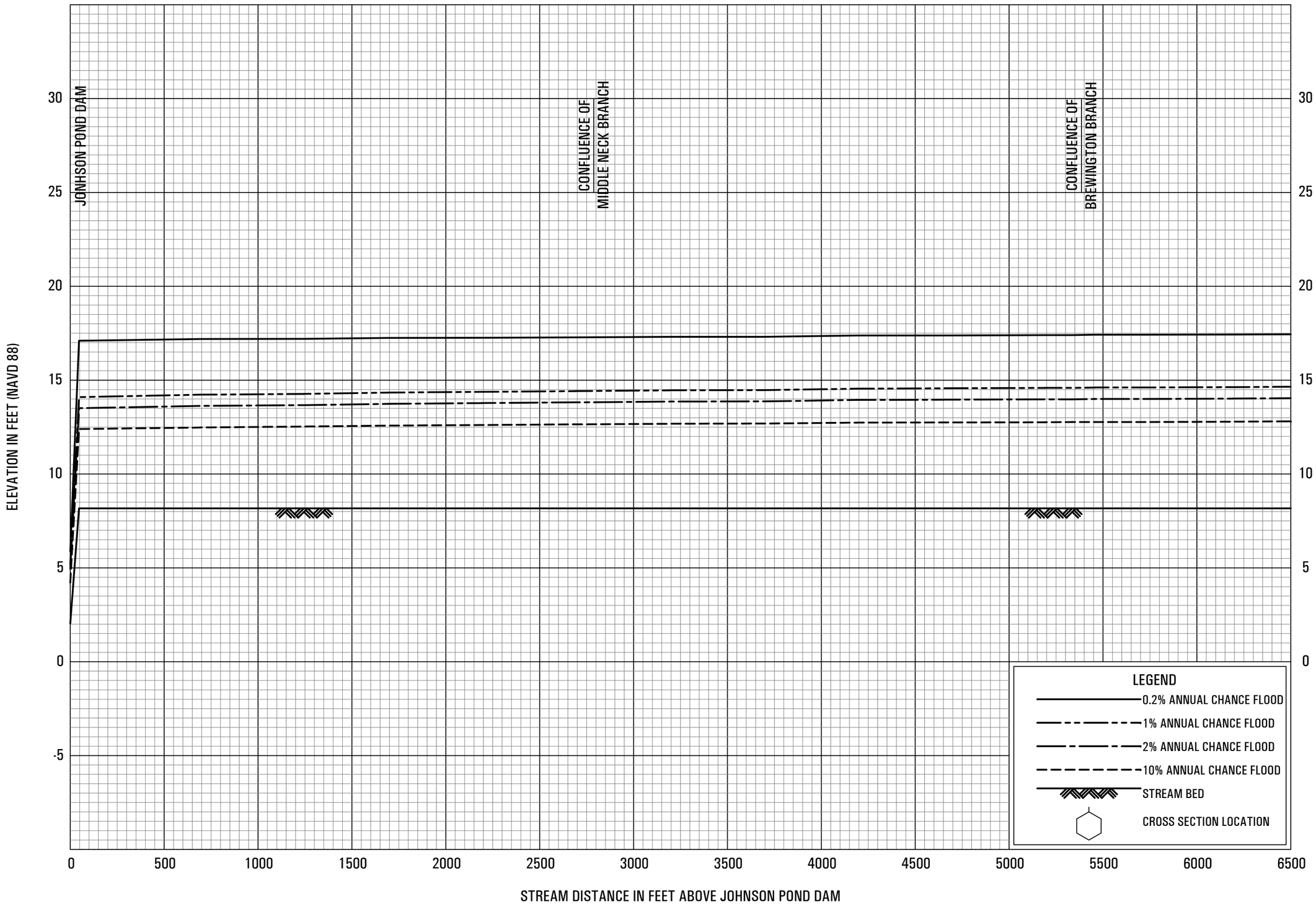
FLOOD PROFILES

TUXENTS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



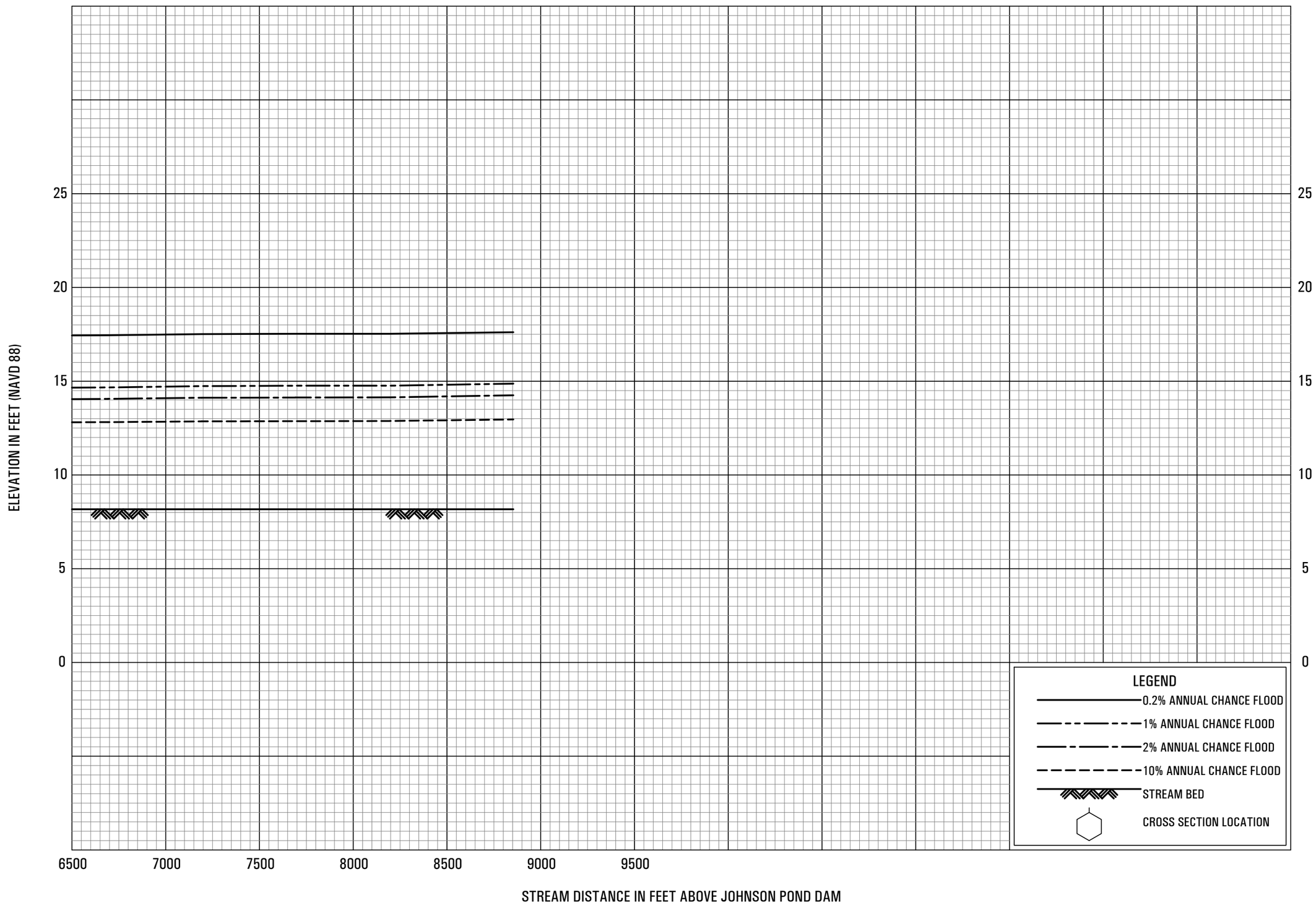
FLOOD PROFILES

NORTH PRONG WICOMICO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS



FLOOD PROFILES

NORTH PRONG WICOMICO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WICOMICO COUNTY, MD

AND INCORPORATED AREAS