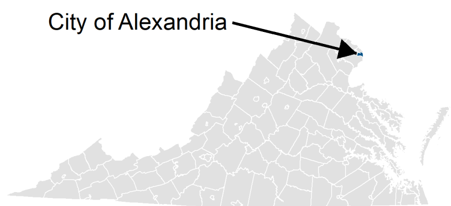
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1



CITY OF ALEXANDRIA, VIRGINIA

INDEPENDENT CITY

COMMUNITY NAME	COMMUNITY NUMBER
ALEXANDRIA, CITY OF	515519

REVISED:

January 11, 2024

FLOOD INSURANCE STUDY NUMBER
515519V000B
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FLOOD INSURANCE STUDY REPORT
CITY OF ALEXANDRIA, VIRGINIA

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

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

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

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

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

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

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

1.2 Purpose of this Flood Insurance Study Report

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

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

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of the City of Alexandria, Virginia.

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

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Alexandria, City of	515519	02070010	5155190009F, 5155190017F, 5155190027F, 5155190028F, 5155190029F, 5155190031F, 5155190033F, 5155190036F, 5155190037F, 5155190041F	

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains; and 1-percent-annual-chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal

Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

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

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

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

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

  The initial Countywide FIS Report for the City of Alexandria became effective on June 16, 2011. Refer to Table 27 for information about subsequent revisions to the FIRMs.

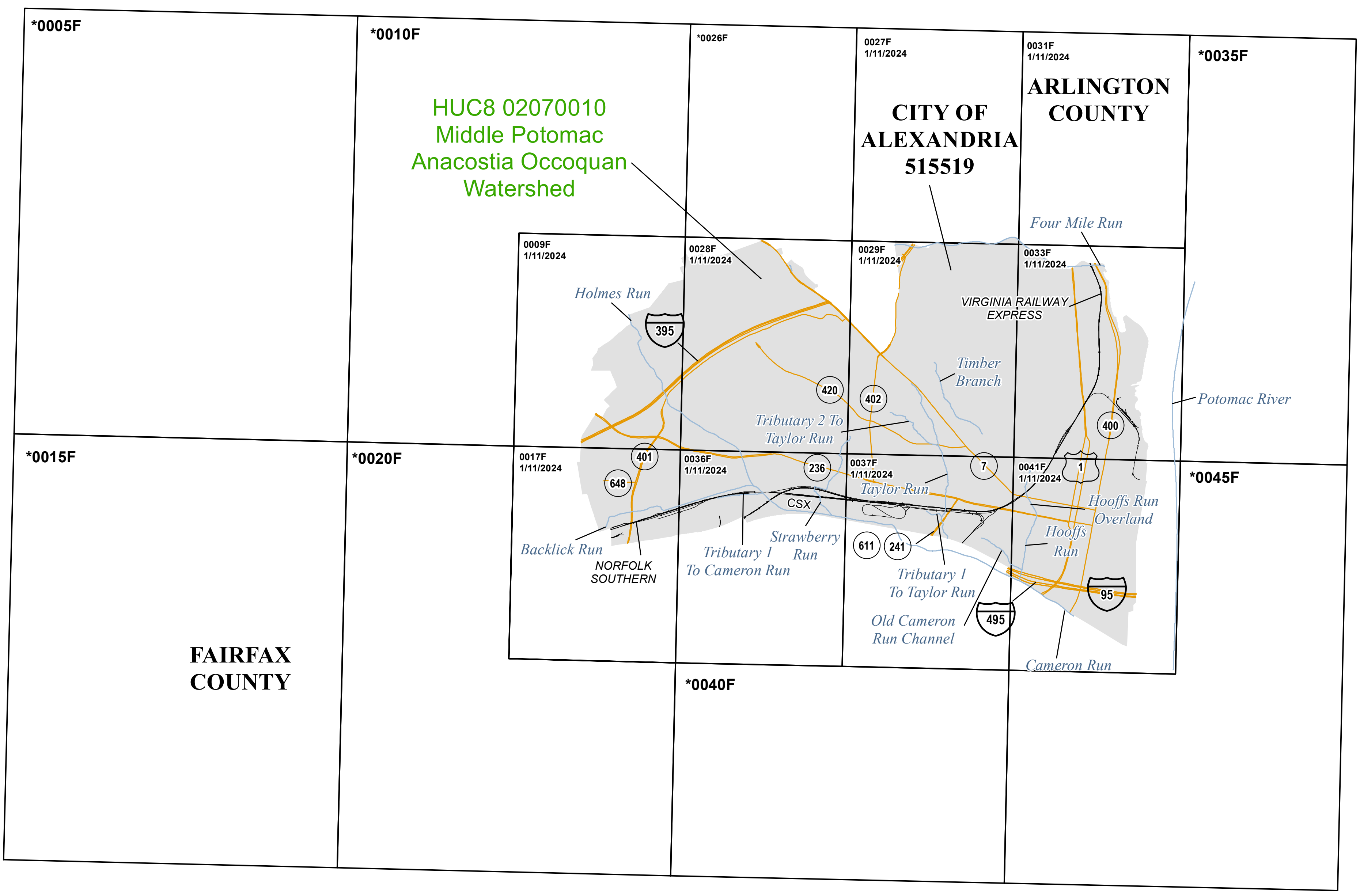
- FEMA does not design, build, inspect, operate, maintain, or certify levees. FEMA is responsible for accurately identifying flood hazards and communicating those hazards and risks to affected stakeholders. FEMA has identified one or more levee systems in this jurisdiction summarized in Table 8 of this FIS Report. For FEMA to accredit the identified levee systems, the levee systems must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

  Information on the levee systems in this jurisdiction can be obtained from the USACE National Levee Database (https://levees.sec.usace.army.mil/). For additional information, the user should contact the appropriate jurisdiction floodplain administrator and the levee owner or sponsor.

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

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

Figure 1: FIRM Index



1 inch = 7,500 feet 1:90,000

Feet

0 3,100 6,200 12,400

Map Projection:
NAD 1983 UTM Zone 18N
North American Datum of 1983

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

HTTPS://MSC.FEMA.GOV

SEE FIS REPORT FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - AREA OUTSIDE COMMUNITY BOUNDARY

COUNTY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CITY OF ALEXANDRIA, VIRGINIA Independent City

PANELS PRINTED:
0009, 0017, 0027, 0028, 0029, 0031, 0033, 0036, 0037, 0041

FEMA

MAP NUMBER
515519IND0B

MAP REVISED
JANUARY 11, 2024

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

Figure 2: FIRM Notes to Users

NOTES TO USERS

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

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

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

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

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

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

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

Figure 2. FIRM Notes to Users

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may have reduced flood hazards due to flood control structures. Refer to Section 4.3 "Dams and Other Flood Hazard Reduction Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 18**.** The horizontal datum was the North American Datum of 1983 NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

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

BASE MAP INFORMATION: Base map information shown on the FIRM was provided in digital format by the United States Department of Agriculture - Aerial Photography Field Office (USDA - APFO), National Agriculture Imagery Program (NAIP). This information was derived from digital orthophotography at a 2-foot resolution from photography dated 2019. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

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

NOTES FOR FIRM INDEX

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

Figure 2. FIRM Notes to Users

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for the City of Alexandria, Virginia, effective January 11, 2024.

NON-ACCREDITED LEVEE SYSTEM: This panel contains a levee system that has not been accredited and is therefore not recognized as reducing the 1-percent-annual-chance flood hazard.

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

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

Figure 3: Map Legend for FIRM

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

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

Figure 3: Map Legend for FIRM

OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Hazard due to Accredited or Provisionally Accredited Levee System: Area is shown as reduced flood hazard from the 1-percent-annual-chance or greater flood by a levee system. Overtopping or failure of any levee system is possible.
	Area with Undetermined Flood Hazard due to Non-Accredited Levee System: Analysis and mapping procedures for non-accredited levee systems were applied resulting in a flood insurance rate zone where flood hazards are undetermined, but possible.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
NO SCREEN	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
(ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct Channel Culvert Storm Sewer	Channel, Culvert, Aqueduct, or Storm Sewer
Dam Jetty Weir	Dam, Jetty, Weir
	Levee, Dike, or Floodwall

Figure 3: Map Legend for FIRM

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

Figure 3: Map Legend for FIRM

MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

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

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

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

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

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

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Backlick Run	Alexandria, City of	At confluence with Cameron Run	Approximately 2,200 feet upstream of Van Dorn Street	02070010	1.7	N	AE	05/01/2007
Cameron Run	Alexandria, City of	At confluence with Potomac River	Approximately 2,100 feet upstream of US Route 1	02070010	0.8	N	AE	05/01/2007
Cameron Run	Alexandria, City of	Approximately 2,100 feet upstream of US Route 1	At Interstate 495	02070010	1.2	N	AE	12/13/2021
Cameron Run	Alexandria, City of	At Interstate 495	Approximately 550 feet upstream of Railroad	02070010	1.6	N	AE	05/01/2007
Four Mile Run	Alexandria, City of	At confluence with Potomac River	Just upstream of South Shirlington Road	02070010	2.3	Y	AE	07/31/2020
Holmes Run	Alexandria, City of	At confluence with Cameron Run	Approximately 2,945 feet upstream of North Beauregard Street	02070010	2.3	N	AE	05/01/2007
Hooffs Run	Alexandria, City of	At confluence with Cameron Run	Approximately 350 feet upstream of Jamieson Avenue	02070010	0.7	N	AE	05/01/2007

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Hooffs Run	Alexandria, City of	Approximately 40 feet upstream of East Linden Street	Just upstream of East Maple Street	02070010	0.1	N	AE	05/01/2007
Hooffs Run (Overland Flooding)	Alexandria, City of	Approximately 350 feet upstream of Jamieson Avenue	Approximately 40 feet upstream of East Linden Street	02070010	0.5	N	AE	06/01/2009
Old Cameron Run Channel	Alexandria, City of	At confluence with Hooffs Run	Approximately 265 feet upstream of Mill Road	02070010	0.5	N	AE	05/01/2007
Potomac River	Alexandria, City of	At confluence of Cameron Run	At confluence of Four Mile Run	02070010	4.0	N	AE	04/03/2008
South Lucky Run	Alexandria, City of	Approximately 40 feet upstream of State Route 7	Approximately 60 feet downstream of South 28th Street	02070010	0.1	N	A	01/30/2017
Strawberry Run	Alexandria, City of	At confluence with Cameron Run	Approximately 670 feet upstream of Fort Williams Parkway	02070010	1.2	N	AE	05/01/2007
Taylor Run	Alexandria, City of	Approximately 930 feet downstream of Telegraph Road	Approximately 1,940 feet upstream of upstream end of Access Road culvert, near intersection of Scroggins Road and King Street	02070010	1.7	N	AE	05/01/2007

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Timber Branch	Alexandria, City of	At West Glendale Avenue	Approximately 360 feet upstream of West Braddock Road	02070010	1.0	N	AE	05/01/2007
Tributary 1 to Cameron Run	Alexandria, City of	At confluence with Cameron Run	Approximately 2,400 feet upstream of confluence with Cameron Run	02070010	0.5	N	AE	05/01/2007
Tributary 1 to Taylor Run	Alexandria, City of	At confluence with Taylor Run	Approximately 880 feet upstream of Mill Road	02070010	0.2	N	AE	05/01/2007
Tributary 2 to Taylor Run	Alexandria, City of	At confluence with Taylor Run	Approximately 3,110 feet upstream of Janneys Lane	02070010	0.7	N	AE	05/01/2007

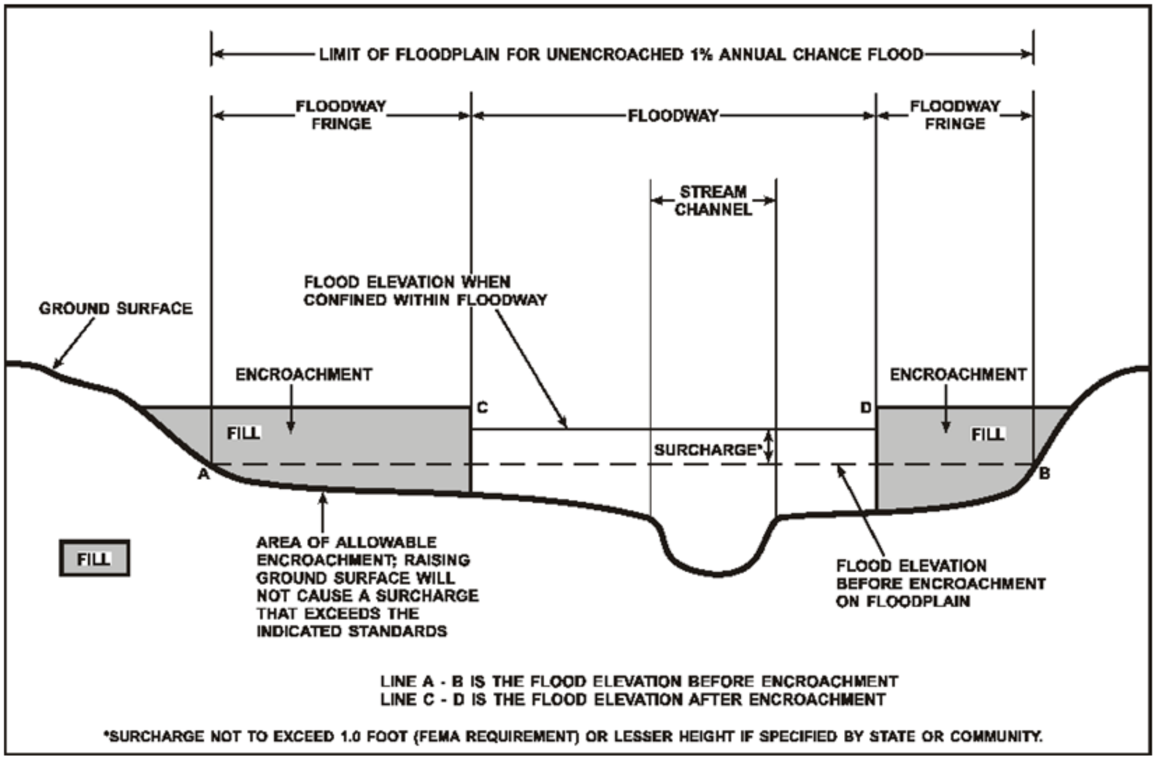
2.2 Floodways

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

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

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

Figure 4: Floodway Schematic



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

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

2.3 Base Flood Elevations

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

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

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk Project.

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1-percent-annual-chance flood and the geometry of the floodplain. Floods in these areas are typically caused by storm events. However, for areas on or near ocean coasts, large rivers, or large bodies of water, BFE and floodplain boundaries may need to be based on additional components, including storm surges and waves.

Coastal flooding sources that are included in this Flood Risk Project are shown in Table 2.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun.
- *Storm surge* is the additional water depth that occurs during large storm events. These events can bring air pressure changes and strong winds that force water up against the shore.
- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1-percent-annual-chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1-percent-annual-chance storm. The 1-percent-annual-chance storm surge can be determined from analyses of tidal gage records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the effects of waves.

- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column. Wave setup was not analyzed in this study.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1-percent-annual-chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since tidal gages are often sited in areas sheltered from wave action and do not capture this information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

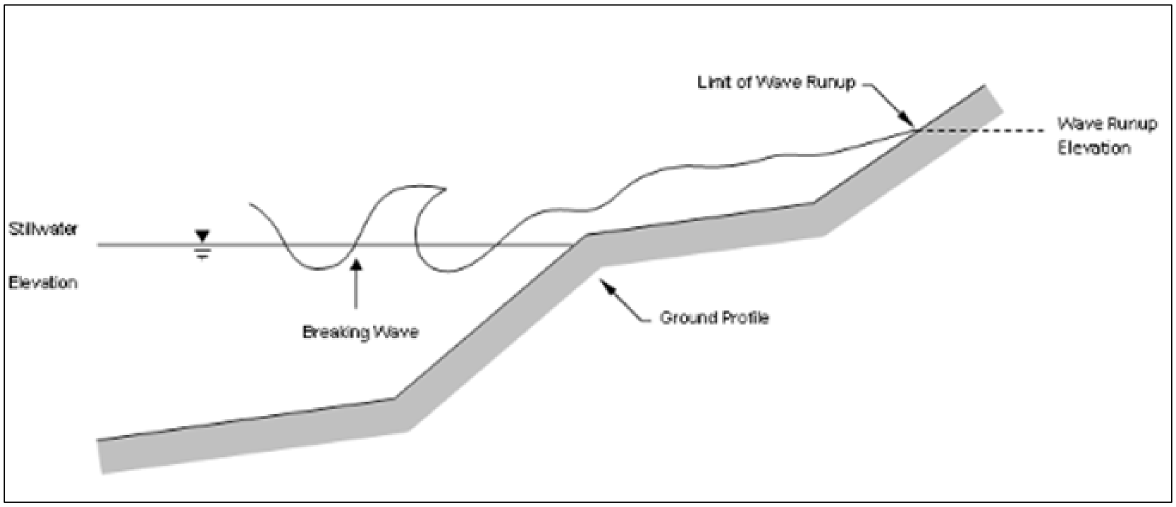
- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate. Storm-induced erosion was not analyzed in this study.

- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore. Overland wave propagation was not analyzed in this study.

- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land. Wave runup was not analyzed in this study.

- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier. Wave overtopping was not analyzed in this study.

Figure 5: Wave Runup Transect Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1-percent-annual-chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1-percent-annual-chance storm. The methods that were used for calculation of total stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report.

Coastal BFEs

Coastal BFEs are calculated as the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1-percent-annual-chance storm plus the additional flood hazard from overland wave effects (storm-induced erosion, overland wave propagation, wave runup and wave overtopping). In this study, wave setup, overland wave propagation, as well as wave runup and overtopping hazards were not considered. Therefore, the BFE is based on the stillwater elevation.

More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this Flood Risk Project.

Figure 6: Coastal Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this Flood Risk Project.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

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

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

Table 3 lists the flood insurance zones in the City of Alexandria.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Alexandria, City of	A, AE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

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

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Middle Potomac-Anacostia-Occoquan	02070010	Potomac River	Encompasses parts of Northern Virginia, District of Columbia, and Maryland. The City of Alexandria lies completely within this watershed.	1,303

4.2 Principal Flood Problems

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

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
All Flooding Sources	Three types of storms cause flooding in the study area: thunderstorms, hurricane storms, and frontal storms. The summer thunderstorms, with high-intensity short-duration rainfall, are the major cause of flooding. Hurricanes creates flood conditions by producing excessive amounts of rain. Frontal storms may cause flooding depending on antecedent conditions. Significant floods have occurred in the vicinity of the study area as a result of these three types of storms. Major hurricanes to hit Northern Virginia area include Floyd in 1999, Isabel in 2003, Irene in 2011 and Sandy in 2012, all of which caused substantial damage. The City experiences nuisance flooding due to an overtaxed stormwater system and owing to the high levels of development described above. Also, its proximity to the tidally influenced Potomac River and low-lying developed areas, both residential and commercial, make parts of the City susceptible to significant flood related damage. It has been included in several disaster declarations, most recently due to severe storms in June of 2006 and as a result of Hurricane Isabel in 2003. Extensive damage due to storm surge and riverine flooding occurred during both of these events. The highest recorded flows determined by an analysis of two USGS gaging stations located in Alexandria (along Four Mile Run and Cameron Run) occurred in 2006 and 1972, respectively.

