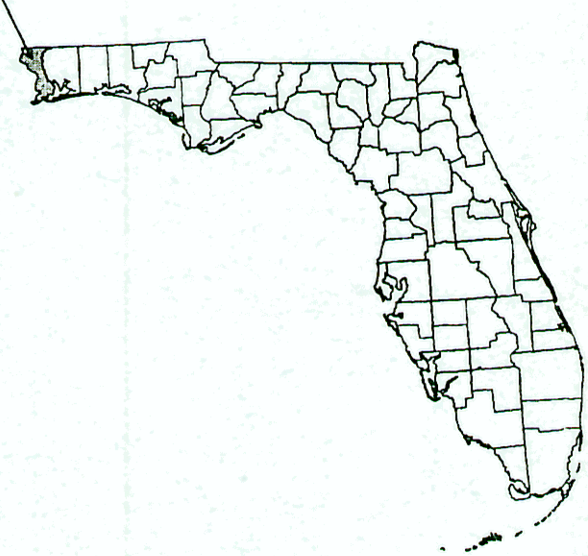
FLOOD INSURANCE STUDY

Escambia County



ESCAMBIA COUNTY, FLORIDA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CENTURY, TOWN OF	120084
ESCAMBIA COUNTY (UNINCORPORATED AREAS)	120080
PENSACOLA, CITY OF	120082
PENSACOLA BEACH - SANTA ROSA ISLAND AUTHORITY	125138

REVISED:
SEPTEMBER 29, 2006

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12033CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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

Initial Countywide FIS Effective Date:	January 21, 1998
Revised Countywide FIS Date:	February 23, 2000 July 17, 2002 (Flood Insurance Rate Map only) September 29, 2006

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FLOOD INSURANCE STUDY
ESCAMBIA COUNTY, FLORIDA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Escambia County, Florida, including: the Cities of Pensacola, Pensacola Beach-Santa Rosa Island Authority, the Town of Century and the unincorporated areas of Escambia County (hereinafter referred to collectively as Escambia County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Escambia County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Escambia County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

The City of Pensacola, Pensacola Beach - Santa Rosa Island Authority, and the unincorporated areas of Escambia County were combined into one FIS report dated August 19, 1987. For the August 19, 1987, FIS report, the hydrologic and hydraulic analyses were prepared by Stottler Stagg & Associates and GKY & Associates, Inc., for the Federal Emergency Management Agency (FEMA) under Contract No. EMW-C-0969. That work was completed in August 1984.

The authority and acknowledgments for the Town of Century are not available because no FIS report was ever published for this community.

For the January 21, 1998, FIS, hydrologic and hydraulic analyses for Bayou Grande, Bayou Marcus, Tributary to Bayou Marcus, Bridge Creek, Tributary to Bridge Creek, Eightmile Creek, Elevenmile Creek, the Escambia River, Garcon Swamp, Jones Creek, Pine Barren Creek, Weekley Bayou, and Tributary to Weekley Bayou were prepared by Taylor Engineering, Inc., for FEMA, under Contract No. EMW-92-C-3805. That work was completed in August 1993.

For the February 23, 2000, FIS, the hydrologic and hydraulic analyses for the coastal flood studies of the Florida Panhandle were performed by Woodward Clyde for FEMA under Contract No. EMW-95-C4678/TO043. The coastal 100-year Stillwater elevations and analyses were revised by Dewberry & Davis, under subcontract to Woodward-Clyde. This work was completed in April 1998.

For this countywide FIS, additional hydrologic and hydraulic analyses for Carpenter Creek, Elevenmile Creek, Bayou Grande, and Bridge Creek were prepared for FEMA by URS Corporation under contract with the Northwest Florida Water Management District (NWFWMD), a FEMA Cooperating Technical Partner (CTP).

The digital base map files were derived from U.S. Geological Survey (USGS) Digital Orthophoto Quadrangles, produced at a scale of 1:12,000 from photography dated 1996 or later.

The coordinate system used for the production of the digital FIRM is State Plane in the Florida North projection zone, referenced to the North American Datum of 1983.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for Escambia County and the incorporated communities within its boundaries are shown in Table 1, "Initial and Final CCO Meetings."

TABLE 1 - INITIAL AND FINAL CCO MEETINGS

Community Name	For FIS Dated	Initial CCO Date	Final CCO Date
Escambia County (Unincorporated Areas)	January 21, 1998 February 23, 2000	July 1, 1991 August 24, 1998*	June 27, 1996 February 11, 1999

* Notification letter from FEMA

For this countywide FIS, a final CCO meeting was held on November 10, 2005. This meeting was attended by representatives of the study contractors, the communities, the State of Florida, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Escambia County, Florida.

All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Bayou Grande	Tributary to Bridge Creek (West)
Bayou Marcus	Tributary 1 to Bayou Grande
Bridge Creek	Tributary 2 to Bayou Grande
Carpenter Creek	Tributary 3 to Bayou Grande
Eightmile Creek	Tributary 4 to Bayou Grande
Elevenmile Creek	Tributary to Bayou Marcus
Escambia River	Tributary to Bridge Creek
Garcon Swamp	Tributary to Carpenter Creek
Jones Creek	Tributary to Elevenmile Creek
Pine Barren Creek	Tributary to Weekley Bayou
Thompson Bayou	Weekley Bayou
Tributary to Bridge Creek (East)	

For the February 23, 2000, FIS, the complete coastline of Escambia County, where the major flooding sources are the Gulf of Mexico, Pensacola Bay, Santa Rosa Sound, Escambia Bay, Perdido Bay, and Big Lagoon, was restudied by detailed methods. The City of Pensacola, the unincorporated areas of Escambia County, and Pensacola Beach-Santa Rosa Island Authority are affected by the revised coastal analysis.

As part of this countywide FIS, updated analyses were included for the flooding sources shown in Table 3, "Scope of Revision."

TABLE 3 - SCOPE OF REVISION

Stream	Limits of New or Revised Detailed Study
Tributary to Elevenmile Creek	From the confluence with Elevenmile Creek (located south of SR-10) upstream to a location just north of SR-10A (US-90).
Carpenter Creek and Tributary to Carpenter Creek	Carpenter Creek from approximately SR-289 to SR-290 and Tributary to Carpenter Creek located south of I-10.
Bayou Grande Tributaries	Tributary 1 to Bayou Grande is a small tributary that originates north of South Loop Road and flows north under Blue Angel Parkway to the confluence with Bayou Grande. Tributary 2 to Bayou Grande is a tributary that originates approximately 1,500 feet east of Blue Angel Parkway. This tributary flows generally to the southeast and crosses Sorrento Road just prior to its confluence with Bayou Grande. Tributary 3 to Bayou Grande is a tributary that originates southwest of Dog Track Road. This tributary flows generally to the south, first crossing Blue Angle Parkway and then crossing Sorrento Road just prior to its confluence with Bayou Grande. Tributary 4 to Bayou Grande is a tributary that originates south of Gulf Beach Highway. This tributary flows generally to the west and crosses Atlanta Avenue just prior to its confluence with Bayou Grande.
Bridge Creek Tributaries	Tributary to Bridge Creek (West) is a tributary to Bridge Creek that originates west of Bridge Creek. This tributary flows east and crosses Creek Ridge Drive just prior to its confluence with Bridge Creek. Tributary to Bridge Creek (East) is located on the east side of Bridge Creek and originates near Dog Track Road. This tributary flows generally to the west to the confluence with Bridge Creek.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the county.

2.2 Community Description

Escambia County forms the westernmost portion of the Florida Panhandle, sharing its western and northern border with the State of Alabama. Escambia County is bordered by Santa Rosa County, Florida, to the east; Escambia County, Alabama, and the Town of Flomation, Alabama, to the north; Baldwin County, Alabama, to the west; and the Gulf of Mexico to the south. The Escambia River serves as the county's eastern border with Santa Rosa County, Florida. The Perdido River serves as the western border separating Escambia County and Baldwin County, Alabama. The land area of Escambia County comprises approximately 660 square miles with 40 miles of shoreline on the Gulf of Mexico, as well as approximately 40 miles on Pensacola, Perdido, and Escambia Bays. The population of Escambia County was 294,410 in 2000, which reflects a 12 percent increase over the past decade. The City of Pensacola, the county's largest city, is located in the southeastern portion of the county. The population of Pensacola was 56,255 in 2000, which reflects a 3 percent increase over the past decade (Reference 1).

While the county's incorporated areas, particularly within the City of Pensacola, support the highest concentration of residential and commercial land use, the unincorporated areas, especially in the southwest, are experiencing development pressure as indicated by the disparity in population growth between Pensacola and the entire county.

The terrain of Escambia County varies considerably. Level to moderately sloping terrain characterizes the southwest portion of the county (west of Pensacola). Much of this terrain is covered with somewhat impermeable, poorly drained soil formations with a seasonally high water table within 1 to 2 feet of the surface. The soils associated with this flat terrain are mostly Plummer-Rutledge, Klej-Leon, and Lakeland-Eustis. Elevations in this area reach only about 35 feet. Most drainage systems in the southwest portion of the county are somewhat poorly defined. They are characterized by flat, low lying areas and heavily vegetated freshwater swamps. These systems often have poorly defined channels. The two largest of these swamps are Garcon and Jones Swamps. Other drainage systems in southwest Escambia County are Weekley Bayou, Bridge Creek, Bayou Grande, and the lower reaches of Bayou Marcus, Elevenmile Creek, and Eightmile Creek. These systems drain west into Perdido Bay and east into Pensacola Bay (References 2, 3, and 4).

In the central and northern portions of the county, rolling forested hills and moderately steep slopes characterize the terrain. Elevations in these areas reach nearly 300 feet (Reference 5). Soils associated with these portions of the county are mostly well drained sands and sandy loams (Lakeland-Eustis and Tifton-Carnegie-Faceville) and poorly drained, mixed alluvial sand (Reference 3). Pine Barren Creek, the Escambia River, and the upper reaches of Elevenmile Creek, Eightmile Creek, and Bayou Marcus lie in the central and northern portions of the county.

Major drainage systems located in the south central portion of the county include the upper reaches of Bayou Marcus, Elevenmile Creek, and Eightmile Creek (a tributary to Elevenmile Creek). Bayou Marcus and Elevenmile Creek empty into Perdido Bay.

The main drainage systems of the county, the Perdido and Escambia Rivers, have large drainage basins extending well into Alabama, and are characterized by low swampy areas that are most extensive at the stream mouths. Floodplains across these rivers reach as far as 4 miles. They are fed by several smaller tributaries, which drain the interior of the central and northern portions of the county.

The climate of Escambia County is subtropical, with a moderating influence from the Gulf of Mexico. The normal average daily temperature varies from 55 degrees Fahrenheit (°F) in January to 82°F in August. The average annual precipitation is over 61 inches, as measured from 1951 to 1980 (Reference 6). The seasonal distribution of rainfall, averaging 21 inches during peak summer periods (July-September), is fairly uniform.

2.3 Principal Flood Problems

Flooding in Escambia County results primarily from tidal surge and overflow of streams and swamps associated with rainfall runoff. Major rainfall events occur as a result of hurricanes, tropical storms, and thundershowers associated with frontal systems. Some of the worst floods to occur in northwestern Florida were the result of high intensity rainfall during hurricanes.

The time of concentration of runoff for large basin rivers in northwestern Florida may be several days; consequently, peak flows do not, as a rule, coincide with hurricane tides at the coast. The smaller streams, however, have a shorter time of concentration, and the floodflow occurring concurrently with the storm surge is more likely. This greatly increases the likelihood of inundation of low-lying areas along the coast. The maximum rainfall ordinarily occurs in the eastern half of the storm system. As the storm passes inland, its intensity decreases, but heavy rainfall continues. Total precipitation of 12 inches recorded at a single station during a hurricane is not uncommon, and in northwestern Florida, rainfall has been as high as 24 inches for the duration of the storm (Reference 7).

The Escambia River is the largest river in the county and accounts for much of the flooding in the area. The river is characterized by wide, flat floodplains varying from several thousand feet to several miles wide. The flat slopes and wide, heavily vegetated floodplains enhance the flood problem by preventing the rapid drainage of floodwaters. At flood stage, the river's waters cover large areas, flooding farmland, fishing resorts, and other businesses built on the floodplain.

Major flooding events to date along the Escambia River include the 1929, 1975, and 1990 storms. The 1929 storm was the largest storm ever recorded. At the gaging station near the Town of Century, the Escambia River reached an elevation of 66.1 feet National Geodetic Vertical Datum of 1929 (NGVD). No other gage records exist for this storm. The 1990 storm was the second largest storm recorded for the Escambia River, reaching an elevation of 52.7 feet NGVD near Century and 15.7 feet NGVD near Molino. The recurrence interval of the 1990 storm is once every 25 years, and the recurrence interval of the 1929 storm is more than once in 500 years.

On Pine Barren Creek, the largest storm occurred in 1955, two years after the gage was installed at Wiggins Bridge near Barth. This storm produced a flow rate of 24,800 cubic feet per second (cfs) and a stage of 47.9 feet NGVD, determined from a high water mark. At the Pine Barren Creek gage, the return period of this magnitude is once every 36 years.

In the southwest portion of the county, most of the floodprone areas feature relatively impermeable soil, a high water table, and flat terrain. These characteristics contribute significantly to flooding problems. Flooding is further aggravated by dense vegetation in natural and excavated stream channels and on overbanks within the floodplains. In addition, the storage capacity of several depressions and man-made and natural lakes is insufficient to significantly reduce the impacts of a major flood (Reference 2).

For the February 23, 2000 FIS, in order to evaluate coastal flood frequencies and revised 100-year stillwater elevations, historical tide gauge water level records for the Florida Panhandle region were used. These water level records are shown in Table 4, "Historical Tide Gage Data."

TABLE 4 - HISTORICAL TIDE GAGE DATA

Agency and Gage I.D.	Site Name	Latitude	Longitude	Range (Feet)	Period of Record
NOS 8728690	Apalachicola	29° 43.6' N	84° 58.9' W	1.11	1967-95
USACE 02359665	Panama City	30° 09' 22" N	85° 38' 12" W	1.33	1935-95
NOS 8729108	Panama City	30° 09.1' N	85° 40.0' W	1.24	1975-95
NOS 8729210	Panama City Beach	~30.2° N	~85.8° W	1.25	1989-94
USACE 02366990	Destin/East Pass	30° 23'20" N	86° 30' 04" W	0.58	1957-94
NOS 8729681	Navarre Beach	30 22.6' N	86° 51.9' W	0.74	1978-89
NOS 8729840	Pensacola	30° 24.2' N	87° 12.8' W	1.19	1923-95
USACE 02376083	Gulf Beach	30° 18' 50" N	87° 25' 40" W	0.83	1940-95

The USGS and NWFWMD have installed stream flow gages at several locations throughout the unincorporated areas of the county. Locations and periods of record for these gages are listed below.

Escambia River near Molino, State Route 184 (32 years, record incomplete)
Escambia River near Century, State Route 4 (57 years)
Pine Barren Creek near Barth, Wiggins Bridge (39 years)
Bayou Marcus near Pensacola (four years)
Elevenmile Creek near Pensacola (four years)
Eightmile Creek near West Pensacola (three years)
Jones Creek at Navy Boulevard (two years)

In spite of the number of gages, very few high water elevations of major floods exist for most of the county (Reference 2). Only the Pine Barren Creek and Escambia River gages have sufficient periods of record to include major historic flooding events. Storm events, including date, peak water-surface elevation, and peak discharge, recorded at the above stream gages are shown in Table 5, "Major Flood Events Recorded at Stream Gages in Escambia County."

TABLE 5 - MAJOR FLOOD EVENTS RECORDED AT STREAM GAGES IN ESCAMBIA COUNTY

Date	Gage Location	Feet (NGVD)	Discharge (cfs)
March 23, 1990	Escambia River near Molino	15.7	113,000
March 18, 1990	Escambia River near Century	52.7	103,000
April 12, 1975	Escambia River near Century	51.7	92,300
March 1929	Escambia River near Century	66.1	315,000
April 14, 1955	Pine Barren Creek near Barth, Wiggins Bridge	47.9	24,800
March 16, 1990	Bayou Marcus near Pensacola	16.7	701
June 8, 1989	Elevenmile Creek near Pensacola	24.6	6,310
June 8, 1989	Eightmile Creek near West Pensacola	28.2	1,850
November 8, 1989	Jones Creek at Navy Boulevard	4.1	409

The gages on Bayou Marcus, Elevenmile Creek, Eightmile Creek, and Jones Creek have limited periods of record (two to four years). The storms listed in Table 5 for these gages are the highest recorded storms during their short period of record. All of these storms are well below 10-year events. Of the gages listed, only the Jones Creek gage was installed by the NWFWMD.

The coastal areas of Escambia County are subject to flooding from tidal surges associated with hurricanes. The terrain inland from Pensacola, Escambia, and Perdido Bays generally rises at a moderate rate and flooding from surges extends only a short distance inland. The elevation of Santa Rosa Island, a barrier island, will permit overtopping from some storms and, thus, does not provide complete protection to inland areas behind the island.

Communities along the coastline in Escambia County are subject to widespread flooding resulting from storm surges that accompany hurricanes and other severe storms from one or more of the following flooding sources: the Gulf of Mexico, Pensacola Bay, Santa Rosa Sound, Escambia Bay, Perdido Bay, and Big Lagoon. Present conclusions about recurrent coastal flood elevations rely heavily on historical evidence from the continuous tidal records identified in Table 3. Areas near the beach may be subject to wave action and high velocity surges that can cause erosion and property damage.

Escambia County has experienced flooding from several hurricanes since 1871. Among the most severe hurricanes were those of 1906, 1917, 1926, 1979 (Frederic), and 1995 (Opal). In 1906, high tides of 10 feet NGVD were reported at Pensacola and 10.8 feet NGVD at Ft. Barrancas. In the storm of 1917, a high tide of 7.8 feet NGVD was reported at Ft. Barrancas and in the 1926 storm, a high tide of 9.4 feet NGVD was observed at the Pensacola waterfront. This compares with the GKY & Associates, Inc., 100-year surge prediction of 3 to 6 feet NGVD (Reference 8). The prediction does not incorporate the effects of wind driven waves or the tidal influences of the heavenly bodies.

The following brief descriptions of several significant storms provide historical information to which coastal flood hazards and flood depths can be compared. Brief notes on the history and damages caused by hurricanes are abstracted from reports by the USACE and Garriott, Sumner, and Patterson, Bailey, and Paulhus (References 7 and 8). Additional information on hurricane history and damages, particularly for recent storms, comes from papers published in the Monthly Weather Review, and other supplemental information and reports (References 9, 10, 11, and 12). The following gives the significant storms affecting the panhandle in this century. Damage figures are those determined for values at the time of the storm, and no attempt has been made to adjust these figures to present day values.

<u>September 13 - September 24, 1975 (Hurricane Eloise)</u>

Hurricane Eloise struck approximately 40 miles west of Panama City producing high water marks ranging between 10 and 18 feet, between the Cities of Destin and Port St. Joe. Damage to shorefront residential structures was extensive. Total property damage was estimated at $1.08 billion.

<u>1979 Hurricane Frederic (August 29 - September 14, 1979)</u>

This storm landed west of Mobile Bay, Alabama, resulting in damage to shorelines and residential and commercial structures along Mississippi, Alabama, as well as Escambia County, Florida shorelines. Dauphin Island, Alabama, sustained extensive damage, resulting from wind and the tidal surge from the Gulf of Mexico. Over $3.5 billion in damage to residential and commercial property were claimed as a result of this storm.