Table 5: Principal Flood Problems (continued)

Flooding Source	Description of Flood Problems
All Flooding Sources	The most recent widespread flooding in the City of Alexandria occurred in June 2006. Several roadways, including Telegraph Road and U.S. Interstate Highway 495/95 (Capital Beltway) were overtopped; commercial and residential structures in the City of Alexandria reported significant flooding; stormwater infrastructure was inundated with larger than design flows causing deep ponding of water on roadways; and the Huntington area in Fairfax County, on the southern bank of Cameron Run, received significant flood damages. On September 23, 2003, the USGS gaging station (01653000) at Cameron Run in Alexandria recorded a peak streamflow of 9,330 cfs with a gage height of 11.29 feet as a result of Hurricane Isabel (FEMA 2011). The hurricane’s eye tracked well west of the Chesapeake Bay, but the storm's 40 to 60 mph sustained winds pushed a bulge of water northward up the bay and its tributaries producing a record storm surge. The Virginia western shore counties of the Chesapeake Bay and the tidal tributaries of the Potomac, Rappahannock and other smaller rivers, experienced a storm surge which reached 5 to 9 feet above normal tides. In many locations, Isabel's surge was higher than the previous record storm known as the Chesapeake-Potomac Hurricane of 1933.

Table 6 contains information about historic flood elevations in the City of Alexandria.

Table 6: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Cameron Run	USGS Survey Gage 01653000, Cameron Run at Alexandria, VA	18.1	June 22, 1972	N/A	City of Alexandria FIS (FEMA 2011)
Cameron Run	USGS Survey Gage 01653000, Cameron Run at Alexandria, VA	11.3	September 23, 2003	N/A	City of Alexandria FIS (FEMA 2011)
Four Mile Run	USGS Survey Gage 01652500, Four Mile Run at Alexandria, VA	20.2	June 2006	N/A	City of Alexandria FIS (FEMA 2011)

4.3 Dams and Other Flood Hazard Reduction Measures

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

Table 7: Dams and Other Flood Hazard Reduction Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Backlick Run	N/A	Concrete-lined flood control channel	Cameron Station	Reduce flooding in residential areas
Cameron Run	N/A	Flood control channel	Between the Capital Beltway and the railroad bridge	Constructed in the 1970's to reduce flooding in residential areas

4.4 Levees

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the flood hazard from the 1-percent-annual-chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate flood hazard zone.

Levee systems that are determined to reduce the hazard from the 1-percent-annual-chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with 44 CFR 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee system's accreditation status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets 44 CFR 65.10, FEMA will consider the levee system as non-accredited and issue an effective FIRM showing the levee-impacted area as a SFHA or Zone D.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levee systems that exist within City of Alexandria. Table 8, "Levee Systems," lists all accredited levee systems, PALs, and non-accredited levee systems shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levee systems identified in the table are displayed on the FIRM with notes to users to indicate their flood hazard mapping status.

Please note that the information presented in Table 8 is subject to change at any time. For that reason, the latest information regarding the levee systems presented in the table may be obtained by accessing the National Levee Database. For additional information, contact the levee owner/sponsor or the local community shown in Table 30.

Table 8: Levee Systems

Community	Flooding Source(s)	NLD Levee System ID	NLD Levee System Name	Levee System Status on Effective FIRM	FIRM Panel(s)	Levee Owner(s) / Sponsor(s)
Alexandria, City of	Four Mile Run	2305150001	Alexandria East	Non-Accredited	5155190027F, 5155190029F	City of Alexandria
Arlington County, Unincorporated Areas	Four Mile Run	2305150002	Arlington East	Non-Accredited	5155190027F, 5155190031F, 5155190033F	Arlington County
Alexandria, City of	Four Mile Run	2305150003	Alexandria West	Non-Accredited	5155190027F, 5155190029F	City of Alexandria
Arlington County, Unincorporated Areas	Four Mile Run	2305150004	Arlington West	Non-Accredited	5155190027F, 5155190029F	Arlington County

SECTION 5.0 – ENGINEERING METHODS

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

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

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

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

5.1 Hydrologic Analyses

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

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

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Backlick Run	At confluence with Holmes Run	13.2	6,304	*	11,484	13,948	19,896
Backlick Run	Downstream of Confluence with Turkeycock Run	12.1	6,259	*	11,422	13,858	19,756
Backlick Run	Downstream of Confluence with Indian Run	8.6	4,921	*	8,330	9,999	14,129
Backlick Run	At U.S. Route 495 (Capital Beltway)	3.8	1,600	*	2,799	3,405	4,797
Backlick Run	Upstream of Henry Shirley Memorial Highway	2.7	1,455	*	2,348	2,940	4,171
Backlick Run	At Leesville Boulevard	2.0	1,337	*	2,071	2,493	3,605
Backlick Run	Upstream of Braddock Road	1.1	789	*	1,187	1,398	1,889
Backlick Run	Downstream of Carmine Street	0.5	704	*	1,067	1,233	1,610
Cameron Run	Upstream of U.S. Route 1 Interchange	44.5	11,203	*	20,400	25,414	39,189
Cameron Run	At Telegraph Road (and Huntington Area)	39.1	10,820	*	20,400	25,398	39,056
Cameron Run	At confluence with Strawberry Run	36.0	10,814	*	20,397	25,350	38,372
Cameron Run	At Railroad Bridge	34.0	10,434	*	19,555	24,275	36,650
Cameron Run	At USGS Gage	32.6	9,922	*	18,498	22,944	34,657
Four Mile Run	Approximately 3,000 feet downstream of George Washington Memorial Parkway	19.7	10,982	15,539	19,837	25,051	41,913

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Four Mile Run	Approximately 80 feet downstream of Potomac Avenue	18.7	10,388	14,698	18,764	23,696	39,646
Four Mile Run	Approximately 1,500 feet upstream of Jefferson Davis Highway	17.6	9,806	13,874	17,711	22,367	37,422
Four Mile Run	Approximately 1,777 feet downstream of West Glebe Road	14.2	7,884	11,155	14,241	17,985	30,089
Four Mile Run	Approximately 800 feet downstream of South Shirlington Road	13.2	7,371	10,429	13,313	16,813	28,129
Four Mile Run	Approximately 50 feet upstream of South Shirlington Road	13.1	7,308	10,340	13,200	16,670	27,890
Four Mile Run	Approximately 440 feet downstream of South Nelson Street	12.5	6,960	9,847	12,571	15,875	26,560
Holmes Run	At confluence with Backlick Run	19.0	4,424	*	8,232	10,195	15,875
Holmes Run	Upstream of Duke Street	18.7	4,393	*	8,166	10,095	15,712
Holmes Run	At Henry Shirley Memorial Highway	17.6	4,254	*	7,887	9,741	15,138
Holmes Run	Upstream of Beauregard Street	16.7	4,100	*	7,560	9,315	14,438
Holmes Run	Below Lake Barcroft Dam	14.7	3,770	*	6,914	8,486	13,088
Hooffs Run	At U.S. Route 495	2.8	1,901	*	2,443	2,727	3,006
Hooffs Run	At Jamieson Avenue	2.4	1,559	*	2,094	2,338	3,032
Hooffs Run	Overland Flood Area	1.8	628	*	1,311	1,627	2,324

*Not calculated for this Flood Risk Project

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Hooffs Run	Upstream of Linden Street	1.8	1,885	*	2,574	2,882	3,595
Old Cameron Run Channel	At Truesdale Drive	0.3	410	*	570	641	805
Strawberry Run	Upstream of Eisenhower Avenue	0.7	509	*	806	949	1,310
Strawberry Run	At Early Street	0.4	256	*	449	535	744
Strawberry Run	At Duke Street	0.3	196	*	357	435	610
Strawberry Run	Upstream of Fort Williams Parkway	0.1	67	*	123	150	217
Taylor Run	Upstream of Telegraph Road	1.7	996	*	1,629	1,932	2,654
Taylor Run	At Duke Street	1.2	553	*	917	1,104	1,594
Taylor Run	At Janneys Lane	0.9	343	*	538	672	817
Taylor Run	Near Intersection of Quincy Street and King Street	0.5	252	*	445	540	781
Timber Branch	At Glendale Avenue Culvert	0.6	671	*	995	1,141	1,480
Timber Branch	At Timber Branch Parkway	0.4	581	*	851	969	1,237
Timber Branch	At Braddock Road	0.3	408	*	591	669	852
Tributary 1 To Cameron Run	At confluence with Cameron Run	1.3	946	*	1,480	1,730	2,347
Tributary 1 To Taylor Run	At confluence with Taylor Run	0.4	391	*	588	676	889
Tributary 2 To Taylor Run	At Francis Hammond Parkway	0.3	118	*	224	277	412
Tributary 2 To Taylor Run	Downstream of Key Drive	0.1	61	*	119	148	223

*Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
South Lucky Run	South Lucky Run watershed near Gadsby Place	*	*	*	168.0	*

*Not calculated for this Flood Risk Project

Table 11: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Four Mile Run	01652500	USGS	Four Mile Run at Alexandria, VA	13.1	05/13/1964	02/24/2016

5.2 Hydraulic Analyses

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

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

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

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Backlick Run	At confluence with Cameron Run	Approximately 2,200 feet upstream of Van Dorn Street	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Backlick Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Coincident peaks of flooding were assumed for Backlick Run, Holmes Run, and Old Cameron Run Channel as Cameron Run. The downstream ends of these flooding sources were modeled as junctions in HEC-RAS. Flood hazards redelineated in 2020.
Cameron Run	At confluence with Potomac River	Approximately 2,100 feet upstream of US Route 1	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	USGS Stream gage 01653000 was not considered for analysis due to increasing levels of watershed development throughout the period of record and was consider non-homogenous. Flood hazards redelineated in 2020.
Cameron Run	Approximately 2,100 feet upstream of US Route 1	At Interstate 495	HEC-HMS 3.1.0 (USACE 2006)	HEC RAS 3.1.3 (USACE 2005)	12/13/2021	AE	USGS Stream gage 01653000 was not considered for analysis due to increasing levels of watershed development throughout the period of record and was consider non-homogenous. Letter of Map Revision (LOMR) Case Number 21-03-0303P (FEMA 2021) was redelineated in 2022. Zone A mapping was utilized landward of Interstate 495 Capital Beltway as the hydraulic connections were not determined.

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

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cameron Run	At Interstate 495	Approximately 550 feet upstream of Railroad	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	USGS Stream gage 01653000 was not considered for analysis due to increasing levels of watershed development throughout the period of record and was consider non-homogenous. Flood hazards redelineated in 2020.
Four Mile Run	At confluence with Potomac River	Just upstream of South Shirlington Road	PeakFQ (USGS 2018)	HEC-RAS 5.0.7 (USACE 2019)	07/31/2020	AE w/ Floodway	Levee analysis and mapping procedures were applied to Levee IDs 2305150001 and 2305150002. Gage No. 01652500 was used in hydrologic analysis. Hydraulic models incorporated field measured bridge and culvert data.
Holmes Run	At confluence with Cameron Run	Approximately 2,945 feet upstream of North Beauregard Street	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Holmes Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Coincident peaks of flooding was assumed for Backlick Run, Holmes Run, and Old Cameron Run Channel as Cameron Run. The downstream ends of these flooding sources were modeled as junctions in HEC-RAS. Flood hazards redelineated in 2020.
Hooffs Run	At confluence with Cameron Run	Approximately 350 feet upstream of Jamieson Avenue	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Hooffs Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards redelineated in 2020.
Hooffs Run	Approximately 40 feet upstream of East Linden Street	Just upstream of East Maple Street	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Hooffs Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards redelineated in 2020.

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

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Hooffs Run (Overland Flooding)	Approximately 350 feet upstream of Jamieson Avenue	Approximately 40 feet upstream of East Linden Street	HEC-HMS 3.1.0 (USACE 2006)	FLO-2D (FLO-2D 2009)	06/01/2009	AE	The FLO-2D model was developed based on a 1 meter digital elevation model (DEM) developed by the U.S. Army Geospatial Center (AGC) developed from flights performed in October 2003. Minor refinements to the original Cameron Run watershed hydrologic analysis was made for the Hooffs Run overland flooding analysis (USACE 2009). Flood hazards were redelineated in 2020. Flooding depths of less than 1 foot in this overland flow area are depicted as moderate flood risk (Shaded Zone X) floodplain.
Old Cameron Run Channel	At confluence with Hooffs Run	Approximately 265 feet upstream of Mill Road	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Old Cameron Run Channel was conducted as part of the Cameron Run watershed analysis (USACE 2007). Coincident peaks of flooding were assumed for Backlick Run, Holmes Run, and Old Cameron Run Channel as Cameron Run. The downstream ends of these flooding sources were modeled as junctions in HEC-RAS. Flood hazards were redelineated in 2020.
South Lucky Run	Approximately 40 feet upstream of State Route 7	Approximately 60 feet downstream of South 28th Street	Regression Equations (USGS 2011, USGS 2014b)	HEC-RAS 5.0.3 (USACE 2016)	01/30/2017	A	Zone A analysis was conducted as part of the watershed-wide analysis. There were no hydraulic structures within this reach.
Strawberry Run	At confluence with Cameron Run	Approximately 670 feet upstream of Fort Williams Parkway	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Strawberry Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards were redelineated in 2020.

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

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Taylor Run	Approximately 930 feet downstream of Telegraph Road	Approximately 1,940 feet upstream of upstream end of Access Road culvert, near intersection of Scroggins Road and King Street	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Taylor Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards were redelineated in 2020.
Timber Branch	At West Glendale Avenue	Approximately 360 feet upstream of West Braddock Road	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003) FLO-2D (FLO-2D 2009)	05/01/2007	AE	Hydrologic analysis for Timber Branch was conducted as part of the Cameron Run watershed analysis (USACE 2007). The downstream boundary condition of Timber Branch is a culvert with capacity of 450 cfs. Flow in excess of this was modeled in FLO-2D. Analyses indicated that average flow depths are less than 1 foot and have been represented as area of moderate flood risk (Shaded Zone X) Flood hazards were redelineated in 2020.
Tributary 1 to Cameron Run	At confluence with Cameron Run	Approximately 2,400 feet upstream of confluence with Cameron Run	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Tributary 1 to Cameron Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards were redelineated in 2020.
Tributary 1 to Taylor Run	At confluence with Taylor Run	Approximately 880 feet upstream of Mill Road	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Tributary 1 to Taylor Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards were redelineated in 2020.

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

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Tributary 2 to Taylor Run	At confluence with Taylor Run	Approximately 3,110 feet upstream of Janneys Lane	HEC-HMS 3.1.0 (USACE 2006)	HEC-RAS 3.1.1 (USACE 2003)	05/01/2007	AE	Hydrologic analysis for Tributary 2 to Taylor Run was conducted as part of the Cameron Run watershed analysis (USACE 2007). Flood hazards were redelineated in 2020.

Table 13: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Backlick Run	0.015 (concrete-lined) 0.035-0.050 (natural)	0.015-0.120
Cameron Run	0.030-0.040	0.015-0.120
Four Mile Run	0.035-0.050	0.040-0.100
Holmes Run	0.045-0.070	0.015-0.120
Hooffs Run	0.015 (concrete-lined) 0.035 (natural) 0.020 (concrete)	0.015-0.100
Hooffs Run (Overland Flooding)	0.200 (average grass cover)	0.200 (average grass cover)
Old Cameron Run Channel	0.035	0.015-0.100
South Lucky Run	0.040	0.040-0.120
Strawberry Run	0.020 (concrete-lined) 0.035-0.045 (natural)	0.015-0.100
Taylor Run	0.035-0.050	0.015-0.100
Timber Branch	0.015 (concrete-lined) 0.030-0.045 (natural)	0.015-0.100
Tributary 1 to Cameron Run	0.045	0.015-0.120
Tributary 1 to Taylor Run	0.035	0.015-0.070
Tributary 2 to Taylor Run	0.035-0.040	0.015-0.100

5.3 Coastal Analyses

For the areas of the City of Alexandria that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for this FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 14 summarizes the methods and/or models used for the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Below is the coastal data from the June 16, 2011 FIS formatted in the new tables for this current FIS.

Table 14: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Potomac River	At confluence of Four Mile Run	At confluence of Cameron Run	Storm Surge	ADCIRC (FEMA 2008)	04/03/2008

5.3.1 Total Stillwater Elevations

The total stillwater elevations (stillwater including storm surge plus wave setup) for the 1-percent-annual-chance flood were not determined for areas subject to coastal flooding. While storm surge elevations were determined for areas subject to coastal flooding, wave setup was not analyzed in this study. The models and methods that were used to determine storm surge are listed in Table 14.

Figure 8: 1% Annual Chance Stillwater Elevations for Coastal Areas

[Not Applicable to this Flood Risk Project]

Table 15 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the stillwater elevations.

Table 15: Tide Gage Analysis Specifics

Gage Name	Managing Agency of Tide Gage Record	Gage Type	Start Date	End Date	Statistical Methodology
8594900	NOAA	Tide	1965	2008	EST

5.3.2 Waves

This section is not applicable to this Flood Risk Project.

5.3.3 Coastal Erosion

This section is not applicable to this Flood Risk Project.

5.3.4 Wave Hazard Analyses

This section is not applicable to this Flood Risk Project.

Table 16: Coastal Transect Parameters

[Not Applicable to this Flood Risk Project]

Figure 9: Transect Location Map

[Not Applicable to this Flood Risk Project]

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 17: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 18: Results of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

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

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

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

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

The datum conversion locations and values that were calculated for the City of Alexandria are provided in Table 19.

Table 19: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Alexandria	NE	38.875	-77.000	-0.796
Annandale	NE	38.875	-77.125	-0.786
Average Conversion from NGVD29 to NAVD88 = -0.791 feet				

Table 20: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

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

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

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
National Hydrography Dataset	US Geological Survey	08/04/2014	1:24,000	Water area, water lines and attribute information (USGS 2014a)
Roads and Railroads	US Census Bureau	2016	1:100,000	Road center lines, railroad center lines and attribute information (US Census 2016)
Virginia Administrative Boundary Dataset 2018	Virginia GIS Clearinghouse	2018	1:12,000	Political area and boundaries for the City of Alexandria (VGIN 2018)
Virginia NAIP Digital Ortho Photo Images	US Department of Agriculture - National Agriculture Imagery Program	02/19/2019	2 feet GSD (Ground Sample Distance)	Orthoimagery for basemap index (NAIP 2019)

6.3 Floodplain and Floodway Delineation

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

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

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

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

Table 22: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Alexandria, City of	All within the City of Alexandria	Hurricane Sandy Supplemental for National Capital Region (NCR)	11.5 cm RMSEz	1 meter	USGS 2014c

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

Table 23: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	2,317	314 / 77[2]	3,241	7.3	10.2	6.9[3]	7.2	0.3
B	3,773	269	3,276	7.2	10.2	10.0[3]	10.2	0.2
C	4,409	266 / 19[2]	3,998	5.9	12.9	12.9	12.9	0.0
D	7,777	328 / 254[2]	3,802	5.9	14.5	14.5[4] / 14.5[5]	14.6	0.1
E	8,278	197 / 105[2]	3,007	7.4	17.0	17.0[4] / 16.5[5] / 14.8[6]	17.1	0.1
F	9,489	208 / 118[2]	2,354	9.5	18.5	18.5[4] / 18.2[5] / 17.9[6]	18.6	0.1
G	10,245	192 / 89[2]	2,414	7.5	21.0	21.0[4] / 20.8[5]	21.1	0.1
H	11,268	188 / 98[2]	1,697	10.6	23.3	23.3[4] / 23.2[5]	23.3	0.0
I	11,953	177 / 113[2]	2,354	7.6	30.8	30.8[4] / 29.6[5]	31.7	0.9
J	13,662	117	1,654	10.1	39.4	39.4	39.5	0.1

[1] Feet above confluence with Potomac River
[2] Total floodway width / width within the City of Alexandria
[3] Computed without consideration of Potomac River effects
[4] Elevation riverward of levees
[5] Elevation landward of left bank levee
[6] Elevation landward of right bank levee

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

FLOODWAY DATA

FLOODING SOURCE: FOUR MILE RUN

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

[Not Applicable to this Flood Risk Project]

6.4 Coastal Flood Hazard Mapping

This section is not applicable to this Flood Risk Project.

Table 25: Summary of Coastal Transect Mapping Considerations

[Not Applicable to this Flood Risk Project]

6.5 FIRM Revisions

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

6.5.1 Letters of Map Amendment

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

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

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

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

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA's determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

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

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

6.5.3 Letters of Map Revision

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

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

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

Table 26: Incorporated Letters of Map Change

Case Number	Effective Date	Flooding Source	FIRM Panel(s)
21-03-0303P	12/13/2021	Cameron Run	5155190037F

6.5.4 Physical Map Revisions

A Physical Map Revisions (PMR) is an official republication of a community's NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

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

For more information about the PMR process, please visit www.fema.gov and visit the Floods & Maps "Change Your Flood Zone Designation" section.

6.5.5 Contracted Restudies

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

6.5.6 Community Map History

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

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

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

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

- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.

- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community.

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

The initial effective date for the City of Alexandria FIRMs in countywide format was 06/16/2011.

Table 27: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Alexandria, City of	08/22/1969	N/A	N/A	08/22/1969	01/11/2024 06/16/2011 05/15/1991 10/18/1988 04/30/1982 10/22/1976 07/01/1974 05/28/1971 05/02/1970

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

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

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

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Backlick Run, Cameron Run, Holmes Run, Hooffs Run, Old Cameron Run Channel, Strawberry Run, Taylor Run, Timber Branch, Tributary 1 to Cameron Run, Tributary 1 to Taylor Run, Tributary 2 to Taylor Run	06/16/2011	Planning Division of USACE, Baltimore District	HSFE03-06-X-0028	May 2007	Alexandria, City of

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

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Cameron Run	01/11/2024	FEMA	LOMR 21-03-0303P	December 2021	Alexandria, City of
Four Mile Run	01/11/2024	STARR II	HSFE60-15-D-0005	July 2020	Alexandria, City of
Hooffs Run (Overland Flooding)	06/16/2011	USACE, Baltimore District	HSFE03-06-X-0028	June 2009	Alexandria, City of
Potomac River	06/16/2011	USACE Engineer Research and Development Center Coastal and Hydraulics Laboratory	HSFE03-06-X-0028	April 2008	Alexandria, City of
South Lucky Run	01/11/2024	STARR II	HSFE60-15-D-0005	January 2017	Alexandria, City of

7.2 Community Meetings

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

Table 29: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Alexandria, City of	01/11/2024	09/29/2014	Project Discovery	Representatives of Arlington County, Booz Allen Hamilton, Fairfax City Office of Emergency Management, Fairfax County, Fairfax County Office of Emergency Management, Fairfax, City of; Falls Church, City of; Federal Emergency Management Agency, Manassas, City of; Prince William County, Prince William County Emergency Management, RAMPP, Virginia Department of Conservation and Recreation, Virginia Floodplain Management Association
		02/23/2018	Flood Risk Review	Representatives of Alexandria, City of; Arlington County, CERC, Dumfries, Town of; Fairfax, City of; Fauquier County, Federal Emergency Management Agency, Manassas, City of; Prince William County, STARR II, Virginia Department of Conservation and Recreation
		04/06/2020	Flood Risk Review	Representatives of Federal Emergency Management Agency, Strategic Alliance for Risk Reduction II, Virginia Department of Conservation and Recreation
		10/29/2020	Final CCO Meeting	Representatives of Federal Emergency Management Agency, Strategic Alliance for Risk Reduction II, Virginia Department of Conservation and Recreation, City of Alexandria.

SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see https://www.fema.gov.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for the City of Alexandria (FEMA 2011).

Table 30 is a list of the locations where FIRMs for the City of Alexandria can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 30: Map Repositories

Community	Address	City	State	Zip Code
Alexandria, City of	City Hall 301 King Street	Alexandria	VA	22314

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM Databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 31.

Table 31 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

Table 31: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/flood-maps/products-tools/know-your-risk/engineers-surveyors-architects
NFIP website	www.fema.gov/flood-insurance
NFHL Dataset	https://www/msc.fema.gov
FEMA Region III	Federal Emergency Management Agency, Region III One Independence Mall 615 Chestnut Street, 6th Floor Philadelphia, PA 19106-4404 (215) 931-5500
Other Federal Agencies	
USGS website	https://www.usgs.gov
Hydraulic Engineering Center website	https://www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Wendy C. Howard-Cooper, Director, Dam Safety and Floodplain Management, Virginia Department of Conservation & Recreation 600 East Main Street, 24th Floor Richmond, VA 23219 (804) 786-5099 wendy.howard-cooper@dcr.virginia.gov
State GIS Coordinator	Stuart Blankenship, Geospatial Projects Manager Integrated Services Program VITA, Virginia Geographic Information Network (VGIN) 11751 Meadowville Lane Chester, VA 23836 Phone: (804) 416-6208 stuart.blankenship@vita.virginia.gov

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 32 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

Table 32: Bibliography and References

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
EPA 2012	Environmental Protection Agency (EPA)	NHDPlus Version 2	McKay, L., Bondelid, T., Dewald, T., Johnston, J., Moore, R., & Rea, A.	Washington, D.C.	2012	https://www.epa.gov/waterdata/get-nhdplus-national-hydrography-dataset-plus-data
FEMA 2008	Federal Emergency Management Agency	*Unified Storm Surge Profile Methodology for the Tidal Portions of the Potomac River, Version 1.1*	Federal Emergency Management Agency, Baker Regional Management Center 3 (RMC3)	Washington, D.C.	August 6, 2008	https://hazards.fema.gov
FEMA 2011	Federal Emergency Management Agency	*City of Alexandria Effective FIRM and FIS Data*	Federal Emergency Management Agency	Washington, D.C.	June 16, 2011	https://hazards.fema.gov
FEMA 2021	LOMR Case Number 21-03-0303P	LOMR for the Cameron Run Huntington Levee	Federal Emergency Management Agency	Washington, D.C.	December 13, 2021	https://hazards.fema.gov
FHWA 2015	Federal Highway Administration (FHWA)	National Bridge Inventory	FHWA	Washington, D.C.	January 2015	https://www.fhwa.dot.gov/bridge/nbi.cfm
FLO-2D 2009	FLO-2D Software, Inc.	*FLO-2D*	FLO-2D Software Inc.	Nutrioso, Arizona	2009	

Table 32: Bibliography and References (continued)

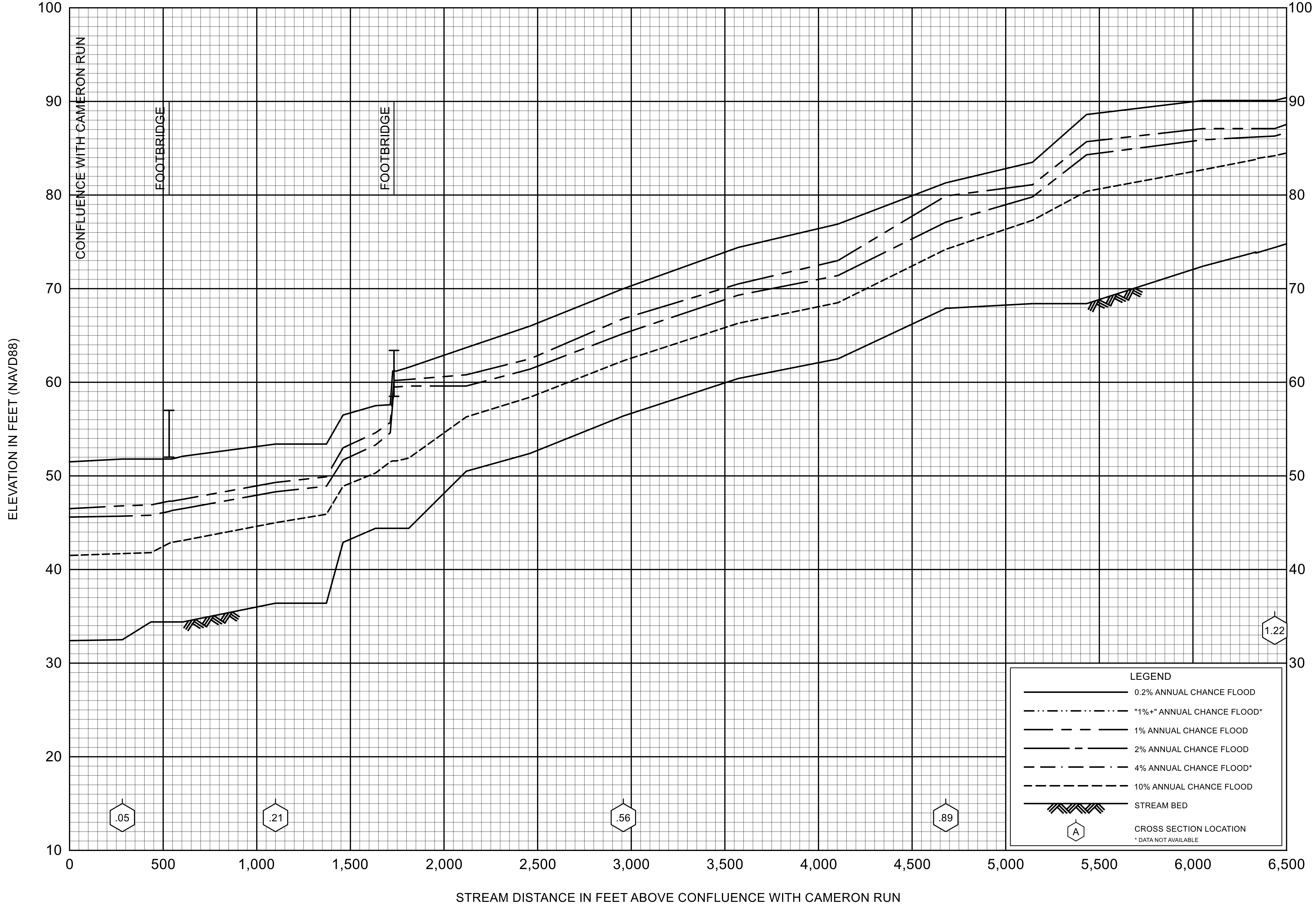
Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
NAIP 2019	US Department of Agriculture - National Agriculture Imagery Program	*Virginia NAIP Digital Ortho Photo Images*	Quantum Spatial, Inc.	Lexington, Kentucky	February 19, 2019	https://www.fsa.usda.gov
STARR II 2017a	Federal Emergency Management Agency	*Zone A modeled streams in MPAO Watershed*	Strategic Alliance for Risk Reduction II (STARR II)	Washington, D.C.	January 30, 2017	https://hazards.fema.gov
STARR II 2020a	Federal Emergency Management Agency	*Four Mile Run Hydraulics & Hydrology - Detailed Study*	Strategic Alliance for Risk Reduction II (STARR II)	Washington, D.C.	July 31, 2020	https://hazards.fema.gov
US Census 2016	US Census Bureau	*Roads and Railroads*	US Census Bureau	Suitland, Maryland	2016	https://www.census.gov/
USACE 2003	USACE Hydrologic Engineering Center	*HEC-RAS* version 3.1.1	US Army Corps of Engineers	Davis, California	May 2003	
USACE 2005	USACE Hydrologic Engineering Center	*HEC-RAS* version 3.1.1	US Army Corps of Engineers	Davis, California	May 2005	https://www.hec.usace.army.mil/software/hec-ras/documentation.aspx
USACE 2006	USACE Hydrologic Engineering Center	*HEC-HMS* version 3.1.0	US Army Corps of Engineers	Davis, California	November 2006	
USACE 2007	USACE, Baltimore District	*Hydrologic and Hydraulic Analysis for the Cameron Run Watershed in Northern Virginia,* Final Report	USACE, Baltimore District	Baltimore, Maryland	May 2007	

Table 32: Bibliography and References (continued)

Citation in this FIS	Publisher/ Issuer	*Publication Title*, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 2009	USACE, Planning Division, Baltimore District	*Overland Flood Analysis for Hooffs Run, City of Alexandria, Virginia*	USACE, Planning Division, Baltimore District	Baltimore, Maryland	June 2009	
USACE 2010	USACE Hydrologic Engineering Center	*HEC RAS* version 4.1	US Army Corps of Engineers	Davis, California	2010	https://www.hec.usace.army.mil/software/hec-ras/documentation.aspx
USACE 2016	USACE Hydrologic Engineering Center	*HEC-RAS* version 5.0.3	US Army Corps of Engineers	Davis, California	February 2016	
USACE 2019	USACE Hydrologic Engineering Center	*HEC-RAS* version 5.0.7	US Army Corps of Engineers	Davis, California	March 2019	
USGS 2011	US Geological Survey	*Peak_Flow Characteristics of Virginia Streams*, Scientific Investigations Report 2011-5144	Samuel H. Austin, Jennifer L. Krstolic, and Ute Wiegand	Reston, Virginia	2011	
USGS 2014a	US Geological Survey	*National Hydrography Dataset*	US Geological Survey	Reston, Virginia	August 4, 2014	http://nhd.usgs.gov/data.html
USGS 2014b	US Geological Survey	*Methods and Equations for Estimating Peak Streamflow Per Square Mile in Virginia's Urban Basins*, Scientific Investigations Report 2014-5090	Samuel H. Austin	Reston, Virginia	2014	
USGS 2014c	US Geological Survey	*Hurricane Sandy Supplemental for National Capital Region (NCR)*	US Geological Survey	Washington, D.C.	December 2014	http://nhd.usgs.gov/data.html

Table 32: Bibliography and References (continued)

Citation in this FIS	Publisher/ Issuer	*Publication Title,* “Article,” Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USGS 2018	US Geological Survey	*Estimating magnitude and frequency of floods using the PeakFQ 7.0 program:* U.S. Geological Survey Fact Sheet 2013-3108, 2 p.	Veilleux, A.G., Cohn, T.A., Flynn, K.M., Mason, R.R., Jr., and Hummel, P.R.	Reston, Virginia	March 28, 2018	https://water.usgs.gov/software/PeakFQ/
VGIN 2018	Virginia GIS Clearinghouse	*Virginia Administrative Boundary Dataset 2018*	Virginia Geographic Information Network (VGIN)	Chester, Virginia	January 1, 2018	http://vgin.maps.arcgis.com



FLOOD PROFILES

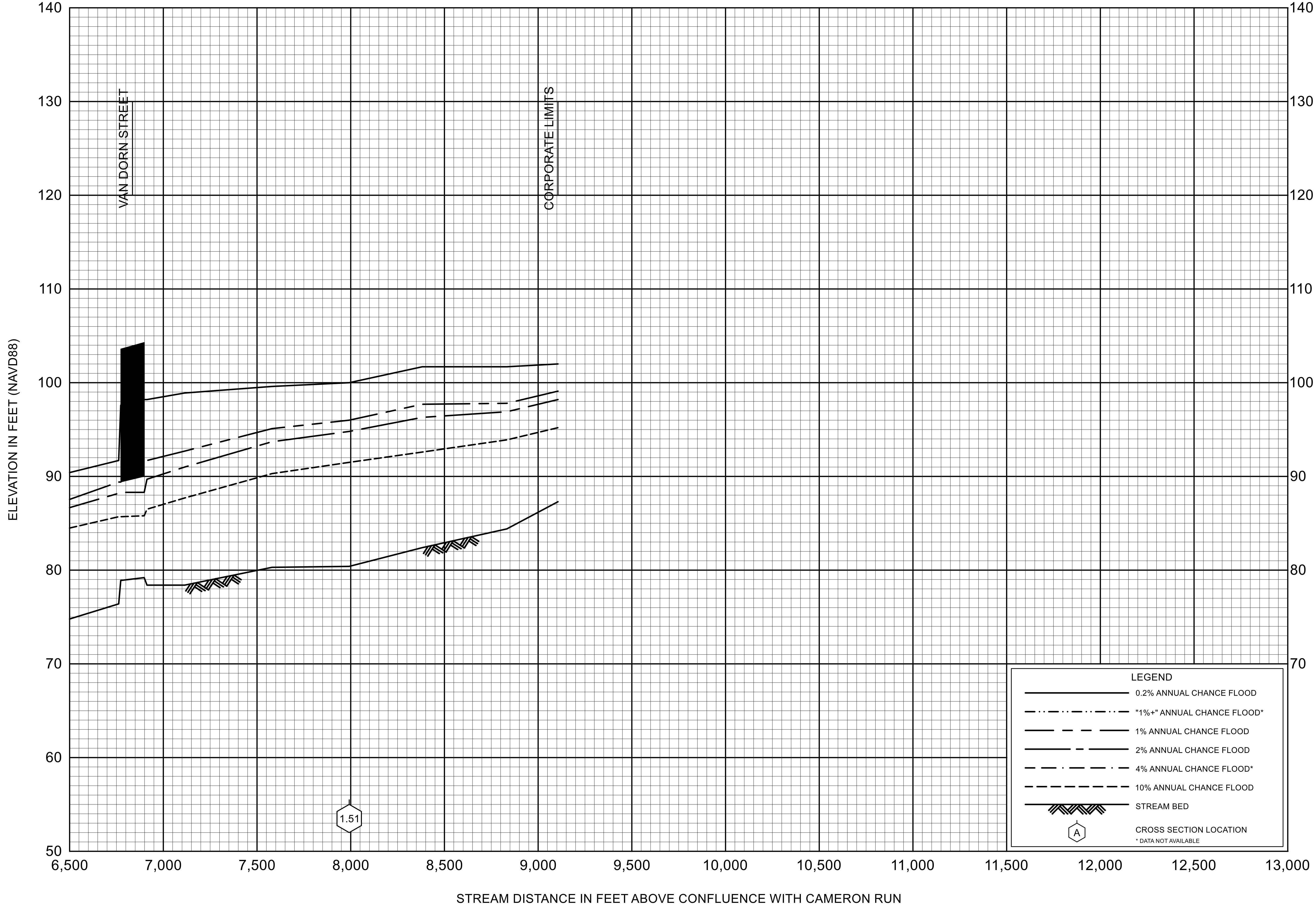
BACKLICK RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