1985 Hurricane Elena (August 29 - September 2, 1985)

Hurricane Elena crossed the shoreline near Gulfport, Mississippi, and resulted in damages to residential and commercial property in portions of Louisiana, Mississippi, Alabama, and portions of the western panhandle of Florida. Due to the storm track running parallel to the Florida shoreline, significant damage to shorefront structures was sustained between Apalachicola and Pensacola Beach. The residential and commercial property damage is estimated to have been $1.4 billion.

1985 Hurricane Kate (November 1.5 - November 23, 1985)

Hurricane Kate, the second hurricane of 1985, was a Category 3 hurricane that made landfall near the City of Port St. Joe. This storm resulted in damage to shoreline residential and commercial structures with winds exceeding 100 mph. Extensive storm related damage was reported along eastern portions of the Florida panhandle, as well as in the City of Tallahassee and northward. Property damage is estimated to have been over $300 million.

1994 Tropical Storm Alberto (June 30 - July 7, 1994)

Tropical Storm Alberto made landfall near Pensacola Beach with only minor beach and structural damage being reported. This slow moving storm stalled over portions of Alabama and Georgia resulting in extensive flooding in Alabama, Georgia, and the Florida Panhandle. Storm-related damages exceeded $500 million.

1995 Hurricane Erin (July 31 - August 6, 1995)

Hurricane Erin bypassed Fort Walton Beach on August 3, 1995, causing moderate beach erosion between Navarre Beach and Pensacola Beach. Storm surges varied from 3 feet in Pensacola Beach to 7 feet in Navarre Beach. Damage to residential and commercial structures, resulting from hurricane force winds, affected over 2,000 structures within portions of the Cities of Pensacola, Mary Esther, Pensacola Beach, and Navarre Beach. Storm related damages to residential and commercial property, within the State of Florida, approached $350 million.

1995 Hurricane Opal (September 27 - October 5, 1995)

After briefly reaching Category 4 intensity in the Gulf of Mexico, Hurricane Opal made landfall as a Category 3 hurricane, near Pensacola Beach, on October 4th. Hurricane force winds were reported between Pensacola Beach and Cape San Bias, with sustained winds exceeding 100 mph between the Cities of Destin and Panama City Beach. Beaches and dune systems already weakened by Hurricane Erin, sustained extensive erosion and wash over as a result of the storm. Storm surges varied between 5 and 14 feet depending on location. Breaking waves in some areas added approximately 10 feet to the reported storm surge. High water marks above mean sea level varied from 10 feet in Pensacola Beach, to 18 feet in

Panama City Beach, to over 21 feet in Walton County. Beach and dune erosion, as well as damage to commercial and residential structures, was reported to be extensive for shoreline areas of the Gulf of Mexico, as well as portions of shoreline areas of Pensacola Bay, Santa Rosa Sound, and Choctawhatchee Bay. Property damage is estimated to have been over $3 billion.

1998 Hurricane Georges (September 15 - October 1, 1998)

Hurricane Georges made six landfalls in the Caribbean before making landfall near Biloxi, Mississippi on September 28th with sustained wind speeds of approximately 78 mph. The system was downgraded to a tropical storm after landfall and then to a tropical depression on September 29th with the system moving in an eastward direction. The system dissipated near the northeast Florida and southwest Georgia coast. An estimated total of 28 tornadoes associated with the Georges occurred in the Florida panhandle and Alabama with the majority touching down in northwest Florida. Rainfall totals for southern Mississippi and Alabama as well as the Florida Panhandle generally ranged from 10 to 20 inches. The storm surge in the Florida Panhandle Counties of Escambia, Santa Rosa, and Okaloosa Counties was estimated to be 5 to 10 feet. Levy County estimated the storm surge to be 2 to 4 feet. Insured property damage estimates supplied by the Property Claims Services Division of the American Insurance Services Group estimates that Georges caused a total of $2.955 billion in damage in the United States including Puerto Rico and the U.S. Virgin Islands. The property damage loss incurred to Florida, mainly the Keys and the Panhandle Counties, is approximately $0.34 billion.

2004 Hurricane Ivan (September 2 - 24, 2004)

Hurricane Ivan made landfall as a Category 3 hurricane with sustained winds exceeding 91 mph near southern Alabama-western Florida Panhandle border, on September 16th. Ivan became a tropical depression on September 17th over northeast Alabama, yet still strong enough to cause flash floods and tornado damage across most of the southeastern United States. Rainfall totals generally ranged from 3 to 7 inches in Florida. A television station in Pensacola, Florida reported that rainfall exceeded 15 inches. Widespread flooding occurred as a result of the severe rainfall from Hurricane Ivan, which fell on already saturated ground caused by Tropical Storm Bonnie and Hurricane Frances in August and early September. The coastline from Destin, Florida in the panhandle to Mobile Bay, Alabama reported storm surges of 10 to 15 feet. The coastline from Destin east to St. Marks in the Florida Big Bend region had storm surges of 6 to 9 feet. Ivan caused severe damage to the coastal and inland areas of the Florida panhandle. Ivan, was the most destructive hurricane to hit Baldwin, Escambia, and Santa Rosa Counties in more than 100 years. The American Insurance Services Group estimates that the insured losses in the United States are over $7 billion, with over $4 billion occurred in Florida alone. The insured damages of insured and uninsured are over $14 billion.

2.4 Flood Protection Measures

No extensive flood protection measures exist within the unincorporated areas of Escambia County. Minor flood protection measures in place include small channels once excavated to convey floodwaters. However, most of these channels have fallen to neglect and now outcroppings of vegetation seriously reduce their conveyance capacities. Ensuing flood problems led county officials to adopt stormwater master plans.

One master plan study, performed through a joint venture by Barrett, Daffin, and Carlan, Inc., and Baskerville-Donovan Engineers, Inc., for southwest Escambia County included: 1) an inventory of existing drainage structures; 2) identification of topographic features and soil types; 3) an analysis of existing and future land use; 4) delineations of major drainage basins; 5) identification of drainage problems and floodprone areas; and 6) several non-structural and structural improvements (such as culvert enlargements and pumping stations) to address specific flooding problems at nine county locations (Reference 2). Structural improvements have been made in the Garcon Swamp, Weekley Bayou, and Bayou Grande basins and are addressed in the January 21, 1998, FIS.

The study cited above concluded that existing stormwater ordinances sufficiently regulated stormwater through non-structural measures. These include active enforcement of building regulations as required by the National Flood Insurance Act. The study also recommended that the county maintain its drainage facilities more aggressively by performing channel maintenance as necessary (Reference 2). Carlan Consulting (formerly Barrett, Daffin, and Carlan, Inc.) is also developing stormwater master plans for other areas of the county. Phase I of this study included an inventory of existing drainage structures, delineation of drainage basins, and identification of topographic and drainage features and floodprone areas (Reference 9). Phase II is now underway, in which flood management solutions are being developed based on modeling techniques for five drainage basins: Thompson Bayou, Eightmile Creek, Elevenmile Creek, Bayou Marcus, and Bayou Grande. All available results from these stormwater master plans were incorporated into the January 21, 1998, FIS.

Two significant dams, Crescent Lake Dam and an unnamed, breached dam downstream from Longleaf Road, are located on Bayou Marcus. There are no plans to restore the breached dam. The Crescent Lake Dam system includes a weir drop structure, which feeds a culvert passing under the dam. This system serves aesthetic purposes for the local neighborhood rather than downstream flood control. While several small, uncontrolled dams and ponds are located in the community, their small size limits their impact on flooding during major storm events.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Riverine Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the county.

Precountywide Analyses

Regional analyses were performed for the Escambia River downstream of State Route 184 and Thompson Bayou, using the procedures in USGS Water-Supply Paper (WSP) 1674 (Reference 10). To determine the accuracy of the data and curves in WSP 1674, various frequency flows at gage sites were estimated by regional analysis and compared to the log-Pearson Type III distributions obtained from the data at the gages (Reference 11). The log-Pearson Type III distributions were consistently steeper than the regionally determined distributions and always provided the better fit to the actual measured data. Variations in the estimated flows by the two methods often exceeded 100 percent, particularly at the higher recurrence intervals.

To minimize the disparity between the regionally determined and log-Pearson Type III flows; it was necessary to modify the regional curves on a hydrologic subunit basis to reflect flood frequency conditions more accurately. The regional analysis methodology of WSP 1674 was developed utilizing a log-normal distribution for data through 1961. The initial modifications to the regional analysis were to include all data through the 1977 Water Year and to reconstruct the regional curves in WSP 1674 using log-Pearson Type III distributions rather than log-normal distributions. This was done by replotting the Mean Annual Flow (Qm) vs. Drainage Area relationship, taking Qm from the logPearson Type III curves at each gage. The ratio of peak flow (Qp/Q.) vs. Recurrence Interval was also replotted using log-Pearson Type III values. By incorporating skew into the regional analysis, the regionally determined distributions were made similar to the log-Pearson Type III distributions at the gages. The differences in the estimated flows at the gages by the two methods were also smaller, reflecting the fact that the flows were determined by similar distributions and that the regional analysis included an additional 16 years of record at many stations.

To further reduce the discrepancies in flows and to bring the regionally determined flows within the expected sampling error at the gages, an adjustment factor was applied to the Mean Annual Flow used in the regional analysis. This adjustment was determined in the following manner. For each gaged site in a hydrologic region, flows from the 2-, 10-, 25-, 50-, 100-, and 500-year return period floods determined by a log-Pearson Type III analysis were divided by the regional Qp/Qm ratios to give values that represent what Qm should have been for the regional analysis to duplicate exactly the log-Pearson Type III values at a gage. The six values so obtained were averaged to gi ve a single value, Qm', for the station. Plotting Qm', against Qm yielded three straight lines, each representing a different hydrologically similar region. The slope of these curves provided a single adjustment factor for each region, applicable to Qm determined from the Qm vs. Drainage Area relationship. This procedure required only one initial correction for streams in a hydrologic subunit and yielded regionally determined flows that approximate those determined by a log-Pearson Type III analysis. Over the range of return periods of interest to this study, the regionally estimated flows fall within the 50 percent confidence interval defined by the confidence limits applicable to the log-Pearson Type III distributions at the gages.

Countywide Analyses

For the February 23, 2000 revised FIS, three methods were used to predict stream discharges for streams studied in detail. These methods were the USACE HEC-1 computer program, log-Pearson Type III statistical analyses, and USGS regional regression equations (References 12, 13, 14, 15, and 16). Individual drainage basin characteristics and available historic data dictated the method used for each stream. For Pine Barren Creek and the Escambia River, a weighted combination of USGS regression equations and log-Pearson Type III statistical analyses were used to estimate the desired discharge-frequency relationships. Initially, historic stream gage data were fitted to a log-Pearson Type III distribution to obtain flood discharges for the 10-, 50-, 100-, and 500-year flood events. This was achieved by following the methods established in the U.S. Water Resources Council Bulletin 17B (Reference 15). In this analysis, a generalized skew coefficient provided by the Tallahassee Subdistrict of the USGS was used. The gage on Pine Barren Creek, located at Wiggins Bridge, provided 39 years of data. The gage on the Escambia River, located at State Route 4 near the Town of Century, provided 57 years of data. The records from the Escambia River gage at State Route 184 near Molino were not used because the gage provided incomplete data.

Using a technique discussed in USGS Water Resources Investigations 82-4012, the log-Pearson Type III discharge estimates were then adjusted based on discharges determined by regional regression equations (Reference 16). USGS engineers in the Tallahassee office supported the use of these methodologies for

Pine Barren Creek and the Escambia River. The remaining basins, except for the upper portions of Elevenmile Creek, Eightmile Creek, and Bayou Marcus basins, are located in southwest Escambia County. As discussed in Section 2.0 of this FIS report, this portion of the county has significantly different drainage characteristics than the northern portion where the Pine Barren Creek and the Escambia River basins are located. The unique characteristics of the southwest basins, including most of Elevenmile Creek, Eightmile Creek, and Bayou Marcus, are unsuitable for regional analysis. In addition, the limited history of stream gage records for streams in southwest Escambia County preclude effective statistical analysis. Therefore, the HEC-1 computer model was used to estimate the desired discharge-frequency relationships for the remaining streams (References 12, 13, and 14). HEC-1 modeling was based on the Soil Conservation Service (SCS) unit hydrograph and kinematic wave routing methods. Parameters supplied to the model of each stream included sub-basin runoff curve numbers, lag times, stream cross-sections, and Manning's "n" roughness factors. Curve numbers were calculated using the SCS curve number method and Florida DOT aerial photographs at a scale of 1:25,000, SCS Soils Report for Escambia County, and available reports on land use (References 17, 18, 3, 2, and 19). Lag times were calculated using the empirical SCS curve number formula (References 20 and 21). Routing cross sections were obtained from field surveys, supplemented with USGS 7.5-minute topographic maps and 1980 aerial photographs (References 4, 5, and 22). Channel roughness factors (Manning's "n") were chosen by engineering judgment shaped by field observation, aerial photographs, surveyor's photographs of the streams and floodplains, and published text and photographs with recommended roughness values (References 22, 18, 23, and 24).

The HEC-1 models of Elevenmile Creek, Eightmile Creek, and Bayou Marcus were calibrated and verified using storm discharge data provided by the Tallahassee Subdistrict of the USGS and corresponding rainfall data obtained from the Champion Paper, the Naval Air Station at Saufley Field, and the National Weather Service at the Pensacola Airport (Reference 25). For calibration, an observed storm was simulated, and the HEC-1 model parameters including curve numbers, lag times, and initial abstractions were adjusted until reasonable fits between observed and predicted peak flows were obtained. For verification, a second storm was simulated to establish the accuracy of the calibrated model parameters. The streamflow and rainfall data from the Jones Creek gages, operated by the NWFWMD, was received too late to calibrate the HEC-1 model of Jones Creek; however, a verification of the HEC-1 model of Jones Creek was performed with satisfactory results. Based on the final calibration results of the three streams, an adjustment factor was determined for each model parameter. These adjustments were then applied to the model parameters of the ungaged streams.

Using the HEC-1 models, peak discharges for the 10-, 50-, 100-, and 500-year floods at selected stream locations were estimated. For these storm events, total storm rainfall amounts were based on Technical Paper No. 40 rainfall frequency atlas for a 24-hour storm duration (Reference 26). The temporal rainfall distribution used in the models was the SCS Type II, Florida modified distribution (Reference 27).

Revised Analyses (September 30, 2006)

Detailed information concerning the methods used to estimate peak discharge-frequency relationships for those streams studied in detail as part of this revised countywide FIS (September 30, 2006) is provided below.

The Carpenter Creek Study Area is located in southeast Escambia County and drains through the central portion of Pensacola into Bayou Texar. The Carpenter Creek basin, which is comprised of about 70 percent urban land use and 30 percent wood and range land, has a contributing drainage area of 6.27 square miles at the 9th Avenue Bridge and about 9.3 square miles at the 12th Avenue Bridge near the head of Bayou Texar. The eastern portion of the basin lying within the City limits is more intensively developed than the western portion lying west of I-110. Streamflow estimation methodologies described USGS Water Resources Investigations 82-4012 (Reference 16) were used to estimate stream discharges for the Carpenter Creek study area.

Weighted discharge estimates for a series of flood frequencies, based upon log-Pearson Type III statistical analyses and USGS regional regression equations, were developed using data from USGS Gage 02376079 Carpenter Creek at Pensacola, Florida. The Carpenter Creek gage had 18-years of data available for use in this estimate. First, historic stream gage data were fitted to a log-Pearson Type III distribution to obtain flood discharges for the 10-, 50-, 100-, and 500-year flood events. This was achieved by following the methods established in the U.S. Water Resources Council Bulletin 17B (Reference 15). In this analysis, a generalized skew coefficient taken from standard references was used. Then, using a technique discussed in USGS Water Resources Investigations 82-4012, the log-Pearson Type III discharge estimates were then adjusted (weighted) based on discharges determined from regional regression equations (Reference 16). Streamflow estimates at a number of additional locations within the Carpenter Creek Study Area were developed by methodologies for estimating discharge at ungaged location on gaged streams.

The Tributary to Elevenmile Creek Study Area consists of a small tributary of the Elevenmile Creek System, which is located on the west side of the main branch. Elevenmile Creek drains a portion of Central Escambia County from Cantonment to Perdido Bay. The confluence of the tributary under study is located approximately 5 miles upstream of the mouth of the system. The Elevenmile Creek Study Area, which is comprised of about 28 percent urban land uses and 62 percent rural land uses such as agriculture, wood and range land, upland forest and wetland, has a contributing drainage area of 4.38 square miles at the confluence with the main branch. Only minor urbanization has occurred within the basin. Urbanizing areas consist primarily of upland areas on the south side of the basin. Streamflow estimation methodologies described USGS Water Resources Investigations 82-4012 (Reference 16) were used to estimate stream discharges for the Elevenmile Creek Study Area.

Weighted discharge estimates for a series of flood frequencies, based upon log-Pearson Type III statistical analyses and USGS regional regression equations, were developed using data from USGS Gage 02376115 Elevenmile Creek near Pensacola, Florida. The Elevenmile Creek gage had 17-years of data available for use in this estimate. First, historic stream gage data were fitted to a log-Pearson Type III distribution to obtain flood discharges for the 10-, 50-, 100-, and 500-year flood events. This was achieved by following the methods established in the U.S. Water Resources Council Bulletin 17B (Reference 15). In this analysis, a generalized skew coefficient taken from standard references was used. Then, using a technique discussed in USGS Water Resources Investigations 82-4012, the log-Pearson Type III discharge estimates were then adjusted (weighted) based on discharges determined from regional regression equations (Reference 16). A streamflow estimate at the mouth of the tributary was developed by methodologies for estimating discharge at ungaged location on gaged streams.

Tributary to Bayou Grande Study Area and Tributary to Bridge Creek Study Area streamflow estimates were developed utilizing the ICPR computer model (Reference 48) The Bayou Grande Study Area is comprised of four individual tributary reaches and the Bridge Creek Study Area is comprised of two individual tributary reaches. The Bayou Grande and Bridge Creek tributary reaches are described in detail below.

Tributary 1 to Bayou Grande is a small tributary to Bayou Grande that originates north of South Loop Road and flows north under Blue Angel Parkway to the confluence with Bayou Grande. The total contributing drainage area for this reach is approximately 135.1 acres of which approximately 13 percent is composed of urban land use and 87 percent of rural land uses such as upland forests and pasture land.

Tributary 2 to Bayou Grande is a tributary to Bayou Grande that originates approximately 1,500 feet east of Blue Angel Parkway. The tributary flows generally to the southeast and crosses Sorrento Road just prior to its confluence with Bayou Grande. The total contributing drainage area for this reach is approximately 91.4 acres of which approximately 53 percent is composed of urban land use and 47 percent of rural land uses such as upland forests and pasture land.

Tributary 3 to Bayou Grande is a tributary to Bayou Grande that originates southwest of Dog Track Road. The tributary flows generally to the south and crosses Sorrento Road just prior to its confluence with Bayou Grande. The total contributing drainage area for this reach is approximately 1,315 acres of which approximately 21 percent is composed of urban land use and 79 percent of rural land uses such as upland forests and pasture land.

Tributary 4 to Bayou Grande is a tributary to Bayou Grande that originates south of Gulf Beach Highway. The tributary flows generally to the west and crosses Atlantic Avenue just prior to its confluence with Bayou Grande. The total contributing drainage area for this reach is approximately 183.5 acres of which approximately 84 percent is composed of urban land use and 16 percent of rural land uses such as hardwood forests and forested wetlands.

Tributary to Bridge Creek (West) is a tributary to Bridge Creek that originates west of Bridge Creek. This tributary flows east and crosses Creek Ridge Drive just prior to its confluence with Bridge Creek. The total contributing drainage area for this reach is approximately 81.9 acres of which approximately 36 percent is composed of urban land use and 64 percent of rural land uses such as hardwood forests and forested wetlands.

Tributary to Bridge Creek (East) is located on the east side of Bridge Creek and originates near Dog Track Road. This tributary flows generally to the west to the confluence with Bridge Creek. The total contributing drainage area for this reach is approximately 173.5 acres of which approximately 62 percent is composed of urban land use and 38 percent of rural land uses such as hardwood forests and pasture land.

ICPR v.3 computer models were developed to perform the hydrologic analyses for the Bayou Grande and Bridge Creek Study Areas. The hydrologic analyses were developed for the purpose of estimating streamflow for a series of flood frequencies within the tributary reaches described above. Watershed drainage area boundaries were delineated using 1-ft. contour interval topography available through Escambia County. Sub-basin outlets were located at major road crossings and at the confluences of major tributaries. Discharges were calculated for the 2-year, 10-year, 50-year, 100-year, and 500-year return frequencies from rainfall depths and distributions, which were consistent with TP-40 and Hydro-35. The NRCS Curve Number method was used to calculate storm runoff volumes. Curve Numbers were determined from land use polygons digitized and identified from the 2004 USGS DOQQs, and digital NRCS Soils Maps. The hydrologic soil group type, land use, and sub-basin polygons were unioned in ArcGIS to determine composite Curve Numbers for each sub-basin. The NRCS segmental method was used to determine travel time though each sub-reach and results were converted to lag time for each sub-basin. The flow paths and parameters for time of concentration were based on the DOQQs, Escambia County topography, USGS topography, field survey data, survey photos, and field observation.

A summary of the drainage area-peak discharge relationships for all of the streams studied by detailed methods is shown in Table 6, "Summary of Discharges."

TABLE 6 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BAYOU GRANDE					
At Blue Angel Parkway	2.93	1,084	1,667	2,063	2,661
At Etheridge Road	1.64	418	610	739	935
TRIBUTARY 1 TO BAYOU GRANDE					
At North Loop Road	0.21	32	41	43	55
TRIBUTARY 2 TO BAYOU GRANDE					
At Sorrento Road	0.14	112	170	181	208
TRIBUTARY 3 TO BAYOU GRANDE					
Blue Angle Parkway	1.02	93	198	399	413
At Sorrento Road	2.05	636	899	979	1,206
TRIBUTARY 4 TO BAYOU GRANDE					
At confluence with Bayou Grande	0.29	240	380	429	755
BAYOU MARCUS					
At Blue Angel Parkway	21.08	3,532	6,445	8,354	12,881
At Mobile Highway	10.85	2,398	4,520	5,816	8,956
At Crescent Lake Dam	7.30	2,398	4,505	5,788	8,704
Just upstream of Crescent Lake	4.32	2,155	3,326	4,019	5,627
Adjacent to Elmhurst Street	2.68	1,980	3,045	3,691	5,231
At Interstate Route 10	0.50	346	590	719	1,028
TRIBUTARY TO BAYOU MARCUS					
At confluence with Bayou Marcus	1.75	660	1,107	1,325	1,836
Approximately 0.4 mile upstream of Lillian Highway	0.93	436	708	850	1,199
Approximately 1.1 miles upstream of Lillian Highway	0.49	253	402	480	666

TABLE 6 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BRIDGE CREEK					
At confluence with Perdido Bay (Lillian Highway)	5.43	1,524	2,310	2,782	3,893
Just upstream of Tributary to Bridge Creek	4.02	1,081	1,604	1,918	2,667
Approximately 1,370 feet upstream of Bridge Creek Drive	2.36	421	609	724	1,007
At Dog Track Road	1.58	213	340	418	609
At Blue Angel Parkway	1.08	200	306	371	528
TRIBUTARY TO BRIDGE CREEK					
At confluence with Bridge Creek	0.75	237	374	453	42
Approximately 0.5 mile upstream of Little Creek Drive	0.14	57	89	109	155
TRIBUTARY (EAST) BRIDGE CREEK					
At confluence with Bridge Creek	0.27	207	301	329	415
TRIBUTARY (WEST) BRIDGE CREEK					
At Creek Ridge Road	0.13	165	227	246	296
CARPENTER CREEK					
Fairfield Drive at Bayou Texar	9.31	2,435	4,358	5,406	8,334
At 9th Avenue Bridge, (USGS 02376079)	6.27	1,640	2,935	3,641	5,613
At Davis Hwy Bridge	5.13	1,680	2,957	3,644	5,374
At Interstate 110 Bridge	3.35	1,451	2,458	2,991	4,119
Main Channel at Tributary	1.17	618	1,020	1,210	1,620
TRIBUTARY TO CARPENTER CREEK					
Tributary at Main Channel	1.19	583	926	1,090	1,420

TABLE 6 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
EIGHTMILE CREEK					
At confluence with Elevenmile Creek	12.67	3,770	5,477	6,503	8,943
At Klondike Road	11.20	3,370	4,907	5,826	7,999
Approximately 0.7 mile downstream of State Route 297	7.99	2,224	3,234	3,837	5,247
At Ashland Drive	4.15	1,162	1,675	1,980	2,694
At Fowler Avenue	0.40	218	309	362	486
ELEVENMILE CREEK					
At confluence with Perdido Bay	46.75	12,154	17,025	19,909	26,643
Just upstream of confluence of Eightmile Creek	29.80	9,638	13,321	15,488	20,512
Just downstream of Mobile Highway	17.19	6,823	9,368	10,859	14,338
Just downstream of State Route 297A	14.67	6,720	9,129	10,554	13,887
Just downstream of State Route 186 (Kingsfield Road)	6.26	3,201	4,409	5,112	6,739
TRIBUTARY TO ELEVENMILE CREEK					
At confluence with main branch	4.32	978	1,823	2,308	3,661
Unnamed tributary (Section 8)	2.51	561	1,045	1,323	2,098
At Nine Mile Road	1.16	259	482	610	968
ESCAMBIA RIVER					
Just upstream of U.S. Route 90	*	83,665	163,110	209,605	356,680
At State Route 184	4,147	82,153	134,177	161,087	237,286
Just upstream of confluence of Pine Barren Creek	*	79,397	128,743	153,760	225,296
Just upstream of confluence of Cotton Creek	3,941	78,379	126,478	150,744	219,818
At State Route 4	3,817	76,322	121,929	145,039	208,946

TABLE 6 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
GARCON SWAMP					
At Sorrento Road	3.69	793	1,090	1,262	1,663
At Bauer Road	3.09	758	1,034	1,195	1,566
Approximately 1.56 miles upstream of Bauer Road	1.64	372	509	588	773
At Blue Angel Parkway	0.26	236	321	369	482
JONES CREEK					
At Navy Boulevard	3.91	1,133	1,615	1,904	2,577
At Fairfield Drive	1.59	678	944	1,099	1,477
Approximately 1.1 miles upstream of Fairfield Drive	0.46	281	390	453	601
PINE BARREN CREEK					
At CSX Transportation	93.0	12,541	27,804	37,149	67,619
Just downstream of the confluence of Blue Water Creek	86.6	12,267	27,314	36,559	66,731
At Wiggins Bridge (USGS gage location)	75.3	11,615	26,007	34,884	63,864
THOMPSON BAYOU					
At confluence with the Escambia River	7.5	703	1,370	1,762	2,998
WEEKLEY BAYOU					
At Bauer Road	2.20	839	1,237	1,478	2,051
Approximately 0.5 mile upstream of Bauer Road	1.87	793	1,174	1,402	1,950
Just upstream of Tributary to Weekley Bayou	0.81	360	537	644	901
TRIBUTARY TO WEEKLEY BAYOU					
At confluence with Weekley Bayou	1.06	485	703	834	1,144
Approximately 0.97 mile upstream of confluence with Weekley Bayou	0.58	326	461	540	724

3.2 Riverine 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.

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

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The hydraulic analyses for this study 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.

All elevations are referenced to NAVD88. Elevation reference marks used in this study, and their descriptions, are shown on the FIRM.

Precountywide Analyses

Cross sections, dams, and culverts for the backwater analysis for Thompson Bayou and the Escambia River downstream of State Route 184 were obtained by field survey. The surveys were tied into USGS benchmarks so that all elevations would be referenced to NGVD.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 28). Starting water-surface elevations for the Escambia River were calculated using the slope/area method. Starting elevations for Thompson Bayou were developed by the coincident peak method.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. Channel roughness values range from 0.035 to 0.040 with 0.18 used as the floodplain value.

Countywide Analyses

For the February 23, 2000 revised FIS, the backwater analyses of all stream reaches studied in detail considered all structure cross sections (including bridge, culvert, and dam crossings) and representative natural stream cross sections of the channel and floodplain. Cross sections were obtained from field surveys, supplemented with USGS 7.5-minute topographic maps and 1980 aerial photographs (References 4, 5, and 22). All bridges, dams, and culverts were surveyed to obtain elevation data and structural geometry. Surveys were tied into U.S. Coast and Geodetic Survey and Florida DOT benchmarks. Cross section and bridge data for State Route 4 over the Escambia River were taken from Florida DOT bridge plans (Reference 29).

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 water-surface profile computer program (References 30 and 31). Starting water-surface elevations for all streams were calculated using the slope/area method. For Weekley Bayou, Mean High Water in Tarkiln Bay-determined from NOS records-was used to establish starting water-surface slope. For all other streams, invert elevations near the beginning of the stream study reach were used to estimate starting slope. The coincident peak method was not used for starting elevations on tributaries to main streams. Of the tributaries studied, only Tributary to Weekley Bayou had a drainage basin area comparable to the main stream (within 60 percent). Nevertheless, the slope/area method yielded more reasonable results for this tributary.

Channel roughness factors (Manning's "n") used in the hydraulic computations were determined by engineering judgment based on field observations, aerial photographs, surveyor's photographs of stream channels and floodplains, and published text and photographs with recommended roughness values (References 18, 22, 23, and 24). Roughness values used for the main channels generally ranged from 0.040 to 0.060. However, values as high as 0.020 were used for densely vegetated swamps with no defined channel. Floodplain roughness values generally ranged from 0.120 to 0.200 for all floods.

Two different methodologies were used to determine the elevations of the shallow flooding areas. For the shallow flooding areas on Bayou Grande and Bridge Creek, the elevations were determined using HEC-1 and HEC-2 modeling (References 12, 13, 14, 30, and 31). Data from the modeling were then plotted on topographic maps. For the shallow flooding areas on Jones Creek and Tributary to Bayou Marcus, the elevations were based on the ending elevation as shown on the corresponding flood profiles.

Computations of riverine flood levels along rivers subject to flooding by coastal surges were performed without considering the effects of surge flooding.

The hydraulic model results were checked for reasonableness using engineering judgment and comparisons to observed flood conditions at stream gages described in Section 2.3 of this FIS report.

Revised Analyses (September 30, 2006)

A brief description of each of the areas that were studied in detail as part of the September 30, 2006 FIS revision is presented below. Detailed information concerning the data and methods used to estimate flood elevations for selected recurrence intervals is also presented.

The Carpenter Creek Study Area is comprised of a main branch and tributary branch. The main branch, starting near the 12th Avenue Bridge, is 4.17 miles long and has an average channel slope of 26 feet per mile. The tributary branch is 0.81 miles long and has an average channel slope of 44 feet per mile. The main and tributary branch channels have a sandy bottom with generally heavily vegetated banks, some local obstructions and minor meander. The overbank areas are generally heavily vegetated with trees and underbrush causing a high degree of roughness. The Carpenter Creek study reach includes eight bridge crossings, with seven bridges on the main branch and one on the tributary branch.

The Tributary to Elevenmile Creek Study Area is a single reach tributary branch of Elevenmile Creek. The tributary is 2.72 miles long and has an average channel slope of 17 feet per mile. The channel and floodplain at the downstream end on the study reach (1,250-ft) consist of a man-made prismatic channel, which was realigned to facilitate the construction of a landfill on both sides. The study reach has a sandy bottom throughout with very steeply incised banks in the vicinity of the landfill. The channel has heavily vegetated side slopes throughout. The overbank areas in the vicinity of the landfill are mowed grass while the overbank areas in the remainder of the reach are generally heavily vegetated with trees and underbrush. The single bridge within the study reach is located at the upstream end of the man-made channel and is a single span structure.

The Tributary Bayou Grande Study Area is comprised of four individual tributary reaches described in detail as follows. Tributary 1 to Bayou Grande is a single reach tributary 0.64 miles in length with an average channel slope of 20.3 feet per mile. The channel has a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are generally heavily vegetated with trees and underbrush causing a high degree of roughness. This reach includes two culvert crossings and is piped in one segment. Tributary 2 to Bayou Grande is a single reach tributary 0.61 miles in length with an average channel slope of 33.5 feet per mile. The channel has a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are generally heavily vegetated with trees and underbrush, however the upper segment of the reach flows through a residential development where vegetation is consistent with that land use. This reach includes two culvert crossings. Tributary 3 to Bayou Grande main branch is 2.3 miles in length and has a channel slope of 9.8 feet per mile. The channel has a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are primarily vegetated with trees and underbrush, however the upper segment of the reach flows through a residential development where vegetation is consistent with that land use. This study reach includes three culvert crossings. Tributary 4 to Bayou Grande is a single reach tributary 0.52 miles in length with an average channel slope of 27 feet per mile. The channels have a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are generally heavily vegetated with trees and underbrush causing a high degree of roughness. This reach includes four culvert crossings.

The Tributary to Bridge Creek Study Area is comprised of two individual tributary reaches described in detail as follows. Tributary to Bridge Creek (East) is a single reach tributary 0.50 miles in length with an average channel slope of 17.1 feet per mile. The channel has a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are heavily vegetated on one side with trees and underbrush causing a high degree of roughness; however the opposite side of the reach flows adjacent to a residential development where vegetation is consistent with that land use. This reach includes no road crossings. Tributary to Bridge Creek (West) is a single reach tributary 0.50 miles in length with an average channel slope of 16.9 feet per mile. The channel has a sandy bottom with generally heavily vegetated banks and some local obstructions. The overbank areas are heavily vegetated causing a high degree of roughness. This reach includes one culvert crossing.

Hydraulic models developed to simulate flood elevations as part of the September 30, 2006 revised FIS included details of natural channel geometry and considered all structures which could potentially impact flows and levels such as bridges, culverts, and dams. Cross-section as well as structural information included the channel and floodplain area of each of the areas studied in detail. Channel cross-sections were obtained primarily from field surveys with supplemented cross-sections being developed from Escambia County topographic data. Bridge, dam, and culvert structures were surveyed to obtain elevation data and structural geometry. Ten natural channel cross-sections and eight bridges were surveyed within the Carpenter Creek Study Area. Seven natural channel cross-sections and one bridge were surveyed within the Tributary to Elevenmile Creek Study Area. Seventeen natural cross-sections and seventeen culverts were surveyed within the Tributary to Bayou Grande Study Area. Four natural cross-sections and one culvert were surveyed within the Tributary to Bridge Creek Study Area. All field survey was established with horizontal control in Florida North Zone (903) State Plane coordinates, and vertical control in NAVD 1988 datum. Bridge and culvert structure surveys included the top of road profile and upstream regular cross section.

For the Carpenter Creek and Tributary to Elevenmile Creek Study Areas, water-surface elevations for floods of selected recurrence intervals were computed using of the HEC-RAS computer model (Reference 49). For the Tributary to Bayou Grande and Tributary to Bridge Creek Study Areas, water-surface elevations for floods of selected recurrence intervals were computed using the ICPR unsteady flow computer model (Reference 48).

Channel roughness ('n') values were determined from field observation, surveyor photographs, and DOQQs, through the use of standard literature references (Reference 23) in accordance with the HEC-RAS hydraulic reference manual. All of the areas studies as part of this revision have channels composed of sandy material and generally have bare bottoms. The channels have a relatively high roughness factor due to overhanging vegetation that persists year round. Similarly, the overbank areas are quite rough due to surface irregularities and relatively heavy vegetation.

The starting water-surface elevations in both the HEC-RAS and ICPR v.3 models were determined using the normal depth method. Normal depth produced WSELs greater than mean high tide, but lower than the coastal Stillwater surge elevations from the effective FEMA maps. Floodways were determined for both streams using method 4 encroachment initially, then method 1 to refine the floodway and fix the encroachment stations. All surcharge values are between 0.0 and 1.0, and floodway contains the channel and is within the 100-year floodplain at all cross sections.

3.3 Coastal 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 in detail affecting the county.

Inundation from the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay caused by passage of storms (storm surge) was determined by the joint probability method (Reference 32). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of Escambia County. Primary sources of data for this were obtained from two U.S. Department of Commerce, National Oceanic and Atmospheric Administration reports (References 33 and34).

For areas subject to flooding directly from the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined above). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 48).

The original surge model study (Reference 8) was recognized to provide unrealistic flood elevations in view of severe impacts within Escambia County from the 1979 Hurricane Frederic. Flooding assessments were then revised to reflect upward adjustments to coastal stillwater elevations, inclusion of wave setup, and an erosion treatment for barrier island beaches and dunes. However, experience with the 1995 Hurricane Opal and further review of the available historical record demonstrated the need to reexamine conclusions about coastal flood elevations for Escambia County.

The investigations for the January 19, 2000, revision, (Reference 49) reviewed available reports and extensive historical data, including storm surge and wave effects along the Florida Panhandle coast from Hurricane Opal on October 4, 1995. Existing data and studies include the report on Opal's basic meteorology by the National Hurricane Center (NHC), a hindcast for Gulf of Mexico wave action by the Coastal Engineering Research Center (CERC), and a National Oceanographic and Atmospheric Administration (NOAA) simulation of coastal storm surge using the numerical SLOSH model. Other primary data were comprised of long-term and Opal-related measurements of wave characteristics at offshore sites (over 25 total years of wave records) by the National Data Buoy Center (NDBC); historical tide gauge data for water levels at coastal sites (over

275 total years of tide records) by the National Ocean Service (NOS) and USACE (Table 3); post-Opal coastal dune erosion assessments recorded by the Florida Department of Environmental Protection (FDEP); and post-Opal high water mark surveys and coastal inundation mapping performed by FEMA and the USACE, Mobile District.

Those investigations provided some revised conclusions about coastal flood elevations for Escambia County. Wave setup was determined to significantly contribute to the total stillwater flood levels along the Gulf of Mexico coastline. The amount of wave setup was calculated using the methodology outlined in the USACE publication Shore Protection Manual (Reference 37). The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, Perdido Bay, and Big Lagoon, and are shown in Table 7, "Summary of Stillwater Elevations." These analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects, and include further contributions from wave action. Wave setup effects are reflected only in the open-coast 100-year elevations, as noted in Table 7.