01P



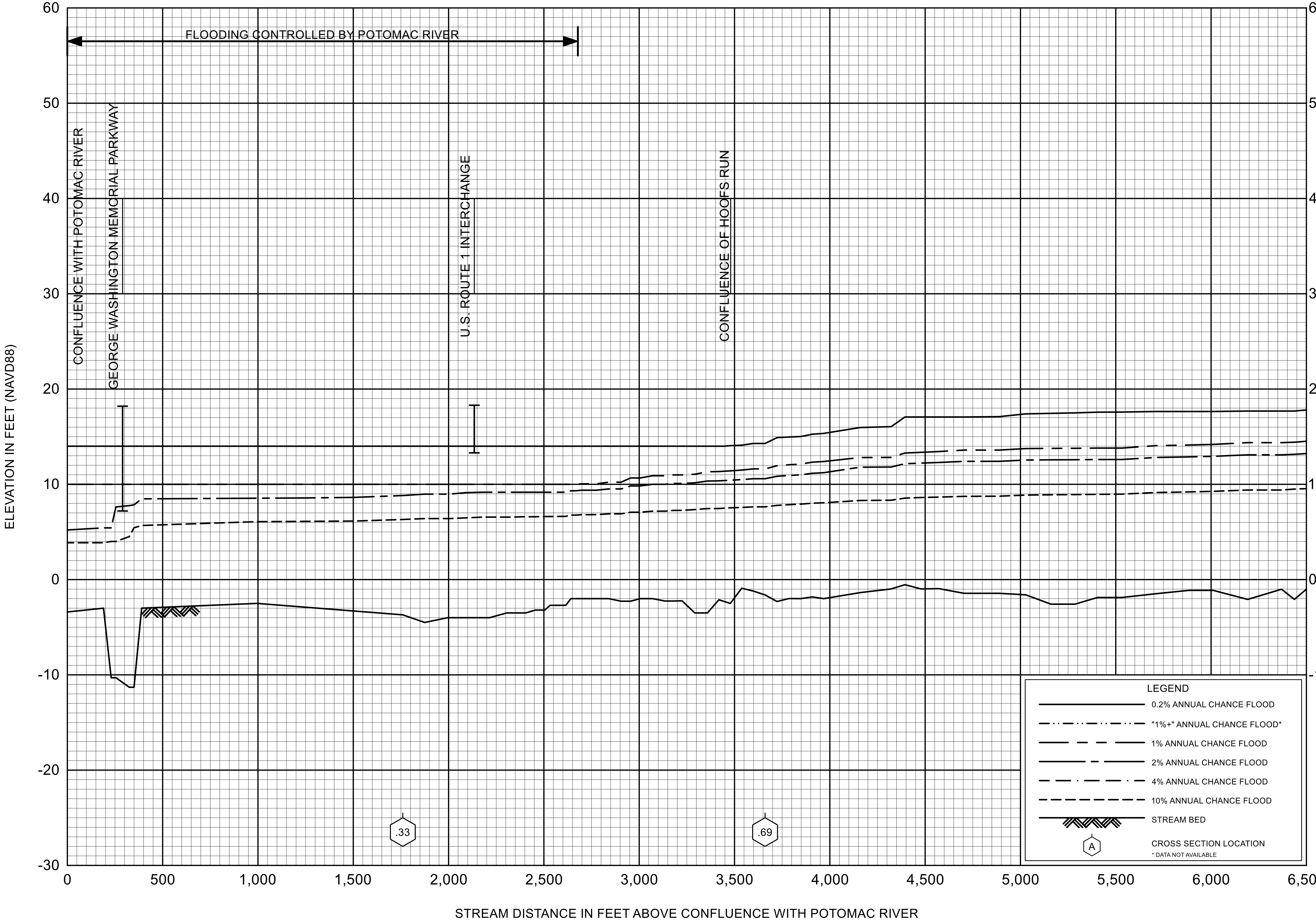
FLOOD PROFILES

BACKLICK RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



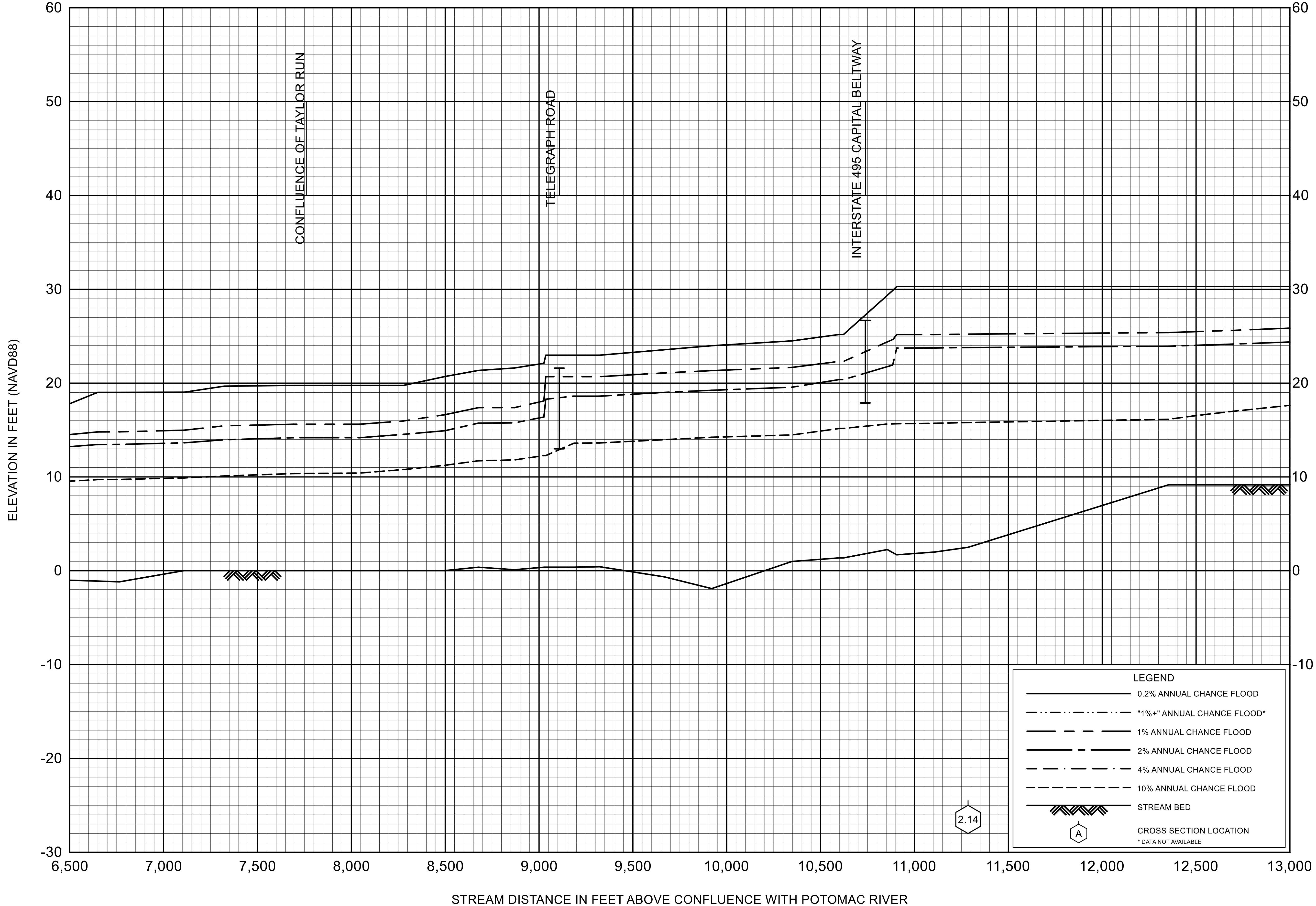
FLOOD PROFILES

CAMERON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



FLOOD PROFILES

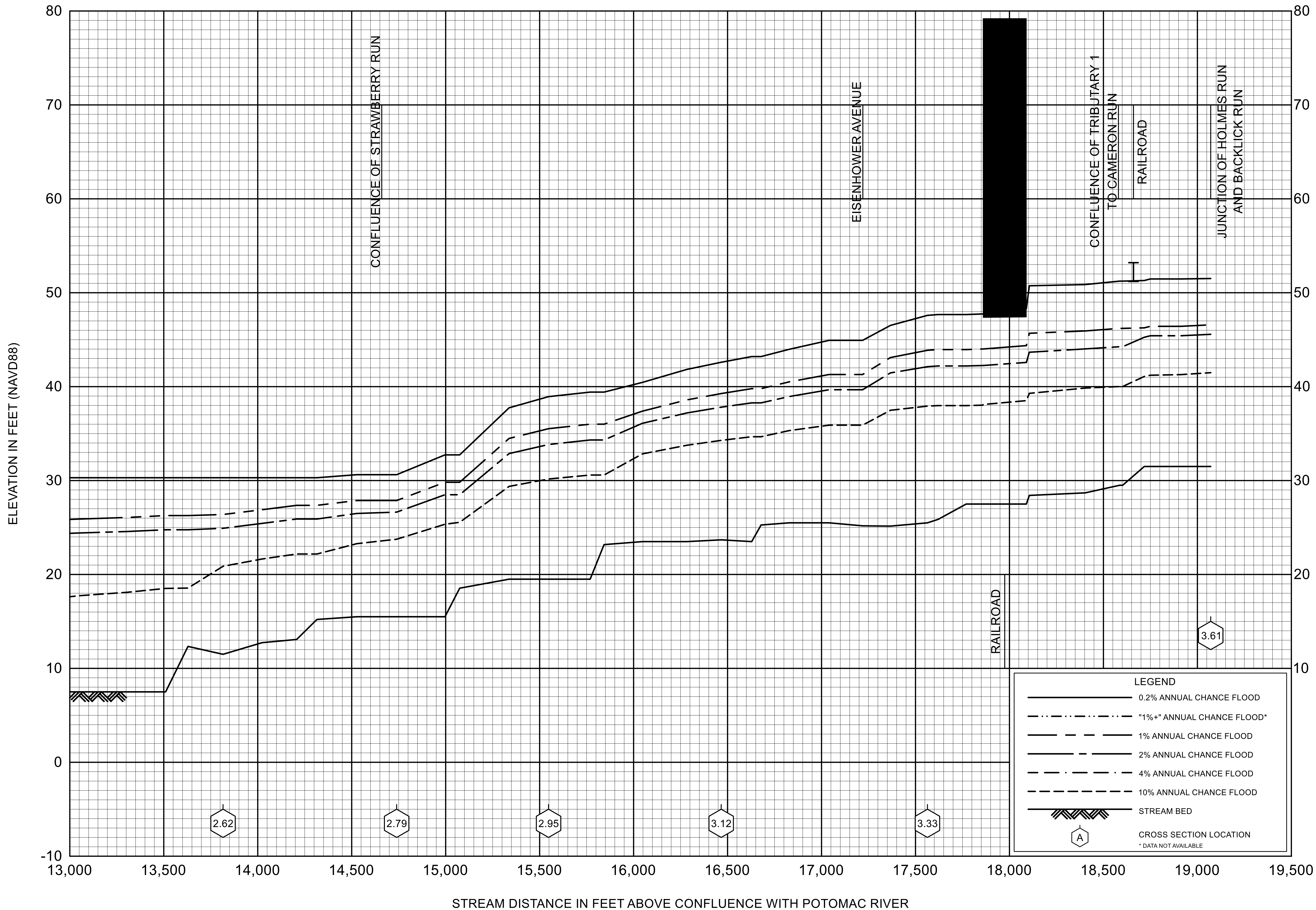
CAMERON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

04P



FLOOD PROFILES

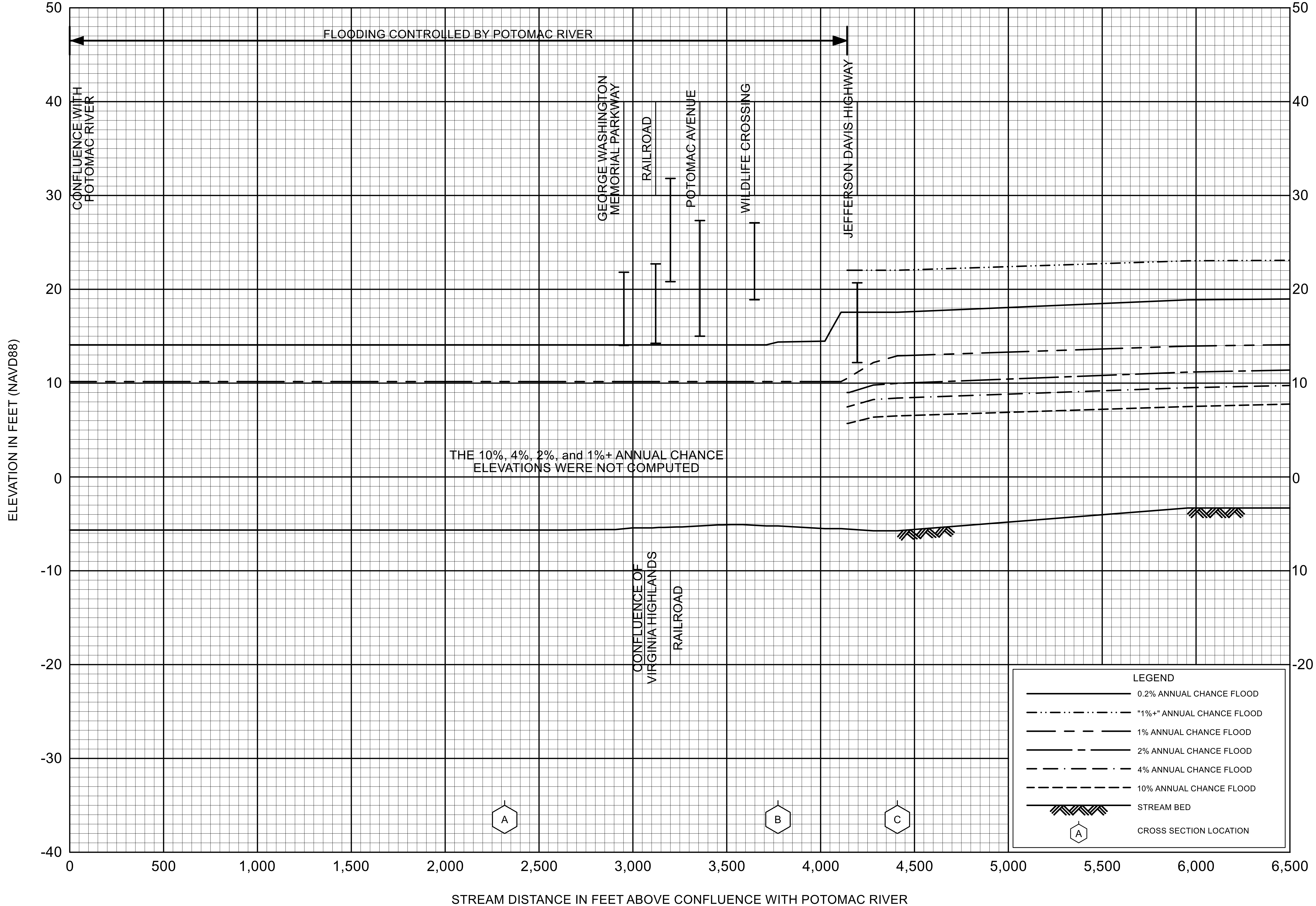
CAMERON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