3.4 Coastal Hydraulic Analyses

Coastal flood elevations were determined and mapped as part of the February 23, 2000 FIS revision. Hydraulic analyses, which considered the storm characteristics, shoreline characteristics and bathymetric characteristics of all flooding sources studied, were conducted to estimate flood elevations for selected recurrence intervals along their respective shorelines.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 38). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstruction, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 38 by the National Academy of Sciences. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

TABLE 7 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet NGVD*) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BIG LAGOON				
Entire shoreline withing Escambia County	*	*	8.0	*
ESCAMBIA BAY				
East of the Pensacola Bay Bridge (U.S. Route 98) near East Pensacola Heights	2.8	5.0	5.9	7.3
South of Gull Point near Ferry Pass (Interstate Route 10)	3.3	6.2	7.2	9.0
North of Ferry Pass (Interstate Route 10) near NAS Ellyson	3.8	7.0	8.1	10.2
North of the confluence of the Escambia River with Escambia Bay	3.9	7.3	8.4	10.6
GULF OF MEXICO				
Entire shoreline within Escambia County	4.0	6.8	10.5[1]	11.0
PENSACOLA BAY				
Entire shoreline west of Pensacola Bay Bridge (U.S. Route 98)	*	*	8.0	*
PERDIDO BAY				
Around Tarkiln Bay and Du Pont Point	1.8	*	4.3	5.5
North of Du Pont Point to Suarez Point	2.0	*	4.6	6.1
South of U.S. Route 98 near Paradise Beach	2.2	*	5.1	6.8
North of U.S. Route 98 and south of Grassy Point	2.3	*	5.6	7.2
South of Bayou Marcus	2.7	*	6.4	8.4
North of Bayou Marcus	2.8	*	6.6	8.6
Between the mouths of the Perdido River and Elevenmile Creek	2.9	*	6.7	8.6
North of Grassy Point and south of the confluence of the Perdido River with Perdido Bay	2.6	*	6.1	8.0
SANTA ROSA SOUND				
Entire shoreline within Escambia County	*	*	8.0	*

[1] Includes wave setup of 2.5 feet
* Data not available

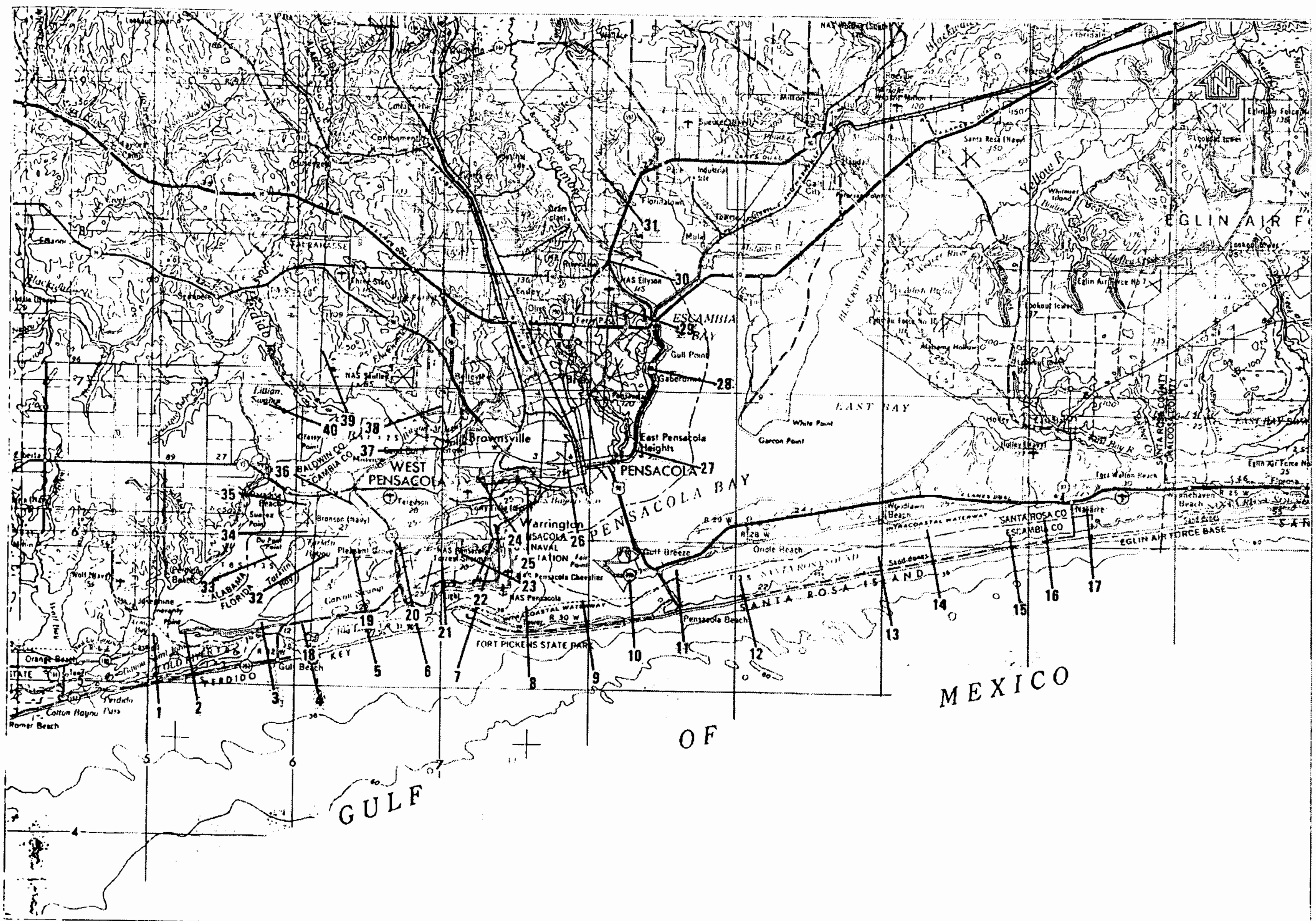
The FIS includes a technical wave height analysis using the revised 100-year flood elevations as described in Section 3.1 above. The analysis was performed as specified in FEMA's Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping (Reference 39). This revision updates the existing FIS on the basis of the post-Hurricane Opal investigations and FEMA's updated definitions of "coastal high hazard area" and "primary frontal dune," field investigations, and development of topography and aerial photography.

Guidance promulgated by FEMA in 1980 defines a "coastal high hazard area" as an area of special flood hazards extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action (i.e., wave heights greater than or equal to 3 feet) from storms or seismic sources. The "primary frontal dune" is defined as a continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms, such as hurricanes. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

Some dunes in Escambia County were found to be sufficient enough in size to sustain wave attack, while others were subjected to failure due to wave attack, erosion and overtopping. Therefore, using standard erosion analysis procedures as outlined in the Guideline and Specifications for Wave Elevation Determination and V Zone Mapping (Reference 39), dune erosion and retreat were used in developing the eroded profiles.

Wave heights were computed along transects (cross section lines) that were located along coastal and inland bay areas of Escambia County, as illustrated in Figure 1, "Transect Location Map." The transects were located with consideration given to existing transect locations and to the physical and cultural characteristics of the land so that they would closely represent conditions in the locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at larger intervals. It was necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transacts.

The wave height transects are located along the barrier island coastline of the Gulf of Mexico, from Perdido Inlet to the easternmost county limits with Santa Rosa County, and along Escambia Bay, Pensacola Bay (up to the U.S. Route 98 bridge), and in Santa Rosa Sound. For the barrier islands, the FEMA erosion treatment (540 square foot method) was performed to adjust the wave transect profiles to an eroded condition before conducting the wave height or wave runup analyses using the FEMA wave height analysis models (WHAFIS 3.0 and RUNUP 2.0). For each coastal transect without overtopping by the 100-year stillwater elevation, wave runup analyses were conducted using the FEMA wave runup model (RUNUP 2.0).



APPROXIMATE SCALE

0 4 8 12 MILES

TRANSECT LOCATION MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FIGURE 1

The transect data is presented in Table 8, "Transect Descriptions," which describes the location of each transect. In addition, Table 8 provides the Gulf of Mexico 100-year stillwater and maximum wave crest elevations for each transect along with the corresponding inland bay or soundside 100-year stillwater and maximum wave crest elevation. In Table 9, "Transect Data," the flood hazard zone, base flood elevations, and 100-year stillwater elevations are provided for each coastal flooding source.

TABLE 8 - TRANSECT DESCRIPTIONS

		Elevation (Feet NAVD 88)	
Transect	Location	Stillwater 100-Year[1]	Maximum Wavecrest 100-Year[2]
1	Located approximately 0.5 mile east of the Baldwin-Escambia County boundary on Perdido Key at the Gulf of Mexico across Perdido Key in a northerly direction	10.5	16.1
2	Located approximately 1.8 miles east of the Baldwin-Escambia County boundary on Perdido Key at the Gulf of Mexico across Perdido Key in a northerly direction	10.5	16.1
3	Located approximately 5.3 miles east of the Baldwin-Escambia County boundary on Perdido Key at the Gulf of Mexico	10.5	16.1
4	Located approximately 6.9 miles east of the Baldwin-Escambia County boundary on Perdido Key at the Gulf of Mexico across Perdido Key in a northerly direction	10.5	16.1
5	Located approximately 2.9 miles west of the Pensacola Bay Inlet on Perdido Key at the Gulf of Mexico	10.5	16.1
6	Located approximately 1.0 miles west of the Pensacola Bay Inlet on Perdido Key at the Gulf of Mexico	10.5	16.1
7	Located approximately 1,000 feet east of the Pensacola Bay Inlet on Santa Rosa Island at the Gulf of Mexico	10.5	16.1
8	Located approximately 3.67 miles east of the Pensacola Bay Inlet on Santa Rosa Island at the Gulf of Mexico	10.5	16.1

[1] Includes wave setup of 2.5 feet.
[2] Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM.

TABLE 8 - TRANSECT DESCRIPTIONS - continued

Transect	Location	Elevation (Feet NAVD 88) Stillwater 100-Year[1]	Maximum Wavecrest 100-Year[2]
9	Located approximately 5.84 miles east of the Pensacola Bay Inlet on Santa Rosa Island at the Gulf of Mexico	10.5	16.1
10	Located approximately 1,580 feet east of the Escambia County – Pensacola Beach Santa Rosa Island Authority western boundary, extending from the Gulf of Mexico across Santa Rosa Island in a northerly direction	10.5	16.1
11	Located approximately 2.38 miles east of the Escambia County – Pensacola Beach Santa Rosa Island Authority western boundary, extending from the Gulf of Mexico across Santa Rosa Island in a northerly direction	10.5	16.1
12	Located approximately 370 feet west of the intersection of Via De Luna and Avenida 23, extending from the Gulf of Mexico across Santa Rosa Island in a northerly direction	10.5[1]	16.1
13	Located approximately 9.5 miles west of the Escambia – Santa Rosa County boundary, extending from the Gulf of Mexico across Santa Rosa Island in a northerly direction	10.5[1]	16.1
14	Located approximately 6.95 miles west of the Escambia-Santa Rosa County boundary on Santa Rosa Island at the Gulf of Mexico	10.5[1]	16.1
15	Located approximately 3.21 miles west of the Escambia-Santa Rosa County boundary on Santa Rosa Island at the Gulf of Mexico	10.5[1]	16.1
16	Located approximately 1.95 miles west of the Escambia-Santa Rosa County boundary on Santa Rosa Island at the Gulf of Mexico	10.5[1]	16.1
17[3]	Located approximately 220 feet east of the Escambia-Santa Rosa County boundary on Santa Rosa Island at the Gulf of Mexico	10.5[1]	16.1
18	An extension of Transect 4 across Big Lagoon in a northerly direction, located approximately 1.23 miles east of the intersection of Don Carlos Road and Innerarity Lane	8.0	11.7

[1] Includes wave setup of 2.5 feet.
[2] Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM.
[3] Located in Santa Rosa County, Florida; not shown on FIRM.

TABLE 8 - TRANSECT DESCRIPTIONS - continued

Transect	Location	Elevation (Feet NAVD 88) Stillwater 100-Year[1]	Elevation (Feet NAVD 88) Maximum Wavecrest 100-Year[2]
19	An extension of Transect 5 across Big Lagoon in a northerly direction, located approximately 0.5 mile west of the intersection of Gulf Beach Highway and Constance Street	8.0	11.1
20	An extension of Transect 6 across Big Lagoon in a northerly direction, located approximately 0.3 mile west of Sherman Cove	8.0	12.0
21	Located approximately 0.39 mile southwest of the intersection of San Carlos Road and Hovey Road, extending from Pensacola Bay in a northerly direction	8.0	12.3
22	Located approximately 0.8 mile east of the intersection of Taylor Road and Murray Road, extending from Pensacola Bay into Chevalier Field in a northwesterly direction	8.0	12.3
23	Located approximately 0.8 mile east of the intersection of Taylor Road and Murray Road, extending from Pensacola Bay into Chevalier Field in a northwesterly direction	8.0	12.3
24	Located approximately 0.66 mile east of the intersection of East Sunset Avenue and 2nd Street, extending from Pensacola Bay in a northwesterly direction	7.0	11.8
25	Located approximately 300 feet west of the intersection of Barrancas Avenue and Odess Lane, extending from Pensacola Bay in a northerly direction	8.0	11.9
26	Located approximately 130 feet west of the intersection of West Main Street and South Baylen Street, extending from Pensacola Bay in a northerly direction	7.0	11.5
27	Along the eastern shoreline of the City of Pensacola, approximately 0.5 mile northeast of Emanuel Point in Escambia Bay	5.9	8.5
28	Located approximately 0.6 mile north of Gaberonne in Escambia Bay	6.5	9.4
29	Just south of Lora Point in Escambia Bay	7.2	11.2

[1] Includes wave setup of 2.5 feet.
[2] Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM.

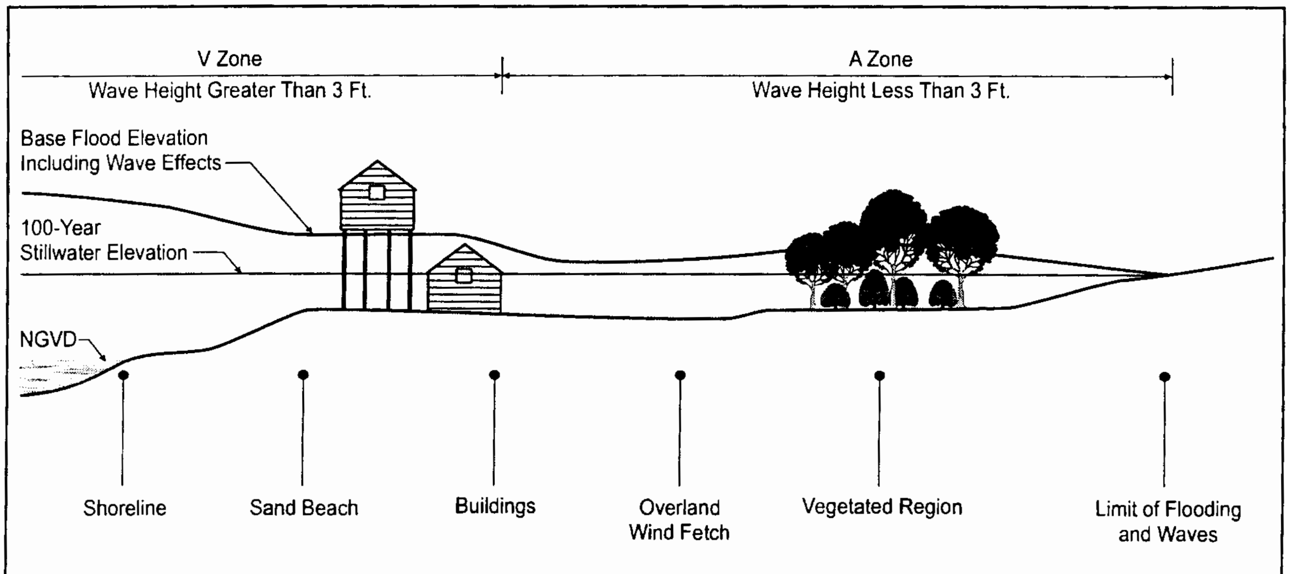
TABLE 8 - TRANSECT DESCRIPTIONS - continued

Transect	Location	Elevation (Feet NAVD 88) Stillwater 100-Year[1]	Elevation (Feet NAVD 88) Maximum Wavecrest 100-Year[2]
30	Approximately 2.3 miles northwest of Lora Point in Escambia Bay	8.1	11.8
31[3]	At the confluence of the Bannahassee River with Escambia Bay	8.4	12.5
32	Within Tarkiln Bay approximately 0.7 mile east of Tarkiln Point in Perdido Bay	4.3	6.6
33	Approximately 0.6 mile northwest of Tarkiln Point in Perdido Bay	4.3	6.5
34	Approximately 1.0 mile southeast of Nix Point in Perdido Bay	4.6	7.1
35	At Perdido Bay Heights just north of Nix Point in Perdido Bay	5.1	7.9
36	At Double Point in Perdido Bay	5.6	8.7
37	Approximately 1.2 miles northeast of Millview in Perdido Bay	6.4	9.8
38	Just south of Ramsey Beach in Perdido Bay	6.6	10.2
39	Approximately 0.8 mile west of Chambers Point in Perdido Bay	6.7	10.3
40[4]	Approximately 1.5 miles south of the confluence of the Perdido River with Perdido Bay	6.1	8.0

[1] Includes wave setup of 2.5 feet.
[2] Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM.
[3] Located in Santa Rosa County, Florida; not shown on FIRM.
[4] Located in Baldwin County, Alabama; not shown on FIRM.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. The results of this analysis are summarized in Table 9, "Transect Data."

Because of map scale limitations, base flood elevations shown on the FIRM represent average elevations for the zones depicted in Figure 2, "Transect Schematic," represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the AN zone boundary.



TRANSECT SCHEMATIC Figure 2

TABLE 9 - TRANSECT DATA

Flooding Source	Stillwater Elevation 10-Percent	2-Percent	1-Percent	0.2-Percent	Zone	Base Flood Elevation (Feet NAVD)[2]
GULF OF MEXICO Transects 1-17	4.0	6.8	10.5[1]	11.0	VE AE	11-16 8-12
BIG LAGOON Transects 18-20	*	*	8.0	*	VE AE	10-12 8-10
PENSACOLA BAY Transects 21-26	*	*	8.0	*	VE AE	9-12 7-11
SANTA ROSA SOUND Entire Sound Within Escambia Bay	*	*	8.0	*	VE	10-12
ESCAMBIA BAY Transect 27	2.8	5.0	5.9	7.3	VE AE	8-9 6-8
Transect 28	3.0	5.5	6.5	7.9	VE AE	9 7-9
Transect 29	3.3	6.2	7.2	9.0	VE AE	9-11 7-9
Transect 30	3.8	7.0	8.1	10.2	VE AE	10-12 8-10
Transect 31	3.9	7.3	8.4	10.6	VE AE	12-13 10
PERDIDO BAY Transects 32 And 33	1.8	*	4.3	5.5	VE AE	6-7 4-6
Transect 34	2.0	*	4.6	6.1	VE AE	7 5-7
Transect 35	2.2	*	5.1	7.2	VE AE	7-9 5-9
Transect 36	2.3	*	5.6	7.2	VE AE	8-9 6-8
Transect 37	2.7	*	6.4	8.4	VE AE	8-10 6-8
Transect 38	2.8	*	6.6	8.6	VE AE	9-10 6-8
Transect 39	2.9	*	6.7	8.6	VE AE	9-10 7-9
Transect 40	2.6	*	6.1	8.0	VE	6-8

[1] Includes wave setup of 2.5 feet.
[2] Because of map scale limitations, the maximum wave elevation may not be shown on the FIRM represent average elevations for the zones depicted.
* Data not available.

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps, aerial photographs, and engineering judgment (References 4, 5, and 40). Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

In addition to the wave height analysis, wave runup was examined along the Atlantic Ocean coastline of Santa Rosa Island. Wave runup was computed using the methodology presented in the USACE Shore Protection Manual (Reference 37). The areas of Santa Rosa Island that were affected by wave runup were designated as shallow flooding areas with a depth of 1 foot.

All elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88). Elevation reference marks (ERMs) used in this study, and their descriptions, are shown on the FIRM. ERMs shown on the FIRM represent those used during the preparation of this and previous FISs. The elevations associated with each ERM were obtained and/or developed during FIS production to establish vertical control for determination of flood elevations and floodplain boundaries shown on the FIRM. Users should be aware that these ERM elevations may have changed since the publication of this FIS. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

3.5 Vertical Datum

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

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 100-year floodplain data, which may include a combination of the following: 10-, 50-, 100-, and 500-year flood elevations; delineations of the 100-year and 500-year floodplains; and 100-year floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section.

For Thompson Bayou and the Escambia River downstream of State Route 184, the boundaries were interpolated between cross sections using topographic maps at a scale of 1:24,000 with a contour interval of 5 or 10 feet (References 4 and 5). For the remaining streams studied in detail, the boundaries were interpolated between cross sections using topographic maps at a scale of 1:24,000 with a contour interval of 5 or 10 feet and aerial photographs at a scale of 1:3,600 with a contour interval of 2.5 feet (References 4, 5, and 22).

For each coastal flooding source studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 5 feet and 2 meters or 10 feet (References 4 and 5, respectively).

The boundaries for the shallow flooding areas on Bayou Grande, Bridge Creek, Jones Creek, and Tributary to Bayou Marcus were delineated on topographic maps at a scale of 1:24,000 with a contour interval of 5 or 10 feet and aerial photographs at a scale of 1:3,600 with a contour interval of 2.5 feet (References 4, 5, and 22).

For the flooding sources studied by approximate methods, the floodplain boundaries were based on the results of the previous FISs/FIRMs, which have been checked for reasonableness using topographic maps and aerial photographs (References 41, 42, 43, 44, 4, 5, and 22).

The 100- and 500-year floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 100-year floodplain boundaries correspond to the boundaries of the areas of special flood hazard (Zones A, AE, AH, AO, and VE), and the

500-year floodplain boundaries correspond to the boundaries of areas of moderate flood hazards. In cases where the 100-and 500-year floodplain boundaries are close together, only the 100-year floodplain boundaries have been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundaries are shown on the FIRM (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 10, "Floodway Data"). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

As shown on the FIRM, the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year floodplain are either close together or collinear, only the floodway boundary has been shown.

Portions of the floodway of the Escambia River lie outside the county boundary.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe thus encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bayou Grande								
A	0[1]	170	959	2.2	11.3	11.3	12.3	1.0
B	3,321[1]	70	341	2.2	18.8	18.8	19.8	1.0
Tributary 1 to Bayou Grande								
A	450[2]	8	19	2.2	10.0	7.3[3]	8.3	1.0
B	2,050[2]	19	22	2.5	14.8	14.8	15.0	0.2
Tributary 2 to Bayou Grande								
A	1,122[2]	65	100	1.9	15.7	15.7	15.7	0.0
B	1,747[2]	15	49	3.9	17.7	17.7	18.4	0.7
C	2,452[2]	82	106	1.2	18.4	18.4	18.9	0.4
Tributary 3 to Bayou Grande								
A	2,778[2]	41	143	5.7	9.1	9.1	10.0	0.9
B	5,263[2]	85	226	3.6	17.2	17.2	17.2	0.0
C	6,158[2]	20	75	4.3	17.8	17.7	17.7	0.0
D	6,751[2]	35	111	2.9	21.6	21.6	22.2	0.6
E	7,886[2]	900	2,016	0.2	24.5	24.5	25.5	1.0
F	8,622[2]	285	490	0.6	24.6	24.6	25.5	0.9
G	9,274[2]	110	435	0.7	24.7	24.7	25.6	0.9
Tributary 4 to Bayou Grande								
A	515[2]	100	126	4.2	7.5	7.0[3]	7.6	0.6
B	914[2]	86	178	3.0	9.2	9.2	9.9	0.7
C	1,322[2]	42	209	1.2	12.6	12.6	13.2	0.6
D	1,737[2]	85	505	0.5	12.7	12.7	13.3	0.6
E	2,145[2]	32	178	1.4	16.2	16.2	16.8	0.5
F	2,735[2]	34	175	1.4	16.3	16.3	16.9	0.6

[1] Feet above Blue Angel Parkway.
[2] Feet above confluence with Bayou Grande.
[3] Elevation computed without consideration of backwater effects from Bayou Grande.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

BAYOU GRANDE – TRIBUTARY 1, 2, 3 AND 4 TO BAYOU GRANDE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bayou Marcus								
A	0[1]	165	1,902	4.4	11.8	11.8	12.8	1.0
B	2,800[1]	719	7,608	1.1	14.0	14.0	15.0	1.0
C	6,409[1]	595	3,480	2.4	15.9	15.9	16.8	0.9
D	10,780[1]	858	6,874	1.2	18.1	18.1	19.1	1.0
E	15,560[1]	241	1,515	3.8	22.9	22.9	23.9	1.0
F	20,170[1]	635	3,758	1.5	25.4	25.4	26.4	1.0
G	24,038[1]	163	1,467	3.9	33.4	33.4	34.4	1.0
H	24,488[1]	533	5,707	1.0	34.0	34.0	35.0	1.0
I	24,609[1]	827	13,263	0.4	41.7	41.7	42.7	1.0
J	28,185[1]	182	1,280	3.1	41.8	41.8	42.7	0.9
K	30,566[1]	160	1,722	2.3	42.3	42.3	43.3	1.0
L	34,786[1]	194	653	6.2	57.8	57.8	58.6	0.8
M	35,691[1]	115	1,086	3.7	64.9	64.9	65.8	0.9
N	39,751[1]	192	1,518	2.4	75.8	75.8	76.8	1.0
O	43,701[1]	139	1,208	0.6	107.9	107.9	108.4	0.5
Tributary to Bayou Marcus								
A	1,400[2]	163	1,080	1.2	13.4	12.5[3]	13.5	1.0
B	5,414[2]	127	729	1.8	19.0	19.0	20.0	1.0
C	11,184[2]	422	1,925	0.2	21.6	21.6	22.6	1.0

[1] Feet above Blue Angel Parkway.
[2] Feet above confluence with Bayou Marcus.
[3] Elevation computed without consideration of backwater effects from Bayou Marcus.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

BAYOU MARCUS – TRIBUTARY TO BAYOU MARCUS

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bridge Creek								
A	3,486[1]	194	1,664	1.7	6.4	6.4	7.4	1.0
B	5,997[1]	88	1,418	1.4	6.6	6.6	7.6	1.0
C	9,792[1]	85	524	3.7	14.2	14.2	15.2	1.0
D	11,157[1]	108	687	1.1	16.7	16.7	17.7	1.0
E	13,912[1]	14	92	5.0	25.1	25.1	26.0	0.9
F	15,995[1]	31	183	2.3	26.7	26.7	27.7	1.0
G	19,545[1]	419	980	0.4	27.6	27.6	28.6	1.0
Tributary to Bridge Creek								
A	5 00[2]	69	269	1.7	6.5	6.4[3]	7.4	1.0
B	2,699[2]	24	172	2.6	16.4	16.4	17.1	0.7
C	5,119[2]	143	379	0.3	18.5	18.5	19.5	1.0
D	6,169[2]	133	341	0.3	18.9	18.9	19.9	1.0
Tributary to Bridge Creek (East)								
A	0[2]	20	105	3.4	16.0	13.4[3]	14.4	1.0
B	1,385[2]	12	66	5.4	19.4	19.4	20.4	1.0
Tributary to Bridge Creek (West)								
A	0[2]	25	190	1.2	16.5	15.2[3]	16.2	1.0
B	704[2]	50	259	0.9	20.0	20.0	20.0	0.0
C	2,654[2]	50	199	1.2	23.7	23.7	23.9	0.2

[1] Feet above mouth.

[2] Feet above confluence with Bridge Creek.

[3] Elevation computed without consideration of backwater effects from Bridge Creek.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

BRIDGE CREEK – TRIBUTARY TO BRIDGE CREEK – TRIBUTARY TO BRIDGE CREEK (EAST) – TRIBUTARY TO BRIDGE CREEK (WEST)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Carpenter Creek								
A	1,120[1]	169	1,215	4.5	8.1	8.1	9.1	1.0
B	3,527[1]	210	1,384	3.9	13.7	13.7	14.7	1.0
C	4,197[1]	349	2,406	2.3	16.0	16.0	17.0	1.0
D	5,005[1]	61	780	4.7	19.0	19.0	19.8	0.9
E	6,297[1]	174	1,264	2.9	21.9	21.9	22.8	1.0
F	7,796[1]	191	2,232	0.9	27.0	27.0	27.9	1.0
G	8,850[1]	74	677	5.4	27.3	27.3	28.2	0.9
H	10,979[1]	77	800	4.6	35.5	35.5	36.4	0.9
I	12,752[1]	99	584	6.2	42.6	42.6	42.8	0.2
J	14,517[1]	149	1,225	3.0	49.5	49.5	50.5	1.0
K	16,033[1]	105	1,840	2.5	63.1	63.1	63.1	0.0
L	17,920[1]	248	2,797	1.1	63.5	63.5	63.8	0.3
M	18,869[1]	207	1,888	1.6	63.9	63.9	64.9	1.0
N	19,980[1]	102	699	1.7	64.1	64.1	65.1	1.0
O	22,669[1]	48	573	3.0	80.0	80.0	80.6	0.5
P	23,833[1]	97	444	2.7	83.0	83.0	84.0	1.0
Tributary to Carpenter Creek								
A	287[2]	92	92	1.8	64.1	64.1	64.1	0.0
B	3,057[2]	68	68	3.3	78.5	78.5	78.5	0.0
C	4,299[2]	186	186	3.1	84.3	84.3	84.3	0.0

[1] Channel distance in feet upstream of 12th Avenue.
[2] Channel distance in feet upstream of confluence with Carpenter Creek main branch.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

CARPENTER CREEK – TRIBUTARY TO CARPENTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Elevenmile Creek								
A	7,430[1]	1,070	8,314	2.4	9.0	9.0	10.0	1.0
B	11,760[1]	882	11,010	1.8	12.8	12.8	13.8	1.0
C	17,420[1]	937	10,392	1.9	16.7	16.7	17.7	1.0
D	21,260[1]	1,158	12,248	1.3	19.3	19.3	20.3	1.0
E	23,940[1]	1,137	11,971	1.3	20.9	20.9	21.9	1.0
F	27,380[1]	1,129	9,779	1.6	23.9	23.9	24.9	1.0
G	30,119[1]	240	3,336	4.6	27.6	27.6	28.6	1.0
H	34,589[1]	642	6,108	2.5	31.8	31.8	32.7	0.9
I	43,389[1]	430	3,684	2.9	39.1	39.1	40.0	0.9
J	46,430[1]	244	2,742	4.0	42.1	42.1	43.1	1.0
K	48,152[1]	299	3,224	3.4	43.7	43.7	44.7	1.0
L	50,853[1]	123	1,601	6.6	47.0	47.0	47.9	0.9
M	53,579[1]	168	2,319	4.6	52.5	52.5	53.2	0.7
N	56,169[1]	360	4,245	2.5	56.5	56.5	57.3	0.8
O	61,139[1]	142	1,602	3.2	62.3	62.3	63.3	1.0
P	65,070[1]	129	1,071	4.8	67.9	67.9	68.8	0.9
Tributary to Elevenmile Creek								
A	0[2]	580	3,180	0.7	35.5	31.3[3]	32.3	1.0
B	1,218[2]	48	344	6.7	36.3	36.3	36.3	0.0
C	2,191[2]	67	839	2.8	38.2	38.2	39.0	0.8
D	3,782[2]	415	3,601	0.6	38.4	38.4	39.4	1.0
E	5,102[2]	78	231	10.0	39.9	39.9	39.9	0.0
F	6,927[2]	240	1,098	1.2	46.8	46.8	46.8	0.0
G	8,227[2]	297	405	3.3	48.6	48.6	48.6	0.0
H	11,177[2]	635	1,113	1.2	64.1	64.1	64.1	0.0
I	13,710[2]	351	644	1.0	69.5	69.5	69.5	0.0
J	14,578[2]	27	82	7.4	72.3	72.3	72.3	0.0

[1] Feet above confluence with Perdido Bay.
[2] Feet upstream of confluence with Elevenmile Creek.
[3] Elevation computed without consideration of backwater effects from Elevenmile Creek.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

ELEVENMILE CREEK – TRIBUTARY TO ELEVENMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Eightmile Creek								
A	1,300	287	3,013	2.2	20.1	20.1	21.1	1.0
B	4,100	485	3,374	1.9	22.2	22.2	23.2	1.0
C	6,555	137	1,337	4.4	28.1	28.1	29.1	1.0
D	8,645	422	3,137	1.9	33.5	33.5	34.5	1.0
E	10,851	218	1,588	3.7	39.8	39.8	40.8	1.0
F	14,931	537	3,476	1.1	50.1	50.1	51.1	1.0
G	18,985	105	1,229	3.1	66.1	66.1	66.9	0.8
H	21,803	190	1,204	3.2	73.8	73.8	74.8	1.0
I	22,026	166	1,344	2.9	74.3	74.3	75.0	0.7
J	23,513	165	618	6.2	79.5	79.5	80.3	0.8
K	24,156	135	921	2.2	81.0	81.0	81.9	0.9
L	27,131	135	613	3.2	98.7	98.7	99.7	1.0
M	27,447	112	704	2.8	100.8	100.8	101.8	1.0
N	28,046	283	1,519	1.3	101.8	101.8	102.8	1.0
O	30,073	39	150	2.4	104.0	104.0	105.0	1.0

[1] Feet above confluence with Elevenmile Creek.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

EIGHTMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Escambia River (continued)								
W	200,492[1]	10,827[4]	198,320	0.8	45.8	45.8	46.8	1.0
X	211,172[1]	15,785[4]	267,611	0.6	46.9	46.9	47.9	1.0
Y	217,572[1]	10,560[4]	166,225	0.9	47.6	47.6	48.6	1.0
Z	222,972[1]	7,733[4]	102,943	1.5	48.8	48.8	49.8	1.0
AA	235,122[1]	8,844[4]	130,894	1.2	52.4	52.4	53.4	1.0
AB	243,542[1]	8,008[4]	133,538	1.1	54.4	54.4	55.4	1.0
AC	253,392[1]	8,617[4]	150,661	1.0	56.4	56.4	57.4	1.0
AD	261,042[1]	8,022[4]	142,296	1.1	57.6	57.6	58.6	1.0
AE	269,291[1]	8,694[4]	94,530	1.5	58.9	58.9	59.9	1.0
Garcon Swamp								
A	0[2]	32	285	4.4	4.9	4.9	5.9	1.0
B	2,595[2]	254	1,280	1.0	10.8	10.8	11.8	1.0
C	5,370[2]	59	420	2.8	16.6	16.6	17.6	1.0
D	10,610[2]	447	1,277	0.9	17.8	17.8	18.8	1.0
E	23,025[2]	138	556	0.7	20.7	20.7	21.7	1.0
Jones Creek								
A	10[3]	33	311	6.1	13.5	12.9	12.9	0.0
B	2,625[3]	118	905	2.1	15.4	15.4	16.3	0.9
C	4,655[3]	688	3,967	0.5	16.7	16.7	17.7	1.0
D	5,905[3]	539	2,582	0.7	17.2	17.2	18.2	1.0
E	7,385[3]	613	3,653	0.5	18.8	18.8	19.8	1.0
F	10,701[3]	65	429	2.6	23.3	23.3	23.9	0.6
G	16,391[3]	54	471	1.0	23.7	23.7	24.7	1.0
H	19,371[3]	200	409	1.1	24.5	24.5	25.5	1.0

[1]Feet above U.S. Route 90.
[2] Feet above Sorrento Road.
[3] Feet above Navy Boulevard.
[4] This width extends beyond county boundary.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

ESCAMBIA RIVER – GARCON SWAMP – JONES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Escambia River								
A[4]	260	11,754	36,963	5.7	10.0	1.5[3]	2.4	0.9
B[4]	9,610	13,210	130,016	1.6	9.0	8.4[3]	8.7	0.3
C	14,210	11,092	138,573	1.5	10.8	10.8	11.3	0.5
D	23,510	8,356	139,970	1.5	15.3	15.3	16.2	0.9
E	30,970	9,500	179,667	1.2	18.1	18.1	19.0	0.9
F	39,920	10,890	191,767	1.1	20.3	20.3	21.1	0.8
G	50,110	12,510	244,300	0.9	22.4	22.4	23.3	0.9
H	56,790	9,645	181,617	1.2	23.5	23.5	24.4	0.9
I	64,350	8,944	167,420	1.3	25.2	25.2	26.0	0.8
J	66,500	5,607	72,627	2.2	25.8	25.8	26.8	1.0
K	73,502	13,330	287,920	0.6	26.5	26.5	27.5	1.0
L	80,602	11,236	221,985	0.7	27.0	27.0	28.0	1.0
M	87,632	12,431	233,338	0.7	27.7	27.7	28.7	1.0
N	97,812	11,363	229,219	0.7	28.7	28.7	29.7	1.0
O	111,852	13,812	274,559	0.6	29.5	29.5	30.5	1.0
P	125,662	15,659	279,608	0.6	30.2	30.2	31.2	1.0
Q	143,062	9,964	142,340	1.1	31.7	31.7	32.7	1.0
R	150,242	9,397	154,267	1.0	33.6	33.6	34.6	1.0
S	163,342	11,869	204,753	0.8	35.8	35.8	36.8	1.0
T	173,042	10,237	150,152	1.0	37.5	37.5	38.5	1.0
U	179,742	5,863	98,286	1.6	39.6	39.6	40.6	1.0
V	193,392	7,136	118,512	1.3	44.4	44.4	45.4	1.0

[1] Feet above U.S. Route 90.
[2] This width extends beyond county boundary.
[3] Elevation computed without consideration of storm surge effects from Escambia Bay.
[4] Cross section located within Escambia Bay storm surge area; not shown on profile.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

ESCAMBIA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Weekley Bayou								
A	0[1]	71	426	3.5	5.5	5.5	6.5	1.0
B	3,750[1]	290	905	0.7	11.8	11.8	12.8	1.0
C	6,450[1]	200	651	1.0	17.2	17.2	18.2	1.0
D	8,950[1]	163	353	0.5	21.5	21.5	22.5	1.0
Tributary to Weekley Bayou								
A	1,000[2]	202	806	1.0	15.4	15.4	16.4	1.0
B	6,100[2]	308	1,409	0.4	21.9	21.9	22.9	1.0

[1] Feet above Bauer Road.
[2] Feet above confluence with Weekley Bayou.

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

WEEKLEY BAYOU – TRIBUTARY TO WEEKLEY BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Pine Barren Creek								
A	0[1]	1,132	12,775	2.9	31.7	28.4[3]	29.3	0.9
B	790[1]	1,119	13,459	2.8	31.7	29.0[3]	29.9	0.9
C	4,710[1]	1,069	16,359	2.3	34.4	34.4	35.4	1.0
D	6,433[1]	950	8,798	4.2	36.7	36.7	37.5	0.8
E	8,784[1]	1,262	13,801	2.7	38.5	38.5	39.5	1.0
F	12,734[1]	986	12,496	3.0	45.4	45.4	46.4	1.0
G	18,454[1]	864	11,504	3.2	51.6	51.6	52.6	1.0
H	22,812[1]	1,944	21,992	1.6	55.3	55.3	56.3	1.0
Thompson Bayou								
A	7,400[2]	150	476	3.7	9.0	4.6[4]	4.8	0.2
B	8,150[2]	150	751	2.3	9.0	6.8[4]	7.2	0.4
C	8,875[2]	120	443	4.0	9.0	7.3[4]	7.6	0.3
D	9,725[2]	103*	327	5.4	9.4	9.4	9.4	0.0
E	11,650[2]	28	179	9.8	19.9	19.9	20.1	0.2

[1] Feet above CSX Transportation.
[2] Feet above confluence with Escambia River.
[3] Elevation computed without consideration of backwater effects from the Escambia River.
[4] Elevation computed without consideration of backwater effects from Escambia Bay.