05P



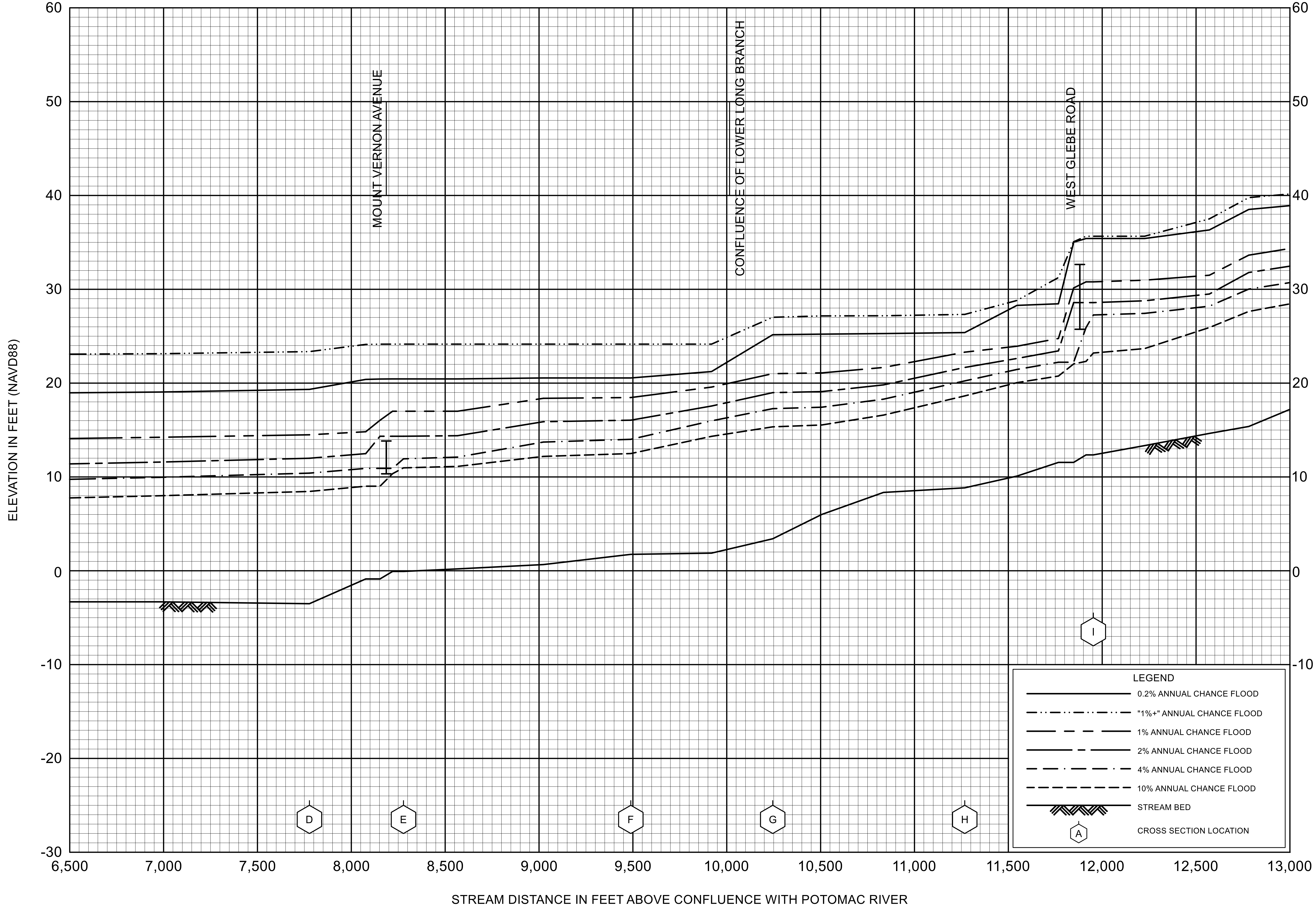
FLOOD PROFILES

FOUR MILE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



FLOOD PROFILES

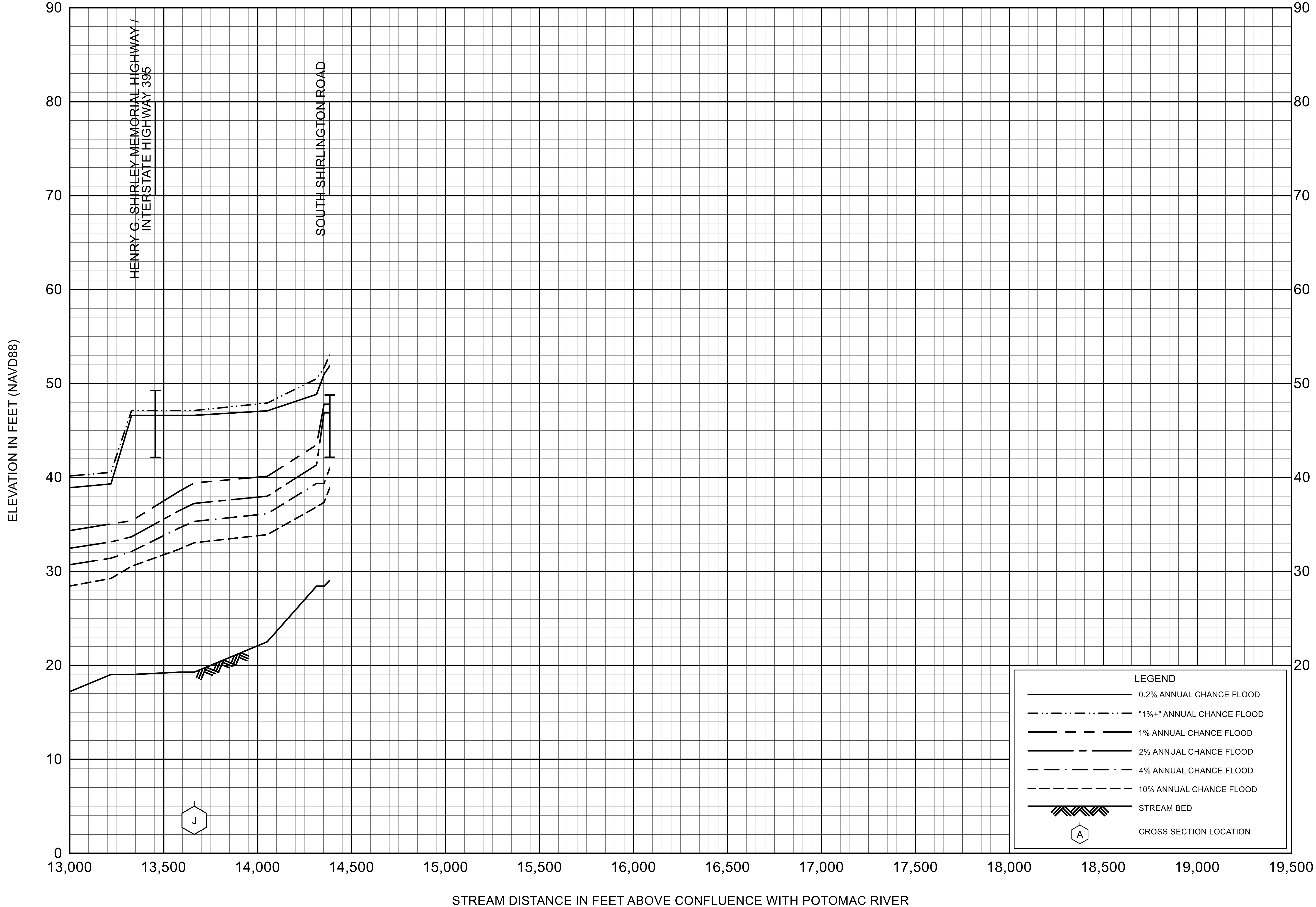
FOUR MILE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

07P



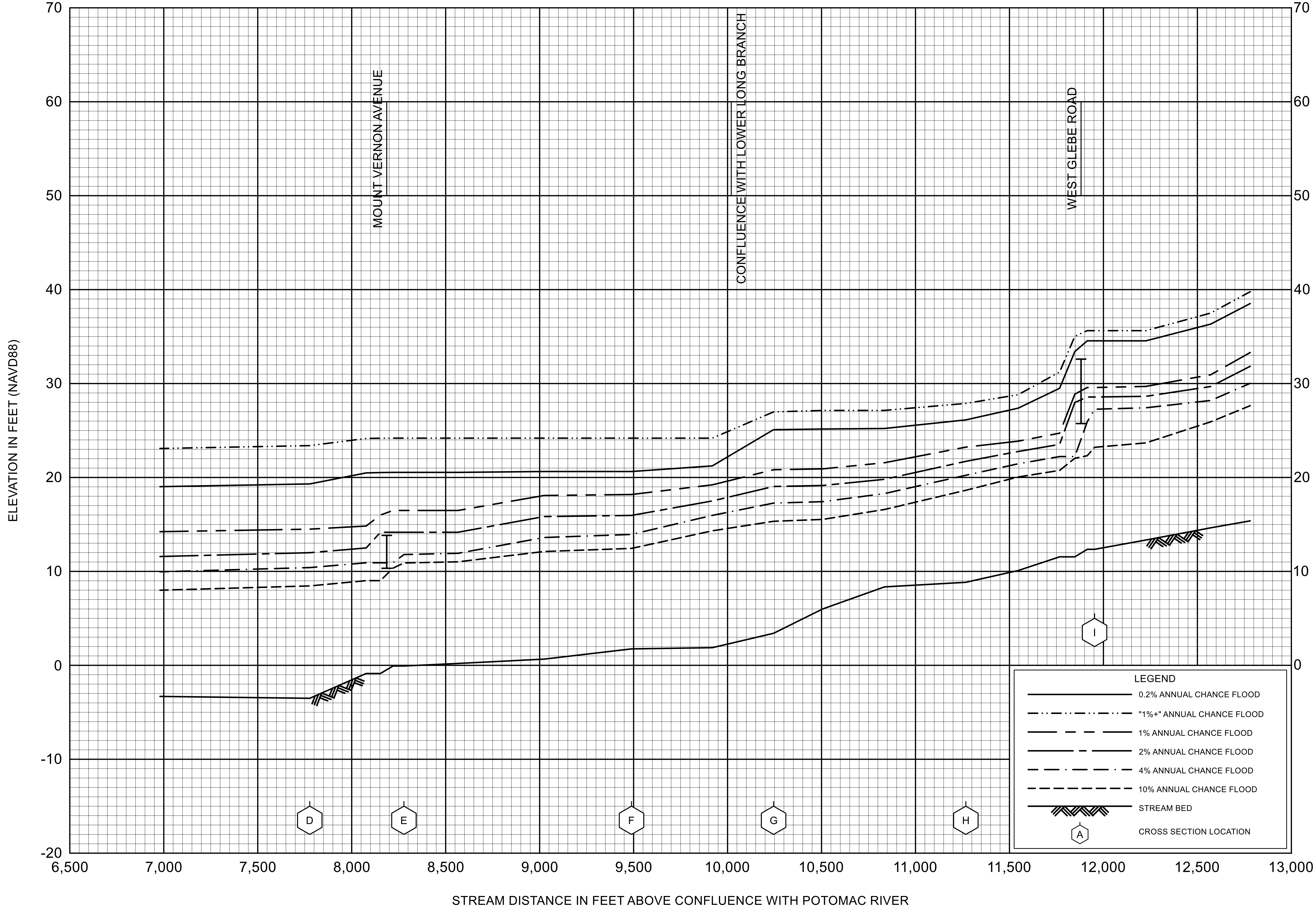
FLOOD PROFILES

FOUR MILE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



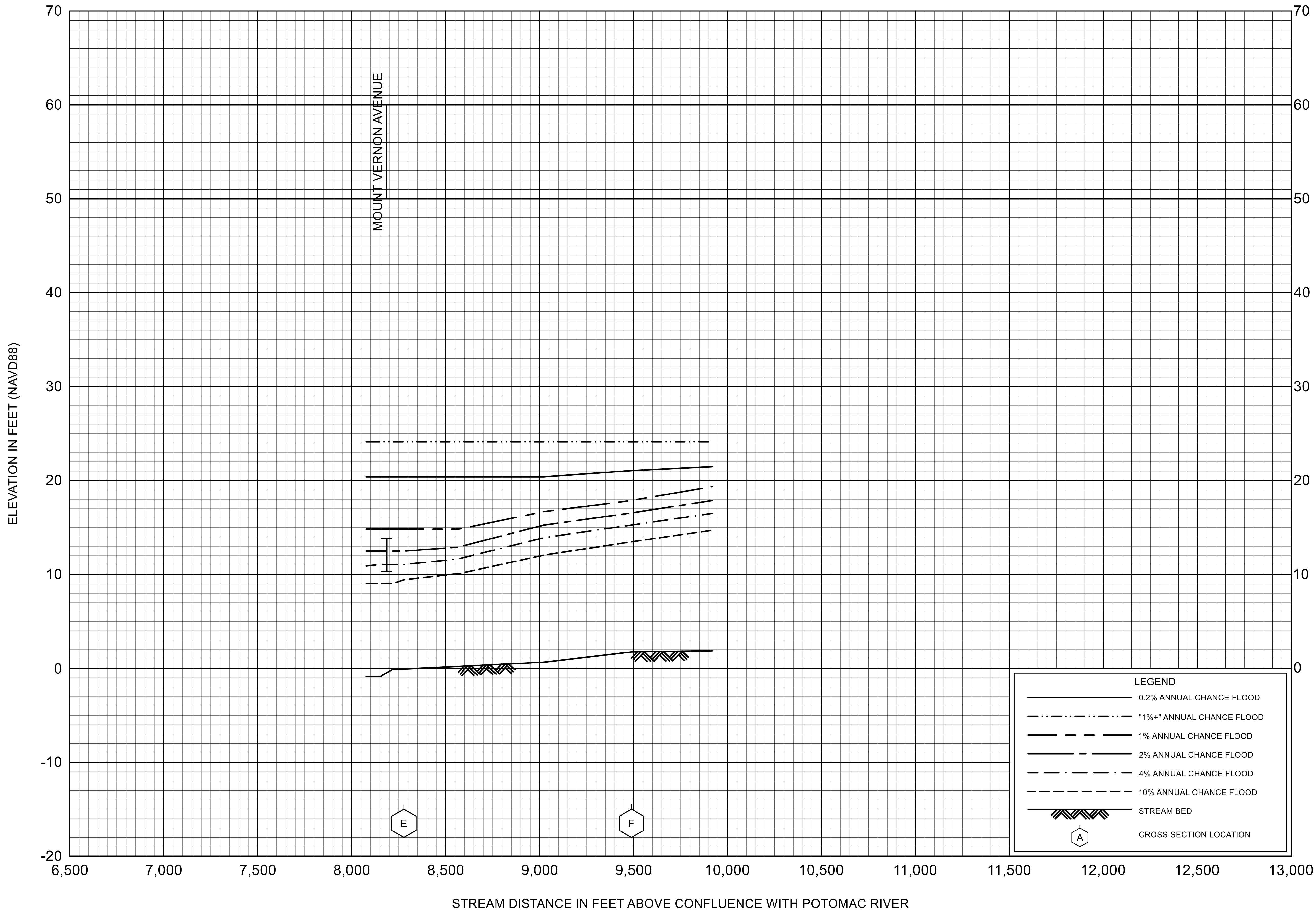
FLOOD PROFILES

FOUR MILE RUN (NATURAL VALLEY LEFT)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



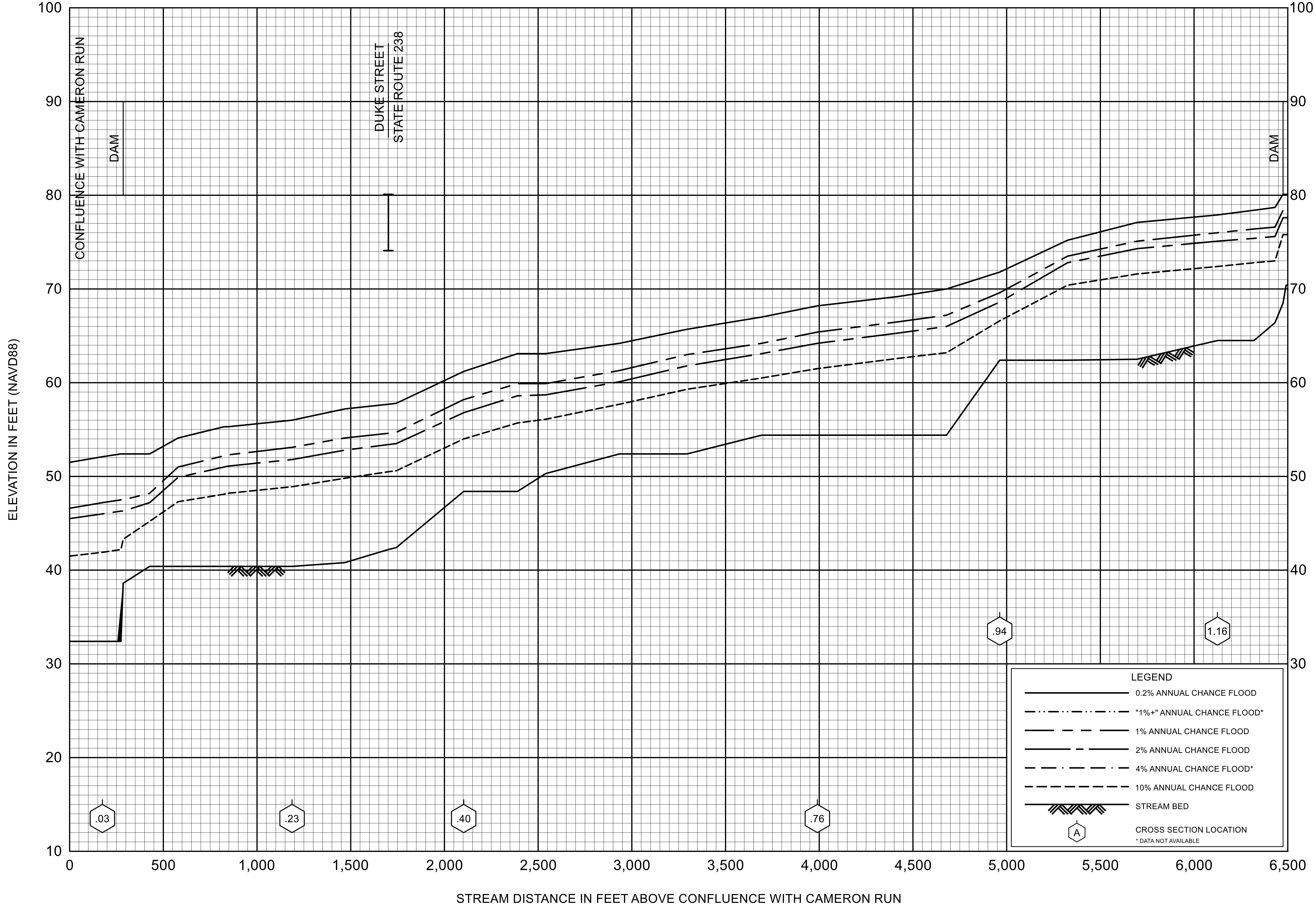
FLOOD PROFILES

FOUR MILE RUN (NATURAL VALLEY RIGHT)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



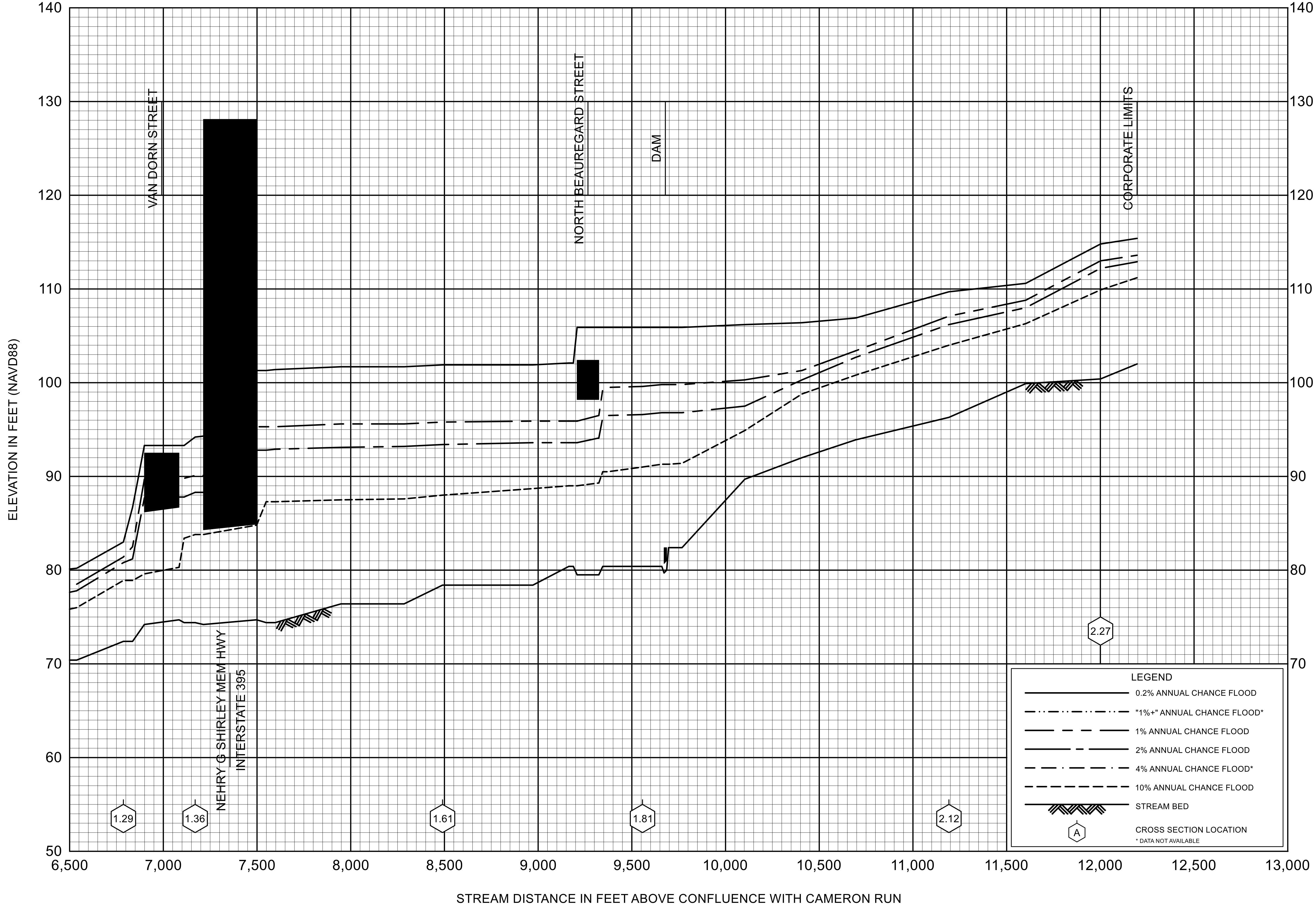
FLOOD PROFILES

HOLMES RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



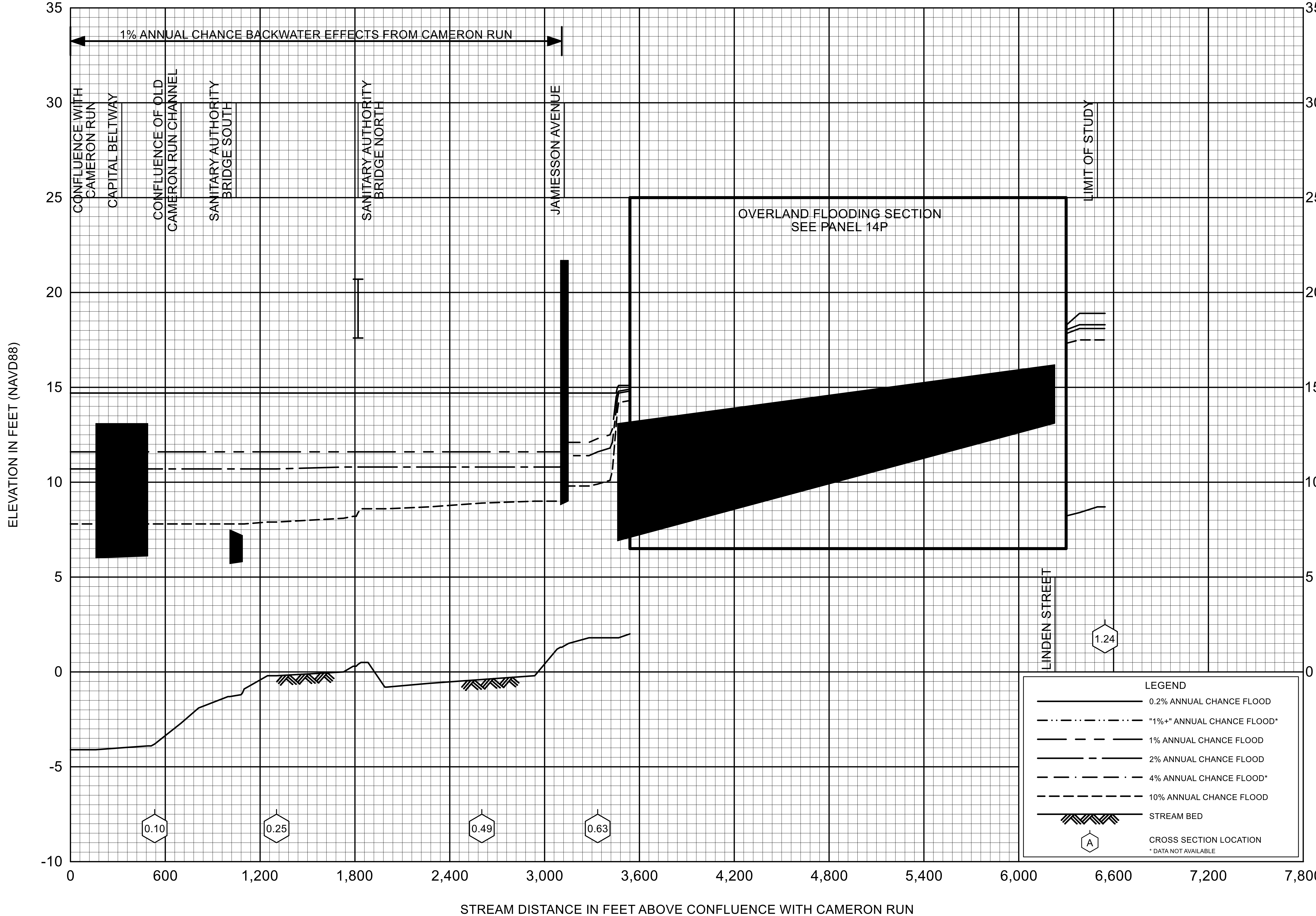
FLOOD PROFILES

HOLMES RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



FLOOD PROFILES

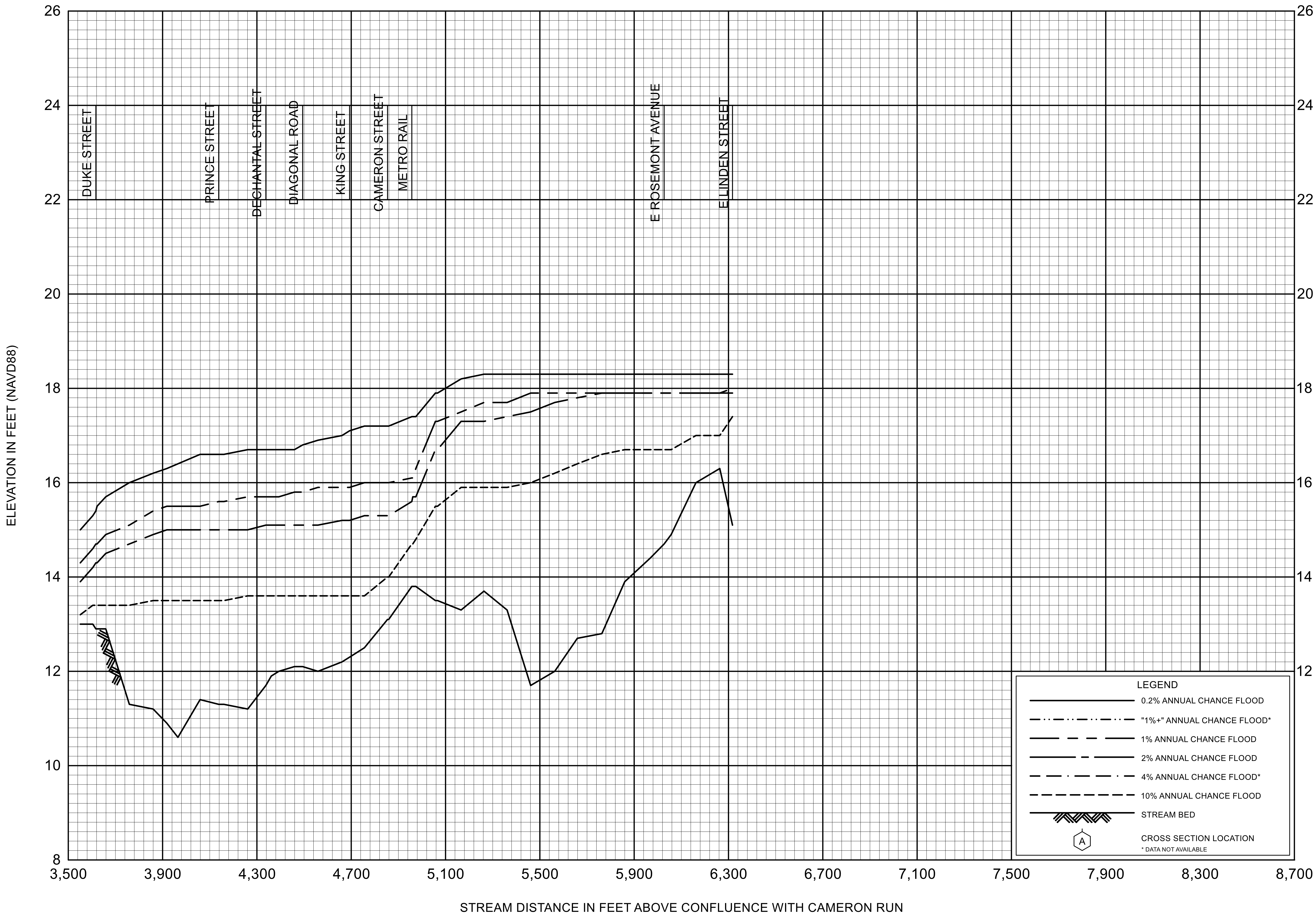
HOOFFS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

13P



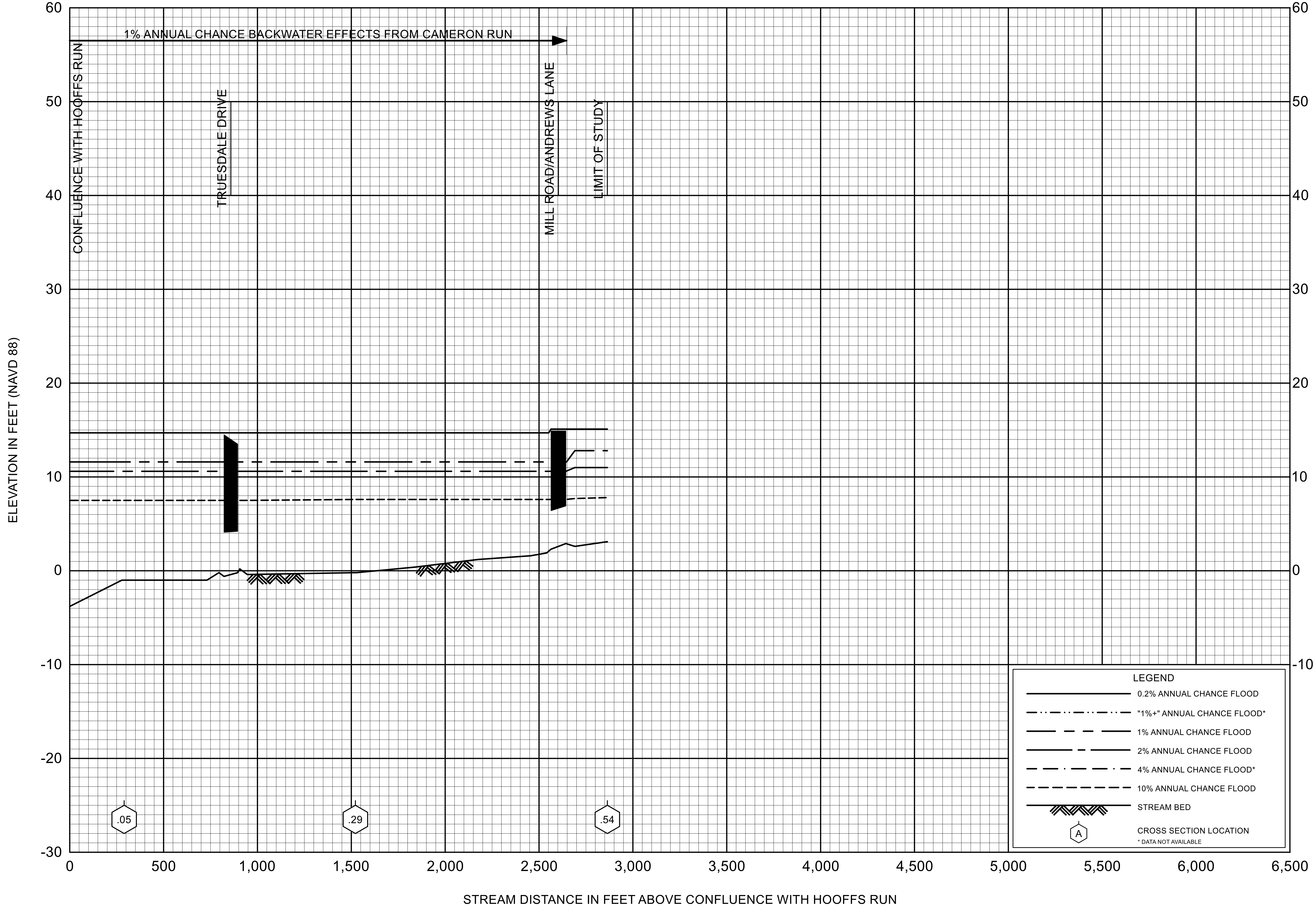
FLOOD PROFILES

HOOFFS RUN (OVERLAND FLOODING)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