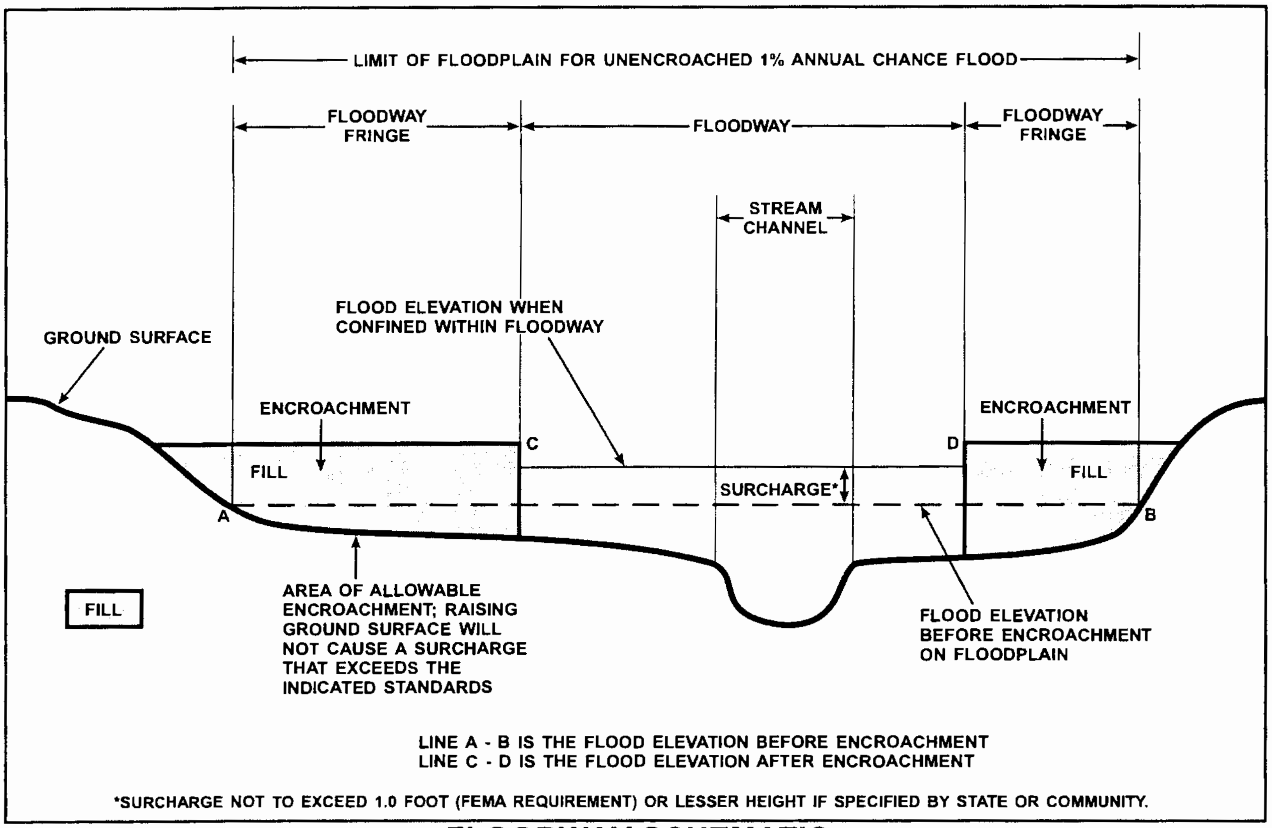
TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

PINE BARREN CREEK – THOMPSON BAYOU



FLOODWAY SCHEMATIC Figure 3

5.0 INSURANCE APPLICATIONS

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

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

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

6.0 FLOOD INSURANCE RATE MAP

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

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. On selected FIRM panels, floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Escambia County. Previously, separate Flood Hazard Boundary Maps and/or FIRMS were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including the January 21, 1998, countywide FIS, are presented in Table 11, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Century, Town of	December 6, 1974	None	August 4, 1987	January 21, 1998
Escambia County (Unincorporated Areas)	December 13, 1974	None	September 30, 1977	August 19, 1987 September 17, 1992 April 17, 1995 January 21, 1998
Pensacola, City of	September 6, 1974	February 27, 1976	September 15, 1977	August 19, 1987 January 21, 1998
Pensacola Beach-Santa Rosa Island Authority	May 26, 1970	None	September 28, 1973	July 1, 1974 November 26, 1976 August 19, 1987 August 18, 1992 June 20, 1995 January 21, 1998

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

FISs have been prepared for the Baldwin County, Alabama and Incorporated Areas; Santa Rosa County, Florida and Incorporated Areas; and the Town of Flomaton, Alabama (References 45, 46, and 47).

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Escambia County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FBFMs, and FIRMs, for all of the incorporated and unincorporated jurisdictions within Escambia County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Federal Insurance and Mitigation Administration, Koger Center-Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Commerce, Bureau of the Census, 2000 Census of Population, Number of Inhabitants, State of Florida, Washington, D.C., U.S. Government Printing Office, 2003.

2. Barrett Daflin, and Carlan, Inc., and Baskerville-Donovan Engineers, Inc., Southwest Escambia County Stormwater Management Plan, Pensacola, Florida, 1988.

3. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey Escambia County, Florida, Washington, D.C., 1960.

4. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet: Lillian, Florida-Alabama, 1987; West Pensacola, Florida-Alabama, 1987; Perdido Bay, Florida, 1987; Fort Barrancas, Florida, 1987.

5. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 Feet: Walnut Hill, Florida, 1978; Bratt, Florida, 1978; Century, Florida, 1978; Enon, Florida, 1978; Bay Springs, Florida 1978; McDavid, Florida, 1978; Barrineau Park, Florida, 1978; Molino, Florida, 1987; Seminole, Florida, 1987; Cantonment, Florida, 1987; Pace, Florida, 1987; Wallace, Florida, 1987; Jay, Florida, 1987; Chumuckla, Florida, 1978; Polard, Alabama, 1986; Foley, Alabama [Contour Interval 2 meters], 1980; Flomaton, Alabama, 1986; Dyas, Alabama, 1978; Dogwood Creek, Alabama, 1978; Atmore, Alabama, 1986; Gatewood, Alabama, 1978.

6. U.S. Department of the Interior, Geological Survey, Northwest Florida Water-Data Report FL-92-4, Water Resources Data: Florida Water Year 1992, Vol. 4, Tallahassee, Florida, 1992.

7. Stottler Stagg & Associates, in association with the U.S. Army Corps of Engineers, Mobile District, Development of Flood Damage Reduction Measures in 16-County Area, August 1977.

8. GKY & Associates, Inc., in cooperation with the Federal Emergency Management Agency, Hurricane Surge Model, Florida Panhandle Communities, December 1982.

9. Barrett, Daffin, and Carlan, Inc., Escambia County, City of Pensacola, and Town of Century Stormwater Drainage Master Plan: Drainage Stricture Inventory, Pensacola, Florida, 1991.

10. U.S. Department of the Interior, Geological Survey, Water-Supply Paper 1674, Magnitude and Frequency of Floods in the United States: Part 2B. South Atlantic Slope and Eastern Gulf of Mexico Basins, Washington, D.C., 1966.

11. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17A, Washington, D.C., June 1977.

12. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package (Version 4.0.1 E), Davis, California, May 1991.

13. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Training Document No. 10, Introduction and Application of Kinematic Wave Routing Techniques Using HEC-1, Davis, California, 1979.

14. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Technical Paper No. 95, Infiltration and Soil Moisture Redistribution in HEC-1, Davis, California, 1984.

15. U.S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981, Revised March 1982.

16. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 82-4012, Techniques for Estimating Magnitude and Frequency of Floods on Natural-Flow Streams in Florida, Washington, D.C., 1982.

17. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 55, Urban Hydrology for Small Watersheds, Washington, D.C., January 1975.

18. Florida Department of Transportation, Aerial Photographs of Escambia County, Florida, Scale 1:25,000, March 1992.

19. T.R. Pratt, P.F. McGinty, G.Z. Guo, W.C. Hunner, and E.F. Songer, Stormwater Assessment of the Bayou Chico Watershed, Escambia County, Florida: Surface Water Improvement and Master Plan, Draft of Water Resources Special Report 92-6, Havana, Florida: Northwest Florida Water Management District, 1992.

20. U.S. Department of Agriculture, Soil Conservation Service, Hydrology: National Engineering Handbook (Section 4), Water Resources Publications, Littleton, Colorado, 1985.

21. P.B. Bedient and W.C. Huber, Hydrology and Floodplain Analysis, Addison-Wesley, New York, 1988.

22. Woolpert Consultants, Topographic Aerial Photography, Escambia County, Florida, Scale 1:3,600, Contour Interval 2.5 feet, 1980.

23. U.S. Department of the Interior, Geological Survey, Water-Supply Paper 2339, Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains, Washington, D.C., 1989.

24. Ven Te Chow, Open-Channel Hydraulics, McGraw-Hill, New York, 1959.

25. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Local Climatological Data: Summary Sheet, August 1988, September 1988, June 1989, March 1990, February 1991, March 1991, Pensacola, Florida.

26. U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall l Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Washington, D.C., 1990.

27. Florida Department of Transportation, Drainage Manual, Vol. 2-A, Tallahassee, Florida, 1987.

28. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, November 1976.

29. Florida Department of Transportation, State Road 4 Bridge Plans, Project No. 48140-3509, Tallahassee, Florida, March 1991.

30. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, User's Manual, Davis, California, September 1990.

31. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program Version 4.6.2), Davis, California, May 1991.

32. U.S. Department of Commerce, Environmental Science Services Administration, Technical Memorandum WBTM Hydro 11, Joint Probability Method of Tide Frequency Analysis Applied to Atlantic City and Long Beach Island, New Jersey by Vance A. Meyers, Washington, D.C., April 1970.

33. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Technical Report NWS 15, Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States by Frances P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear, May 1975.

34. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Hurricane Project, Report No. 33, Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States by Howard E. Graham and Dwight B. Nunn, November 1959.

35. Federal Emergency Management Agency, Coastal Flooding Storm Surge Model, Part 1 Methodology, February 1981.

36. Dewberry & Davis, "Coastal Flooding Studies of the Florida Panhandle," report submitted through Woodward-Clyde Federal Services to the Federal Emergency Management Agency, September 15, 1997.

37. U.S. Army Corps of Engineers, Coastal Engineering Research Center, Shore Protection Manual, Vicksburg, Mississippi, 1977.

38. National Academy of Sciences, Methodology for Calculating Wave Action Effects Associated with Storm Surges, Washington, D.C., 1977.

39. Federal Emergency Management Agency, Guidelines and Specifications for Wave Elevation Determination and V Zone Mapping, Washington, D.C., March 1995.

40. Florida Department of Natural Resources, Aerial Photographs, Escambia County, Florida, February 1981.

41. Federal Emergency Management Agency, Flood Insurance Rate Map, City of Century, Escambia County, Florida, Washington, D.C., August 4, 1987 (Flood Insurance Rate Map only).

42. Federal Emergency Management Agency, Flood Insurance Study, City of Pensacola, Escambia County, Florida, Washington, D.C., August 19, 1987.

43. Federal Emergency Management Agency, Flood Insurance Study, Pensacola Beach-Santa Rosa Island Authority, Escambia County, Florida, Washington, D.C., August 19, 1987 (Flood Insurance Study report), June 20, 1995 (Flood Insurance Rate Map).

44. Federal Emergency Management Agency, Flood Insurance Study, Escambia County, Florida (Unincorporated Areas), Washington, D.C., August 19, 1987 (Flood Insurance Study report), April 17, 1995 (Flood Insurance Rate Map).

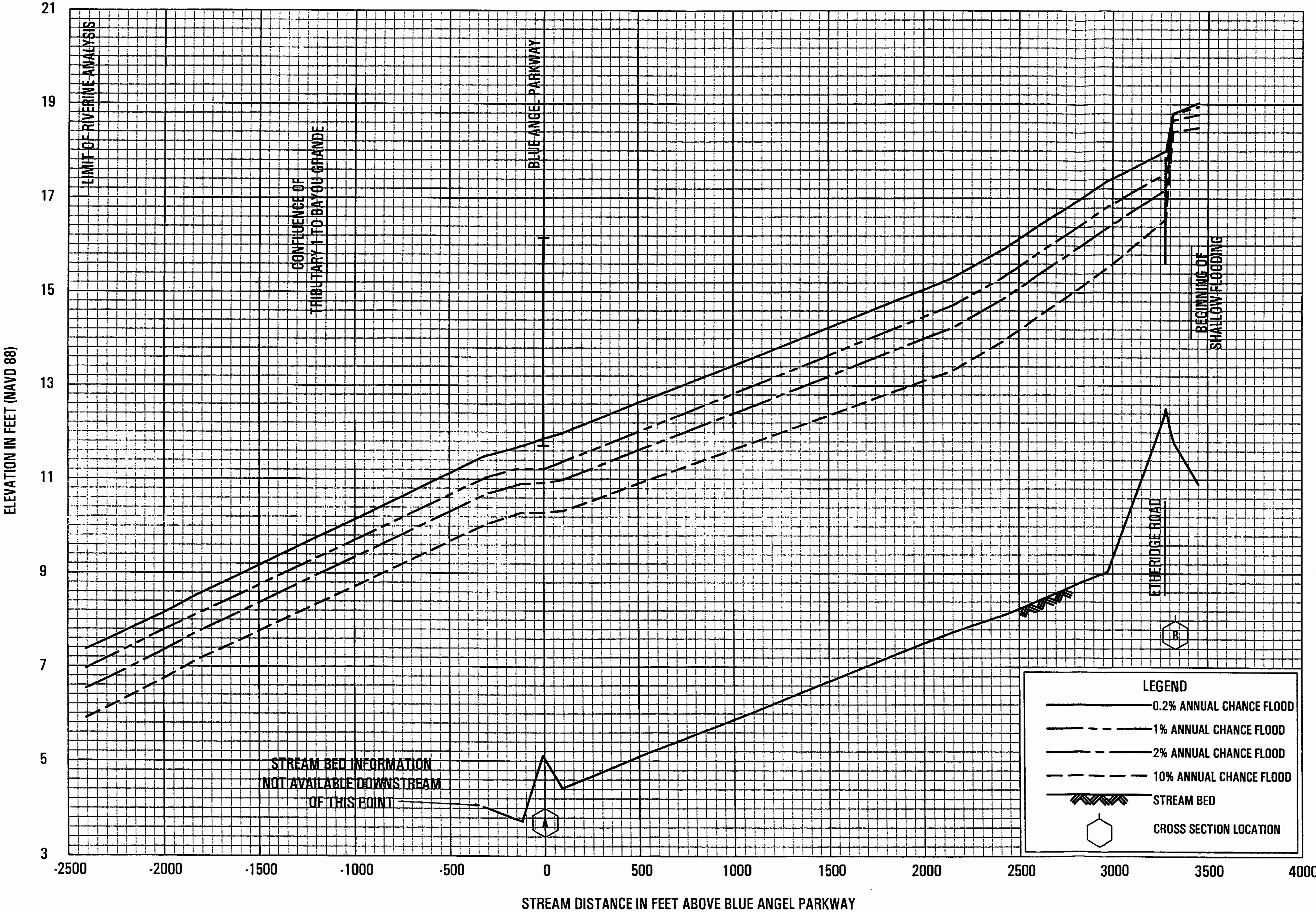
45. Federal Emergency Management Agency, Flood Insurance Study, Baldwin County, Alabama (Unincorporated Areas). Washington, D.C., September 4, 1984 (Flood Insurance Study report), September 20, 1996 (Flood Insurance Rate Map).

46. Federal Emergency Management Agency, Flood Insurance Study, Santa Rosa County, Florida (Unincorporated Areas), Washington, D.C., January 19, 2000.

47. Federal Emergency Management Agency, Flood Insurance Study, Town of Flomaton, Escambia County, Alabama, Washington, D.C., December 17, 1987.

48. Streamline Technologies, Inc., Interconnected Pond Routing (ICPR), version-3.02, Winter Park, Florida, October 23, 2005.

49. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System (Version 3.1), Davis, California, November 2002.



FLOOD PROFILES

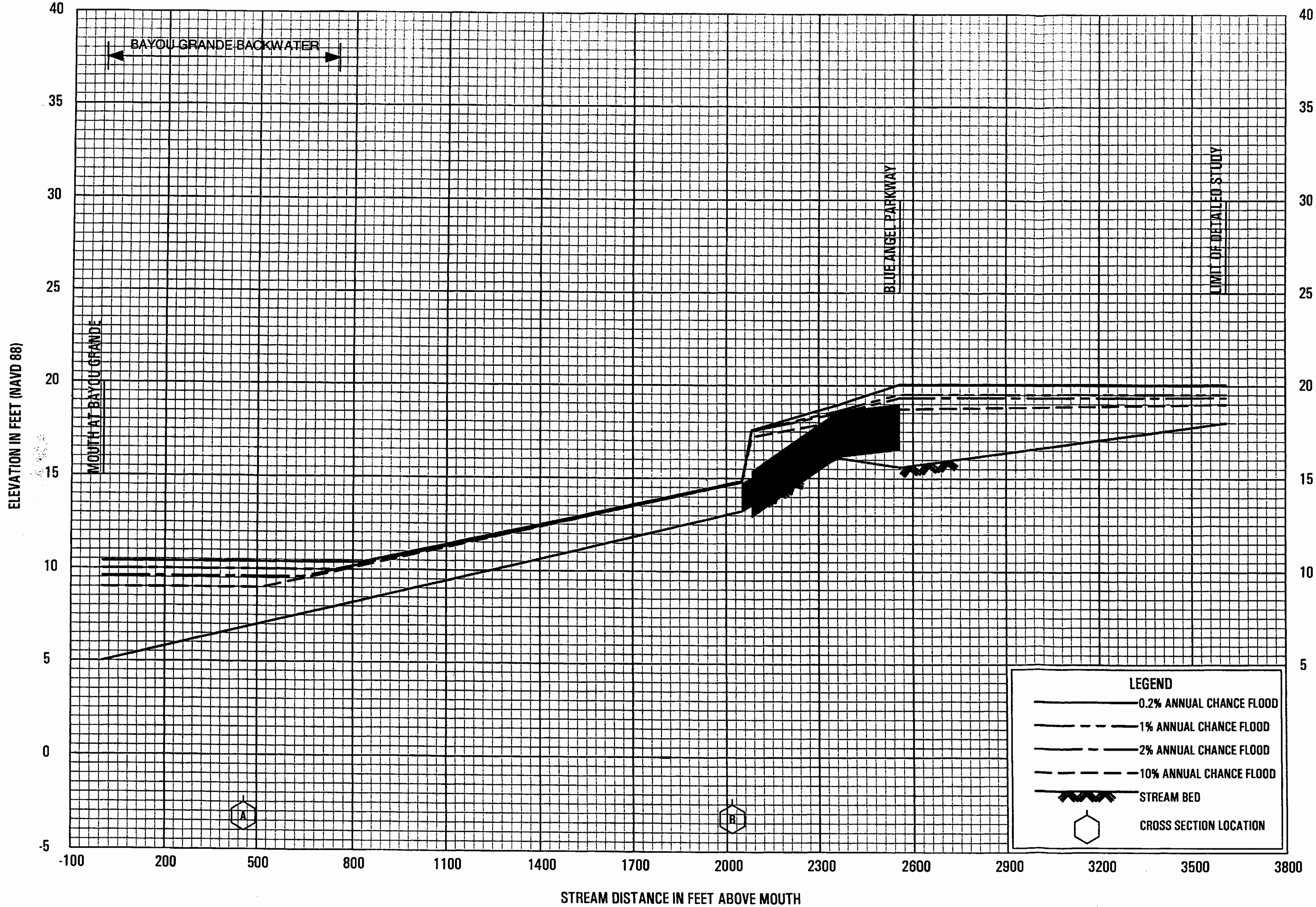
BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

01P



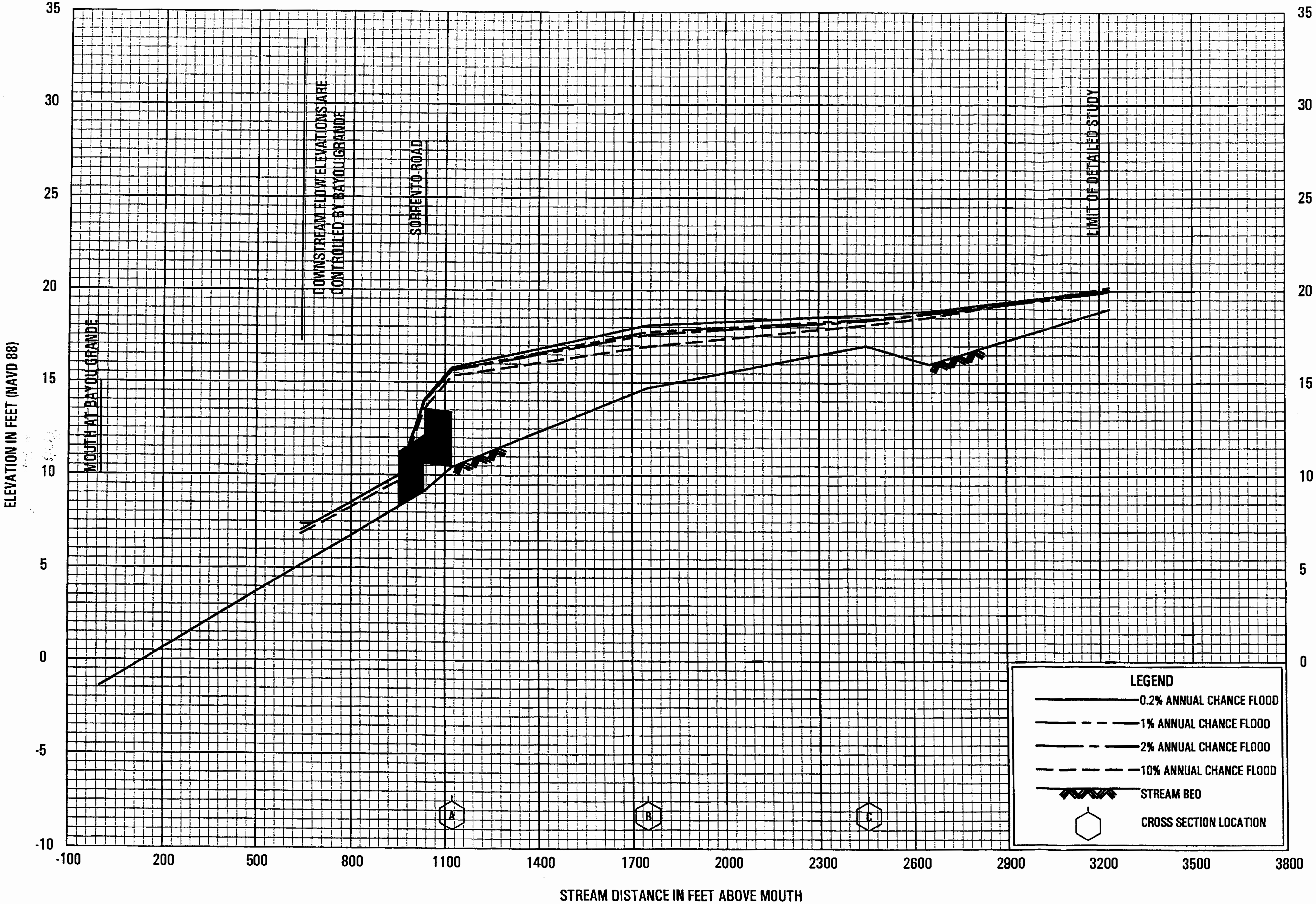
FLOOD PROFILES

TRIBUTARY 1 TO BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA COUNTY



FLOOD PROFILES

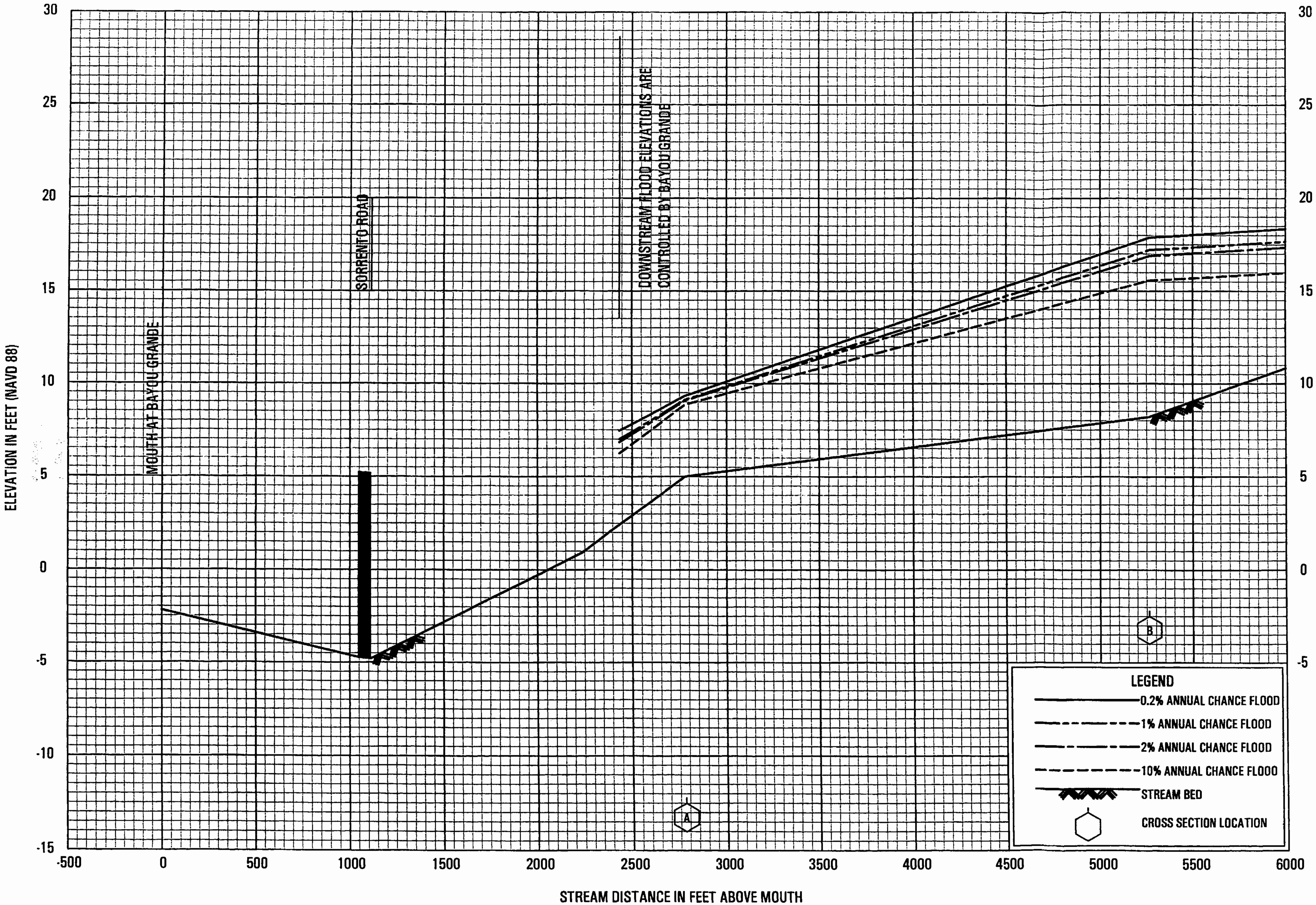
TRIBUTARY 2 TO BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

03P



FLOOD PROFILES

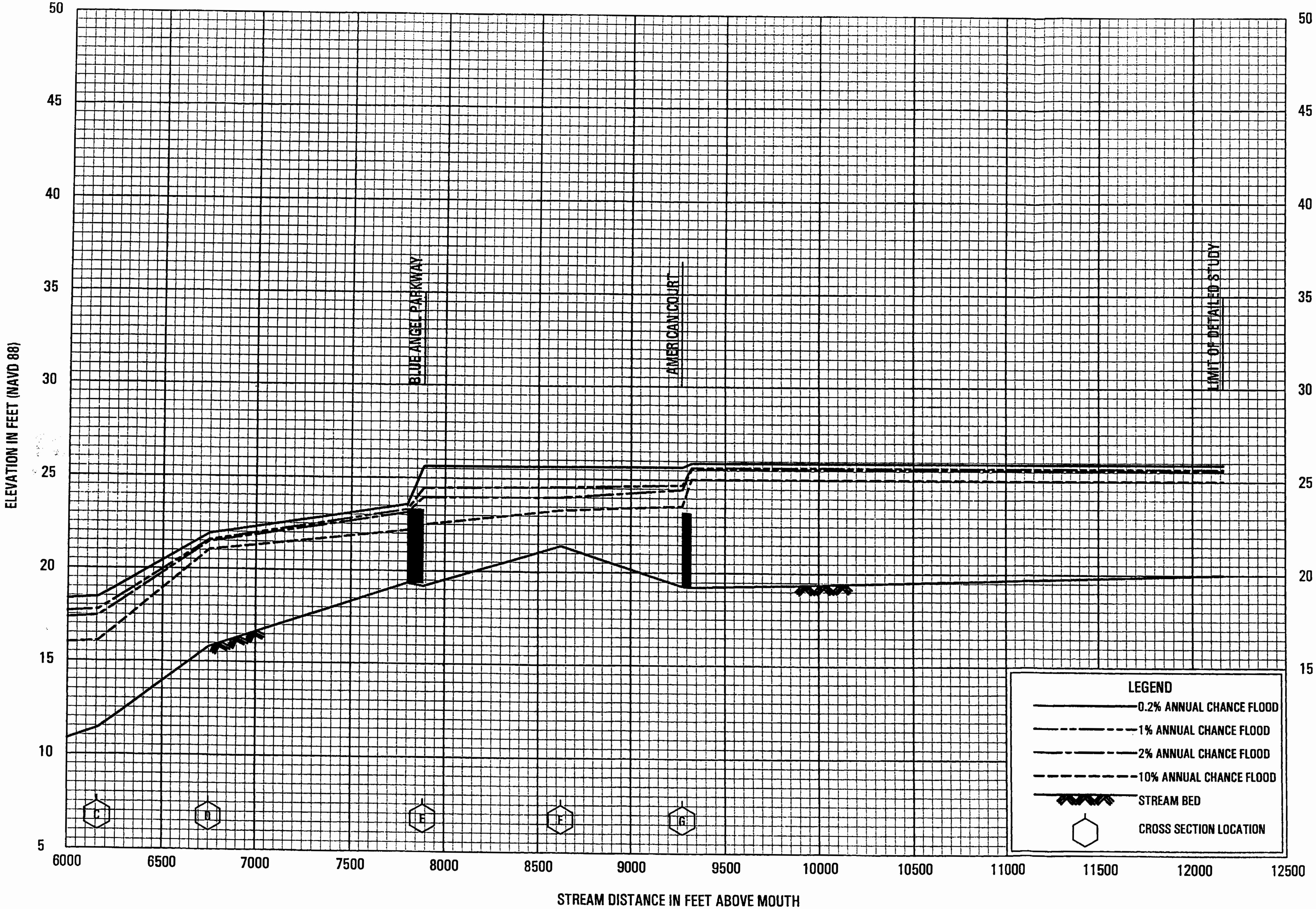
TRIBUTARY 3 TO BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

04P



FLOOD PROFILES

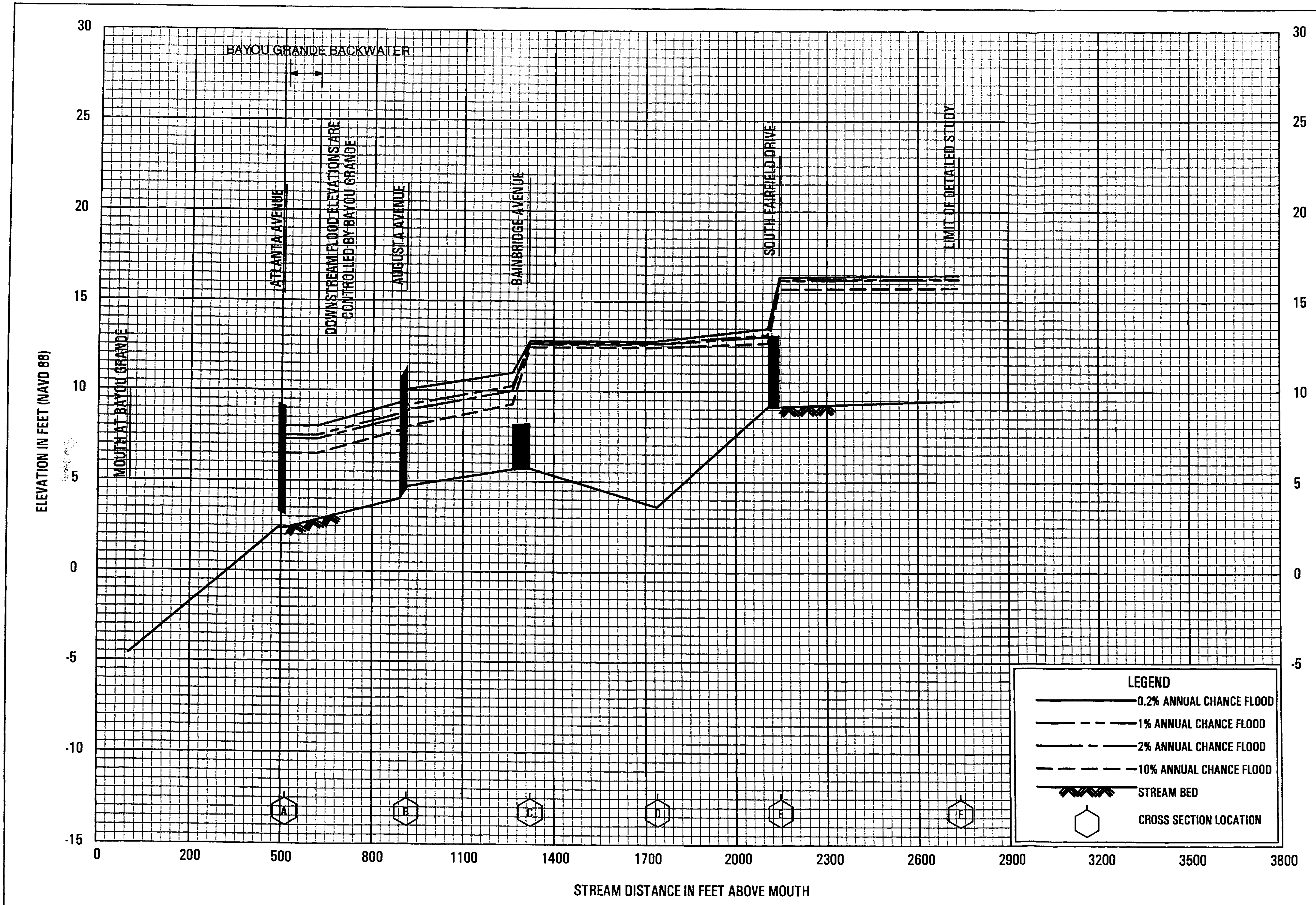
TRIBUTARY 3 TO BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

05P



FLOOD PROFILES

TRIBUTARY 4 TO BAYOU GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

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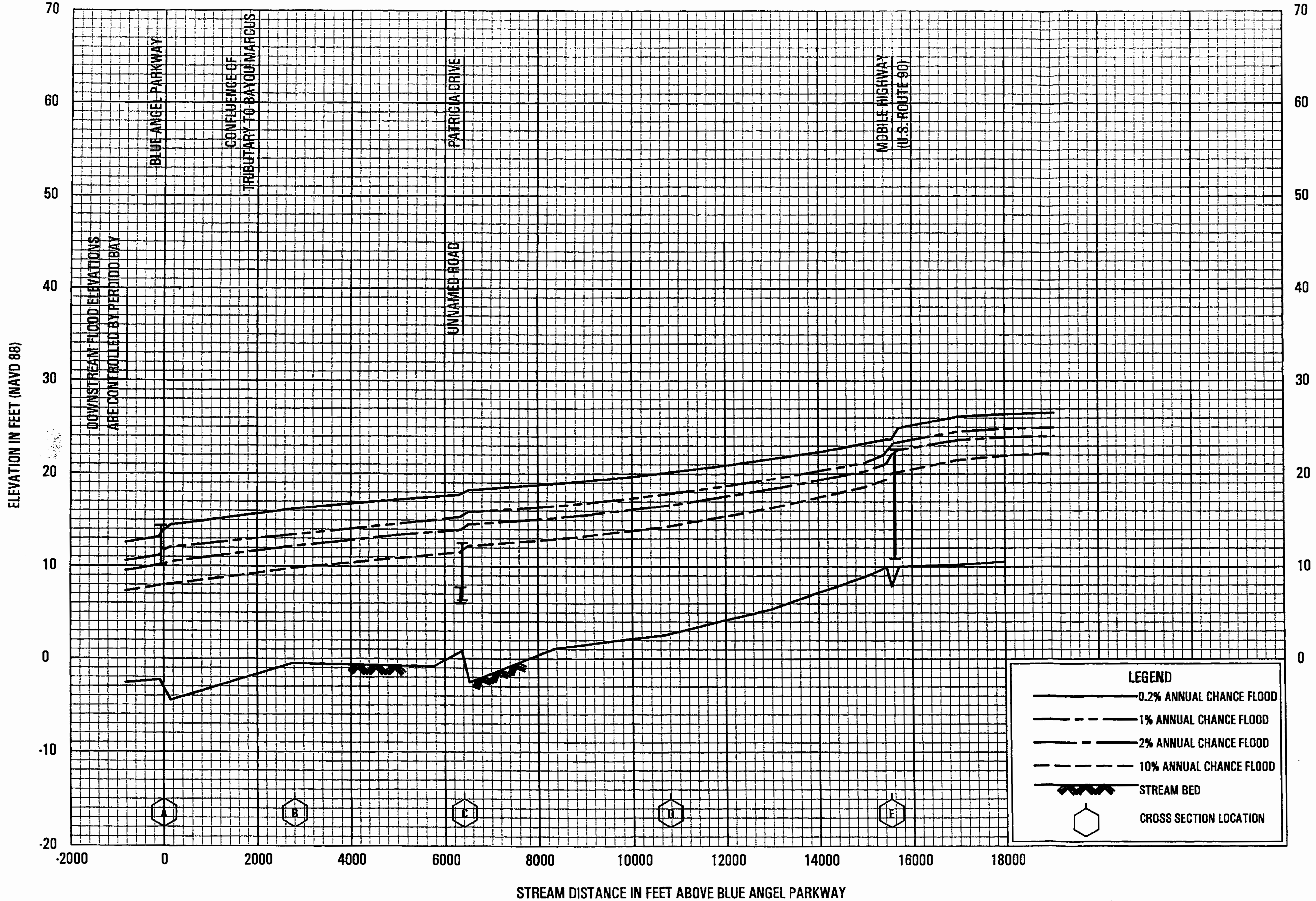