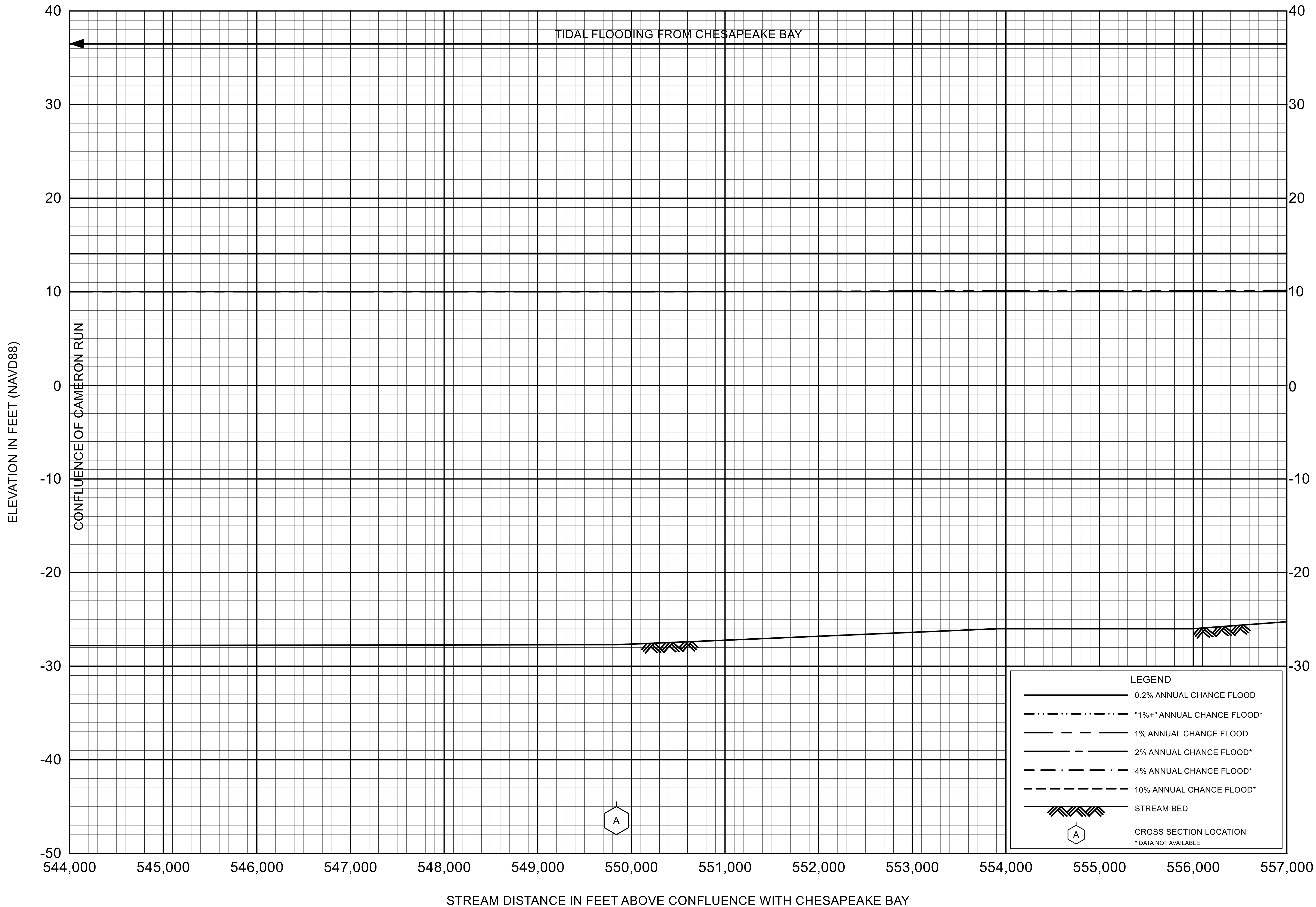
FLOOD PROFILES

OLD CAMERON RUN CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



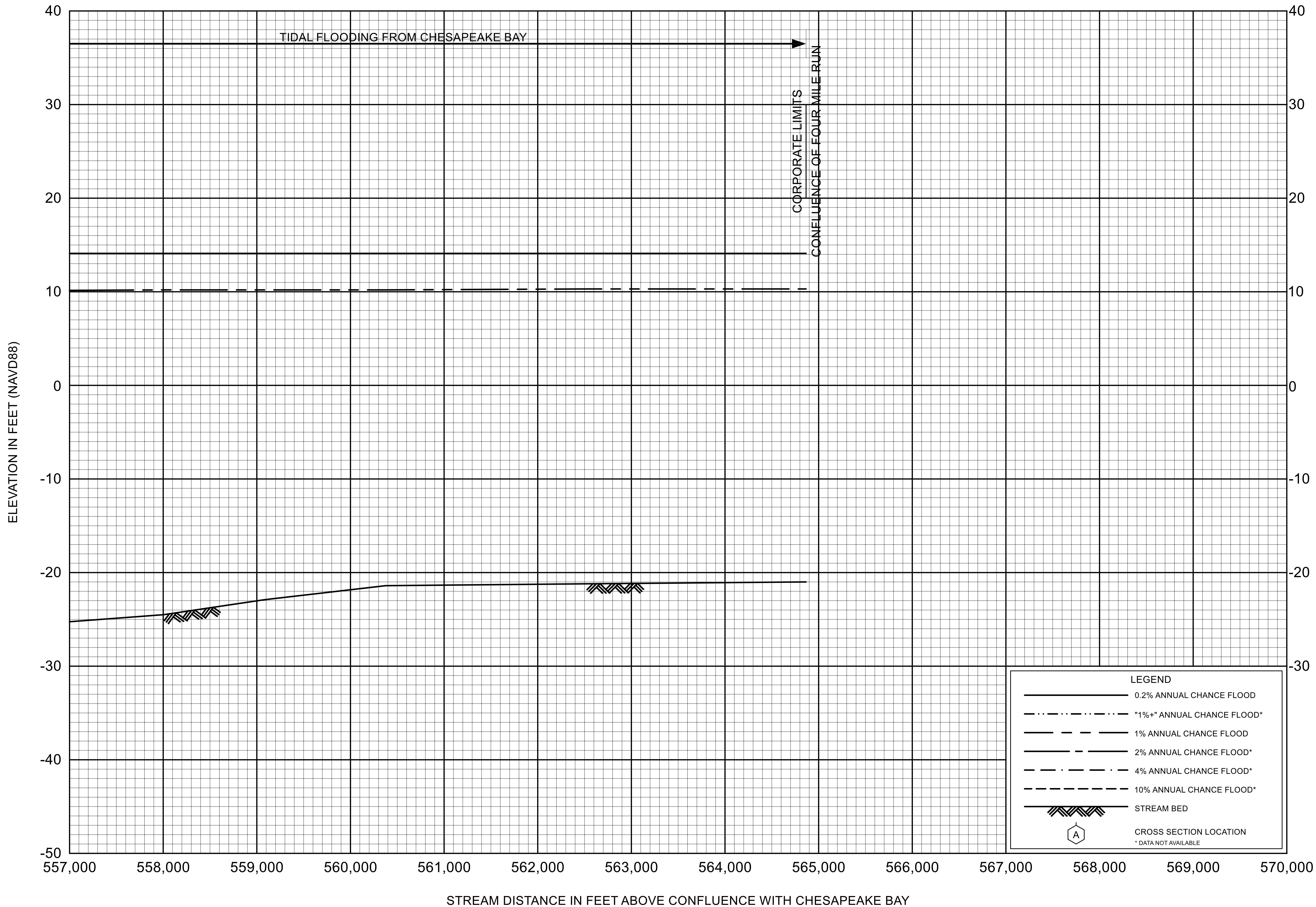
FLOOD PROFILES

POTOMAC RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



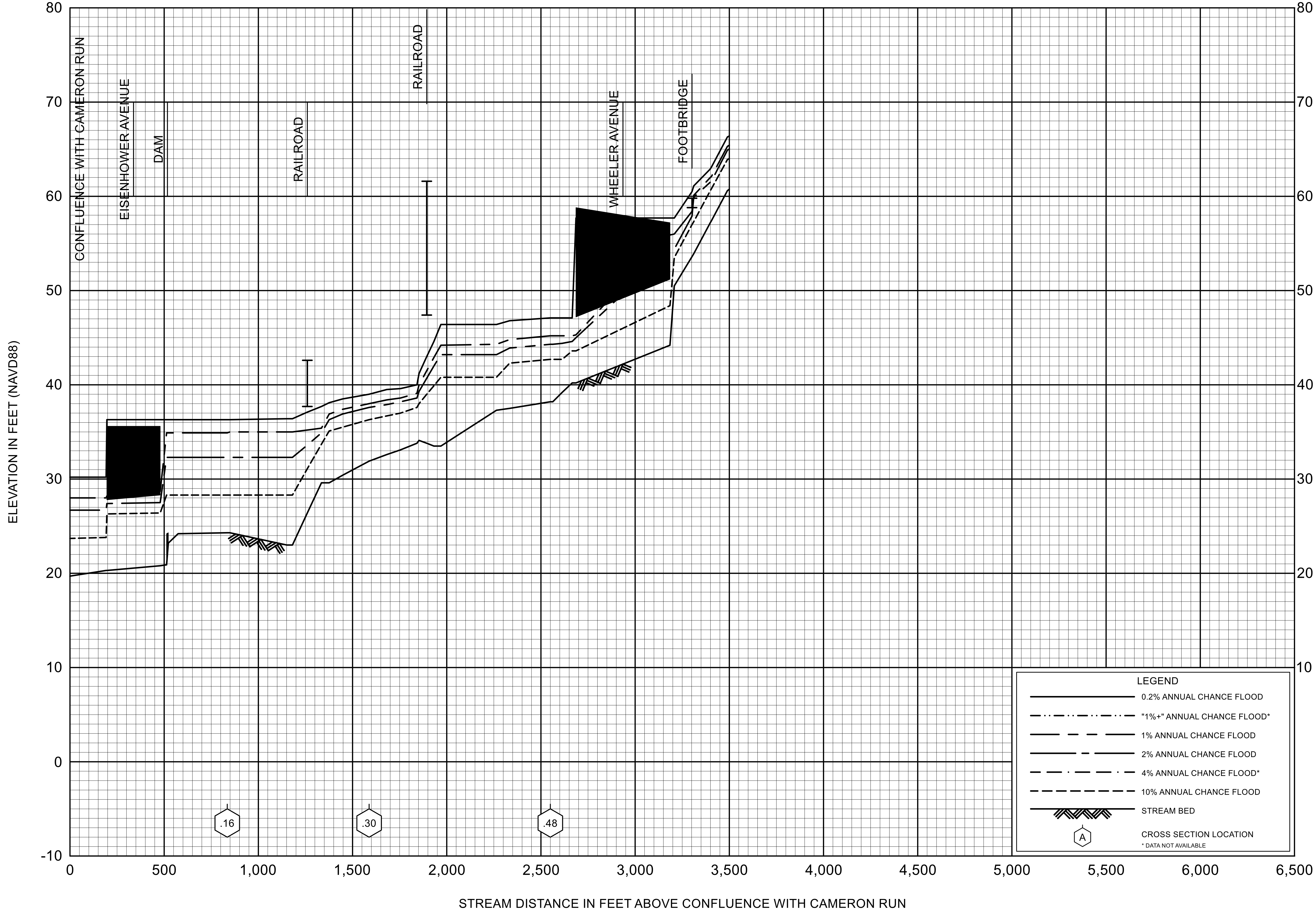
FLOOD PROFILES

POTOMAC RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



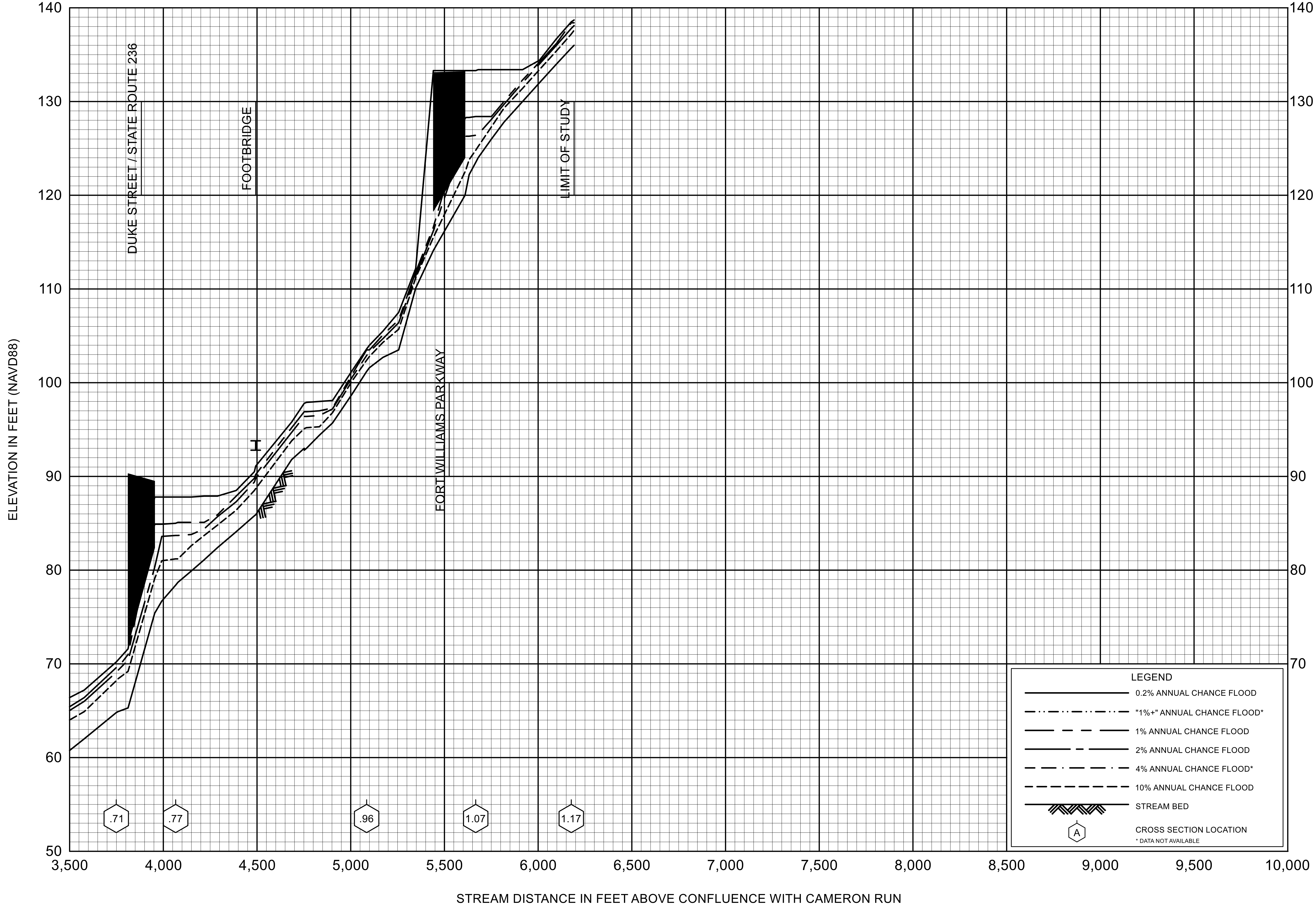
FLOOD PROFILES

STRAWBERRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



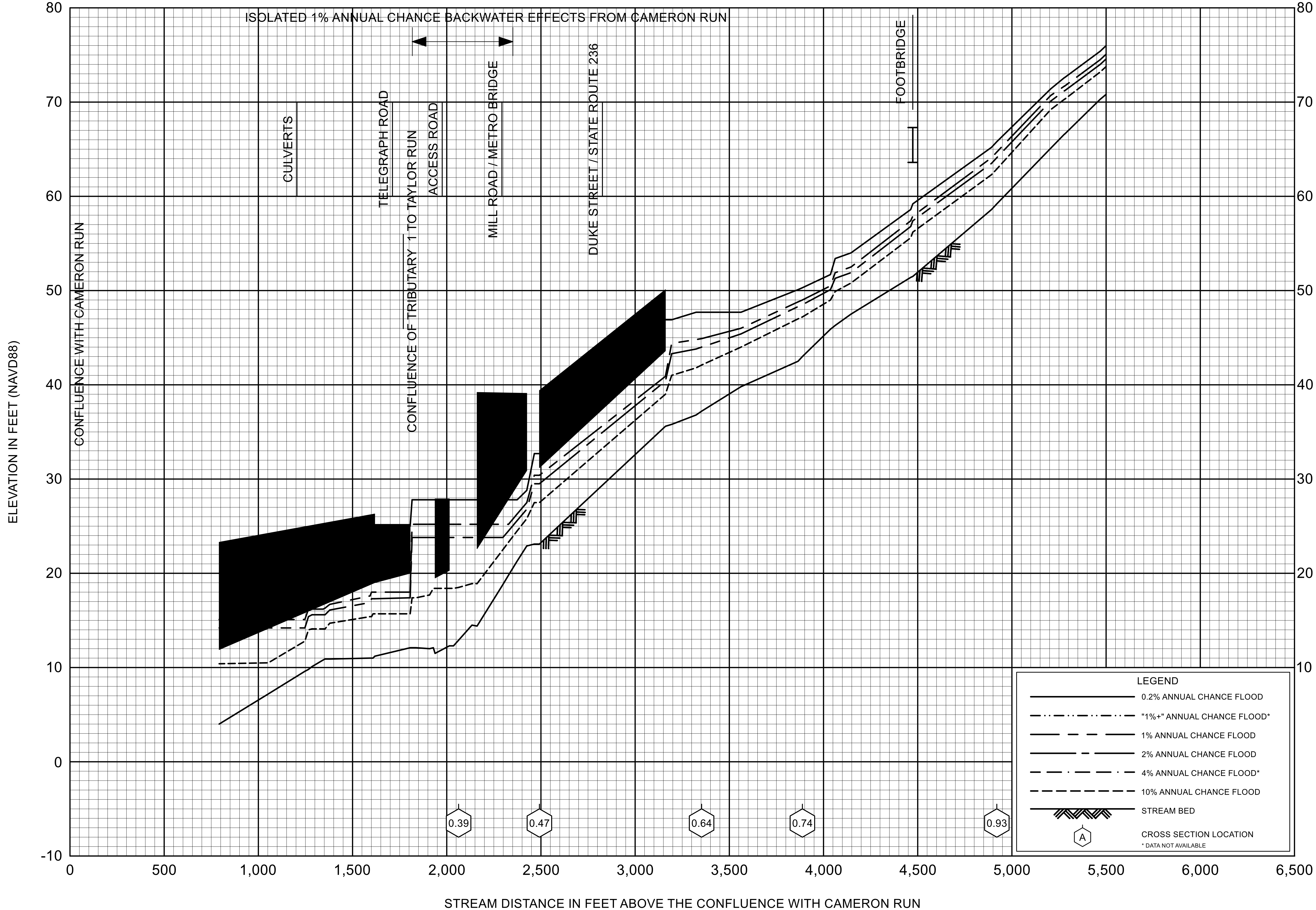
FLOOD PROFILES

STRAWBERRY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



FLOOD PROFILES

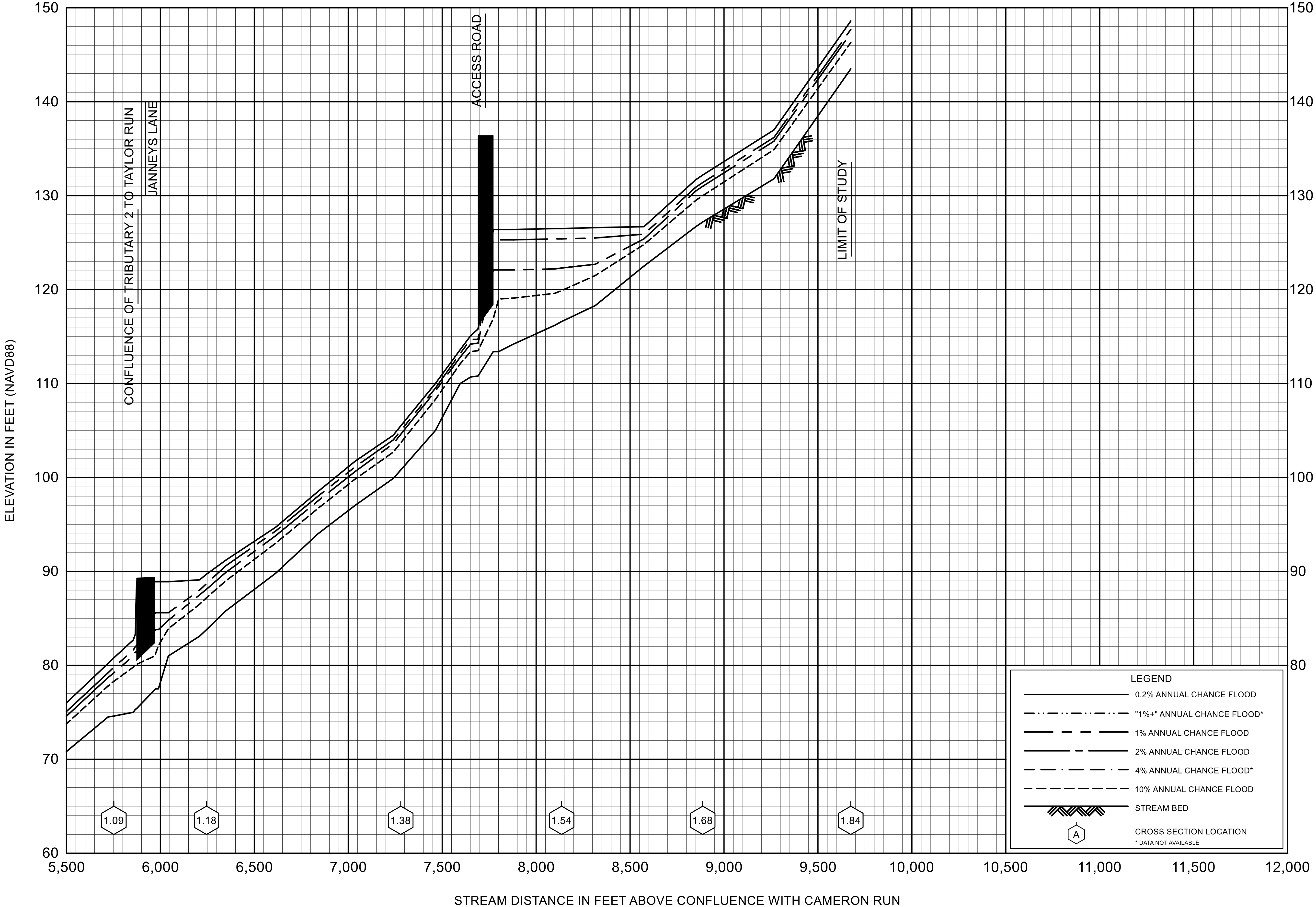
TAYLOR RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY

20P



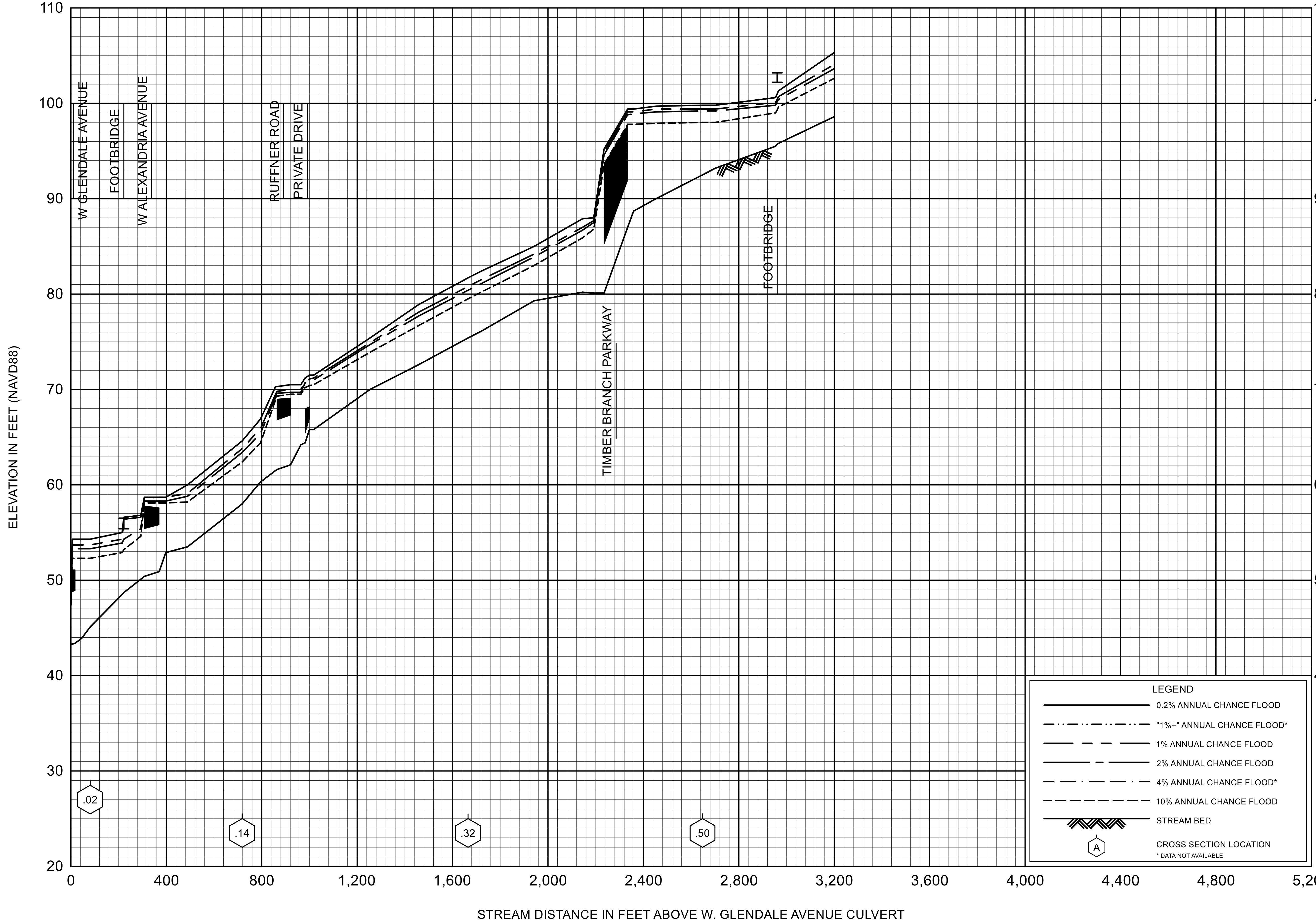
FLOOD PROFILES

TAYLOR RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



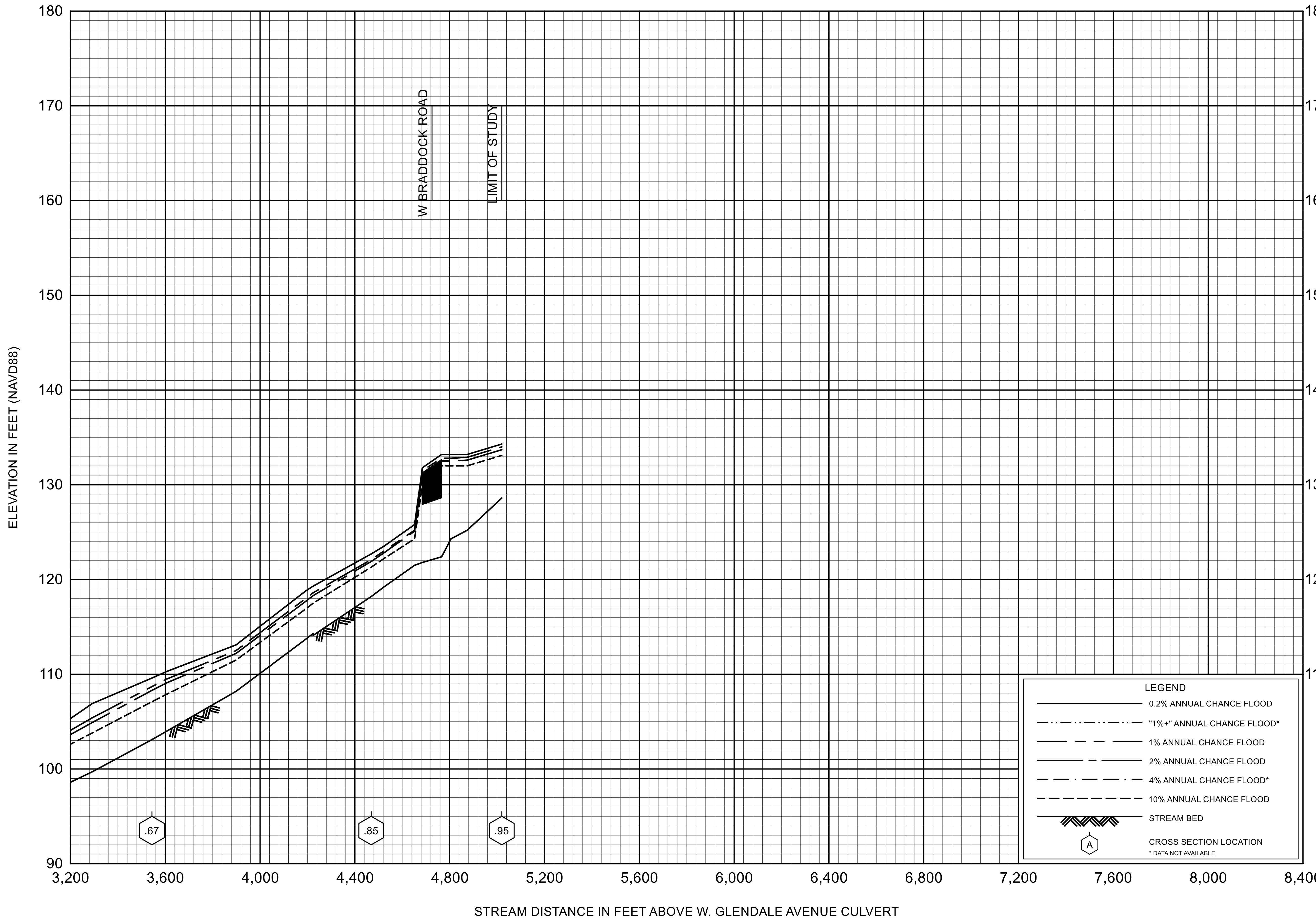
FLOOD PROFILES

TIMBER BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



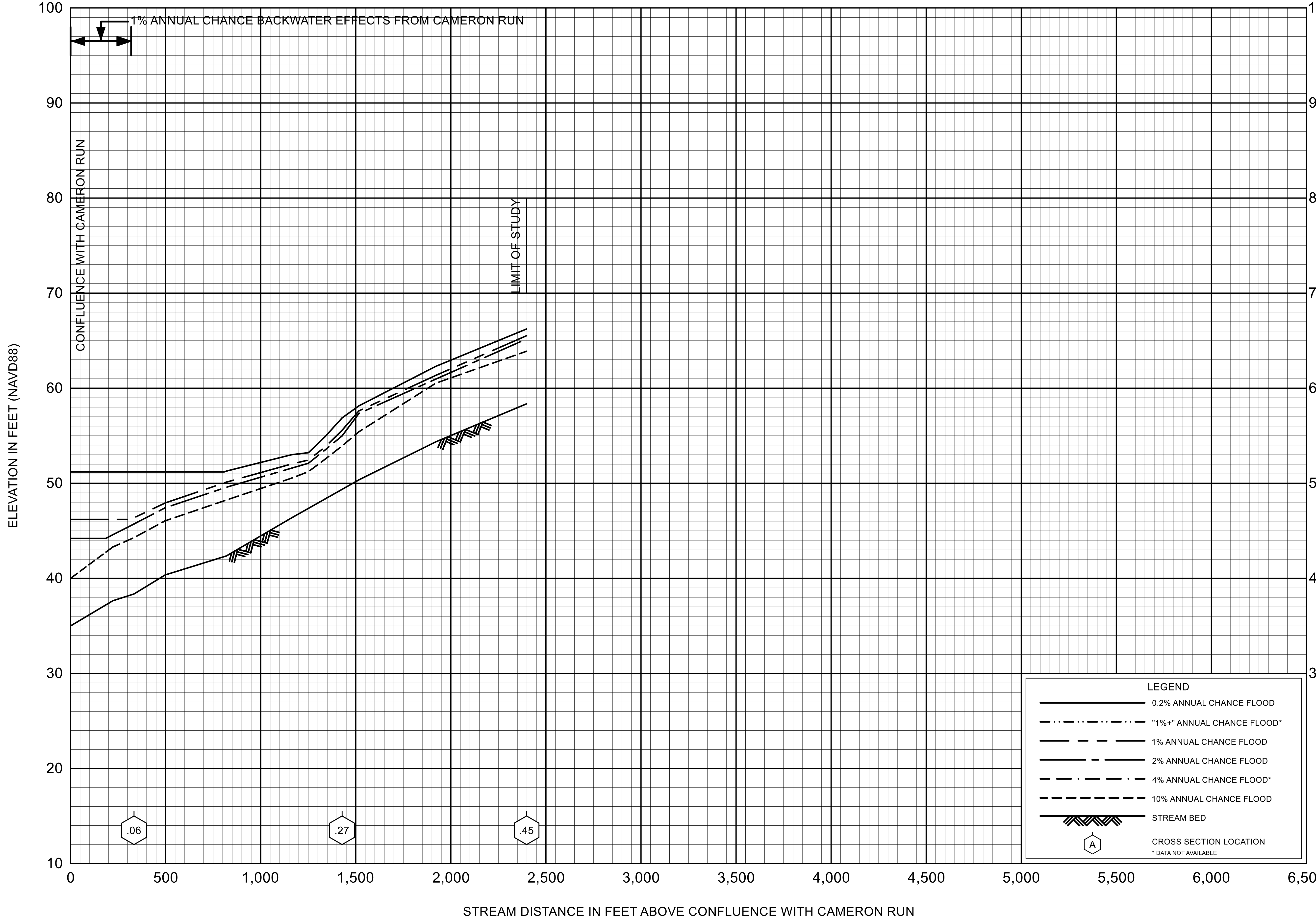
FLOOD PROFILES

TIMBER BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



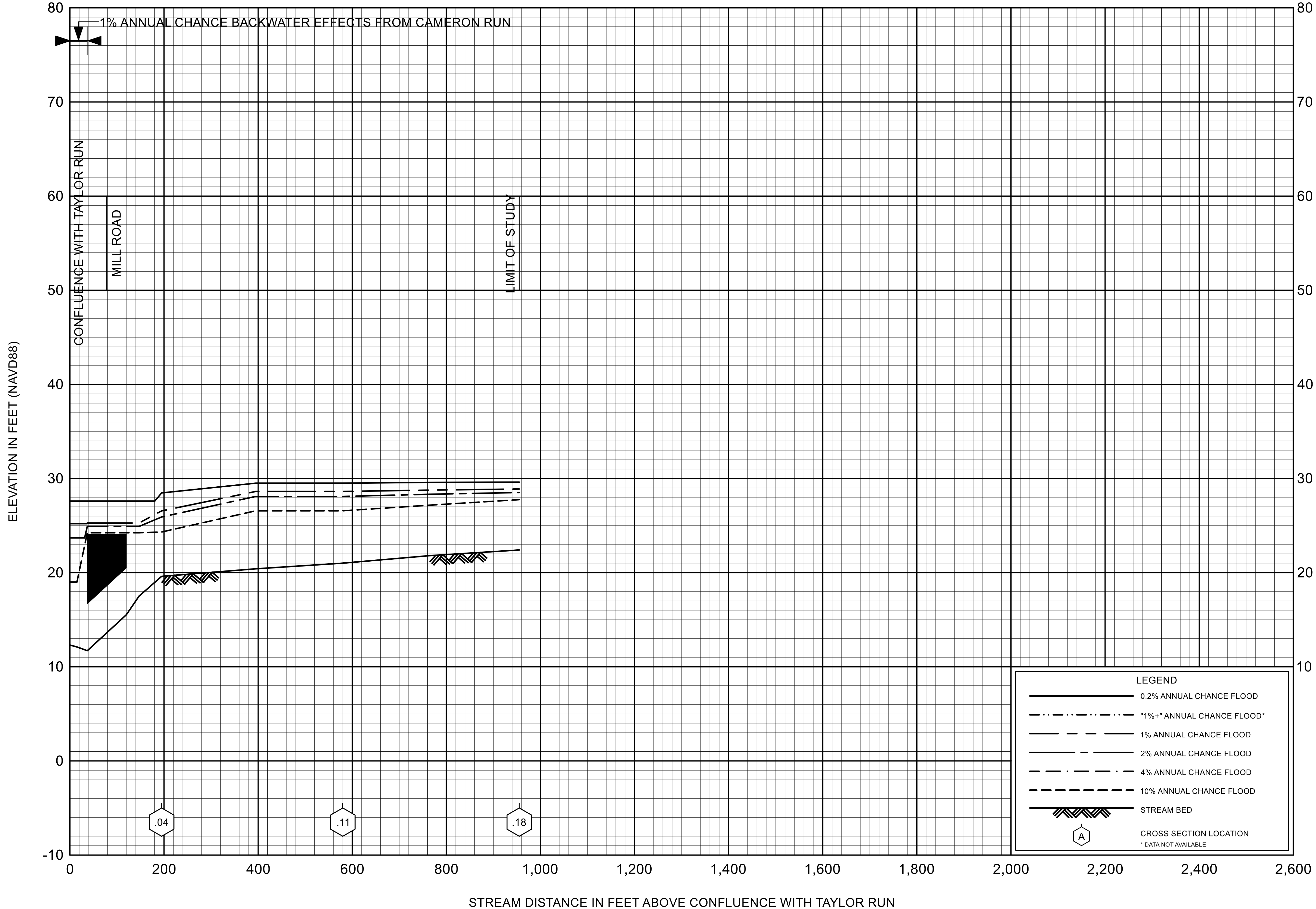
FLOOD PROFILES

TRIBUTARY 1 TO CAMERON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



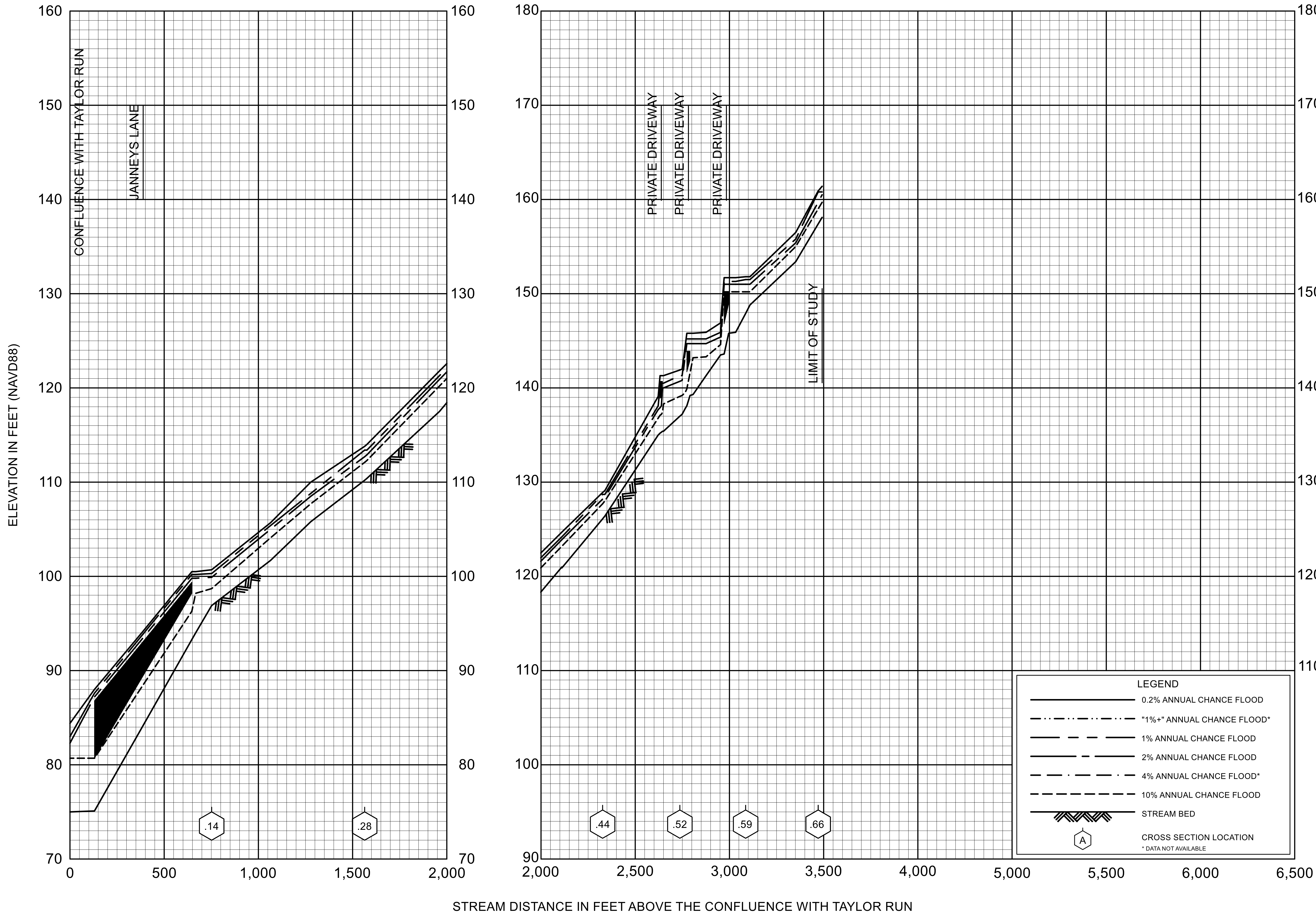
FLOOD PROFILES

TRIBUTARY 1 TO TAYLOR RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY



FLOOD PROFILES

TRIBUTARY 2 TO TAYLOR RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALEXANDRIA, VA

INDEPENDENT CITY