FLOOD PROFILES

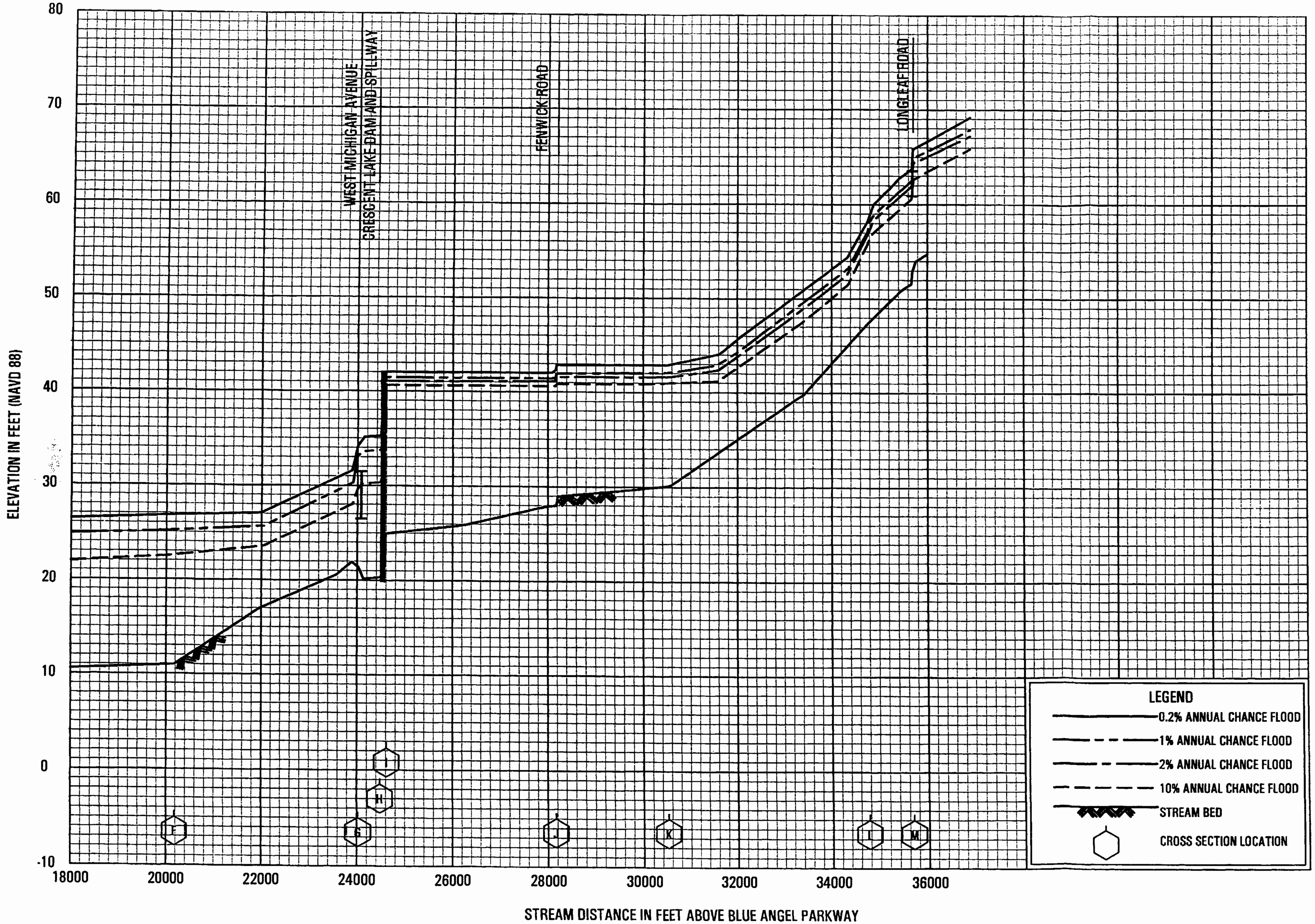
BAYOU MARCUS

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

07P



FLOOD PROFILES

BAYOU MARCUS

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

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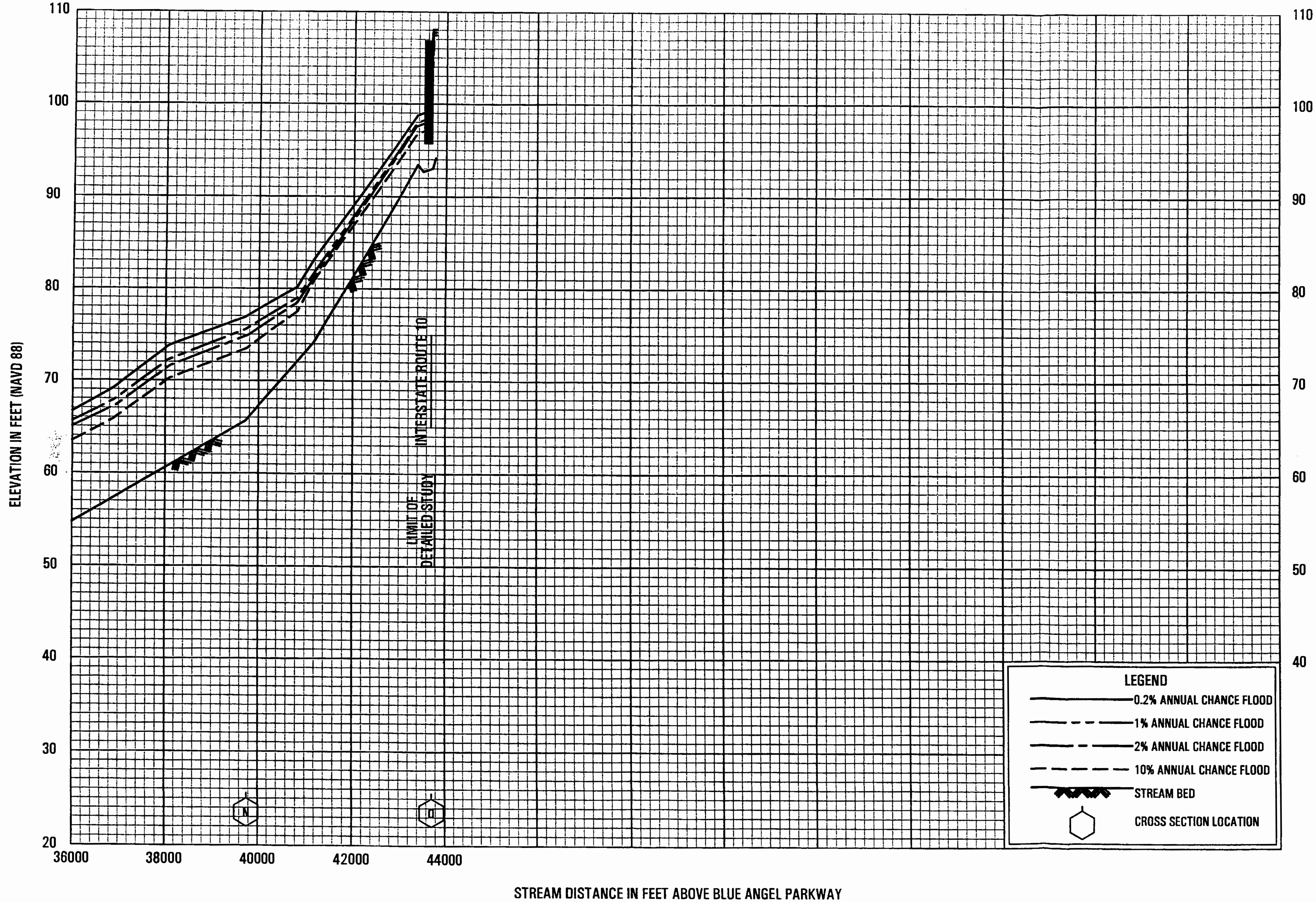


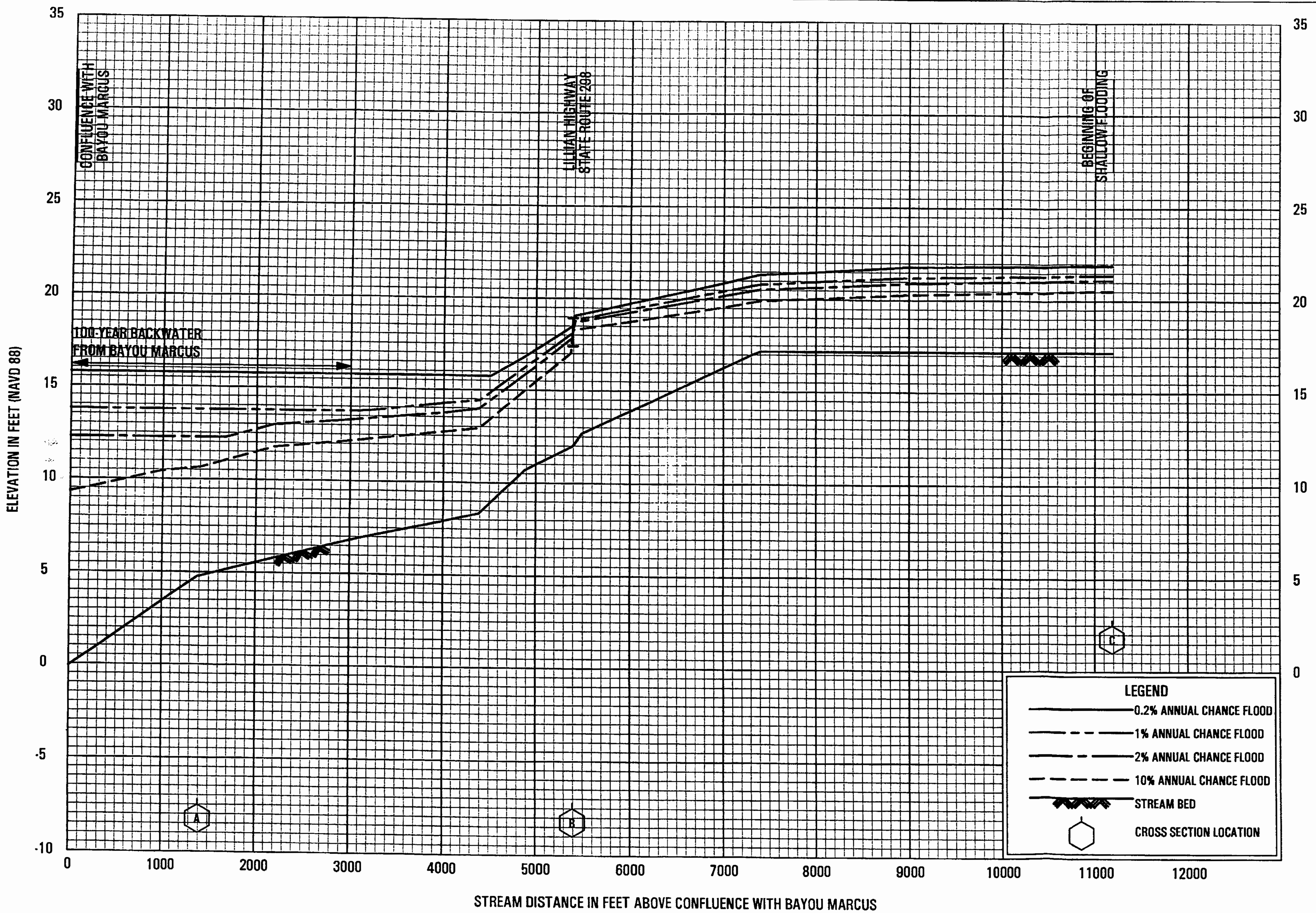
FLOOD PROFILES

BAYOU MARCUS

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL AND INCORPORATED AREAS

09P



FLOOD PROFILES

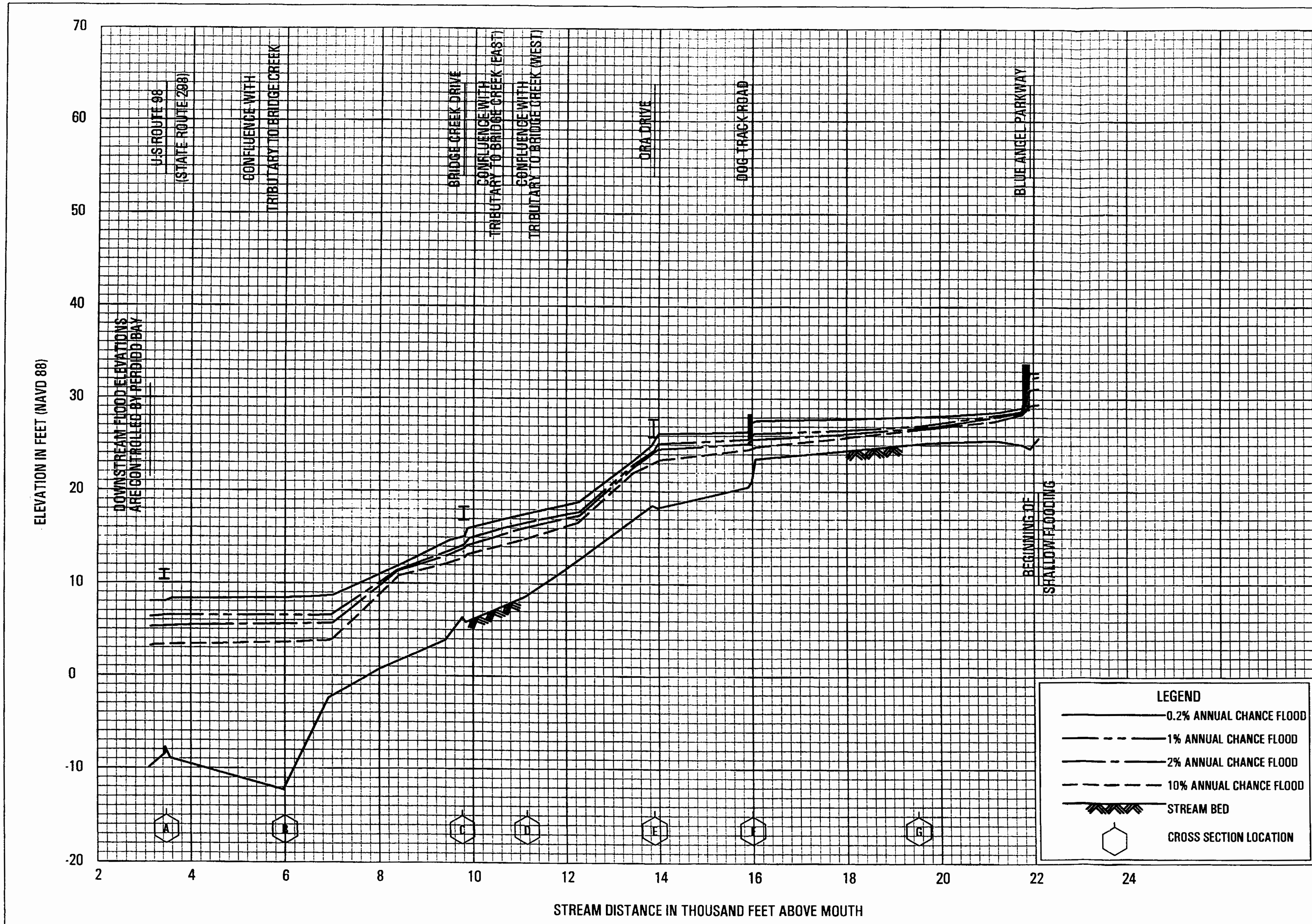
TRIBUTARY TO BAYOU MARCUS

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

10P



FLOOD PROFILES

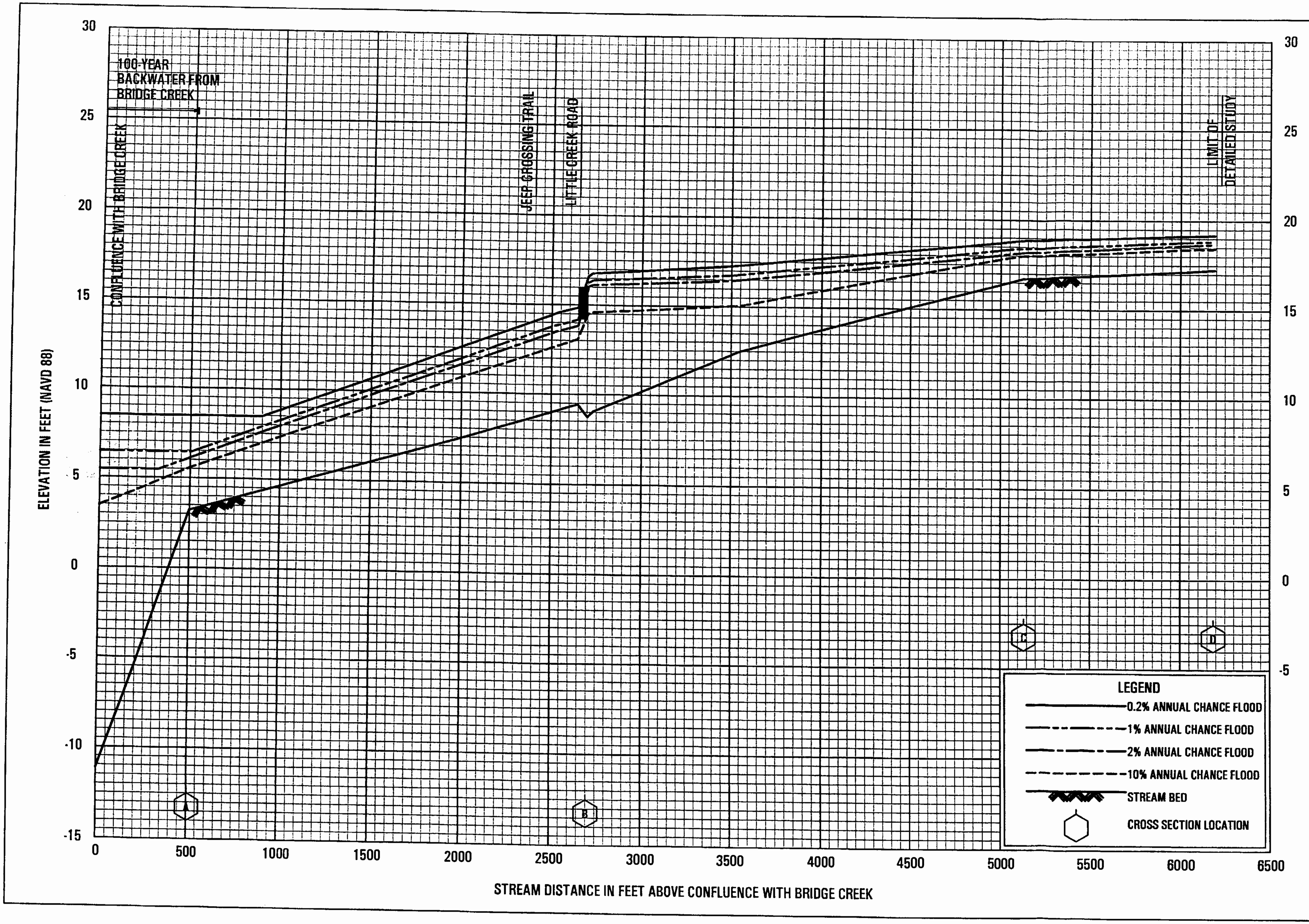
BRIDGE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

11P



FLOOD PROFILES

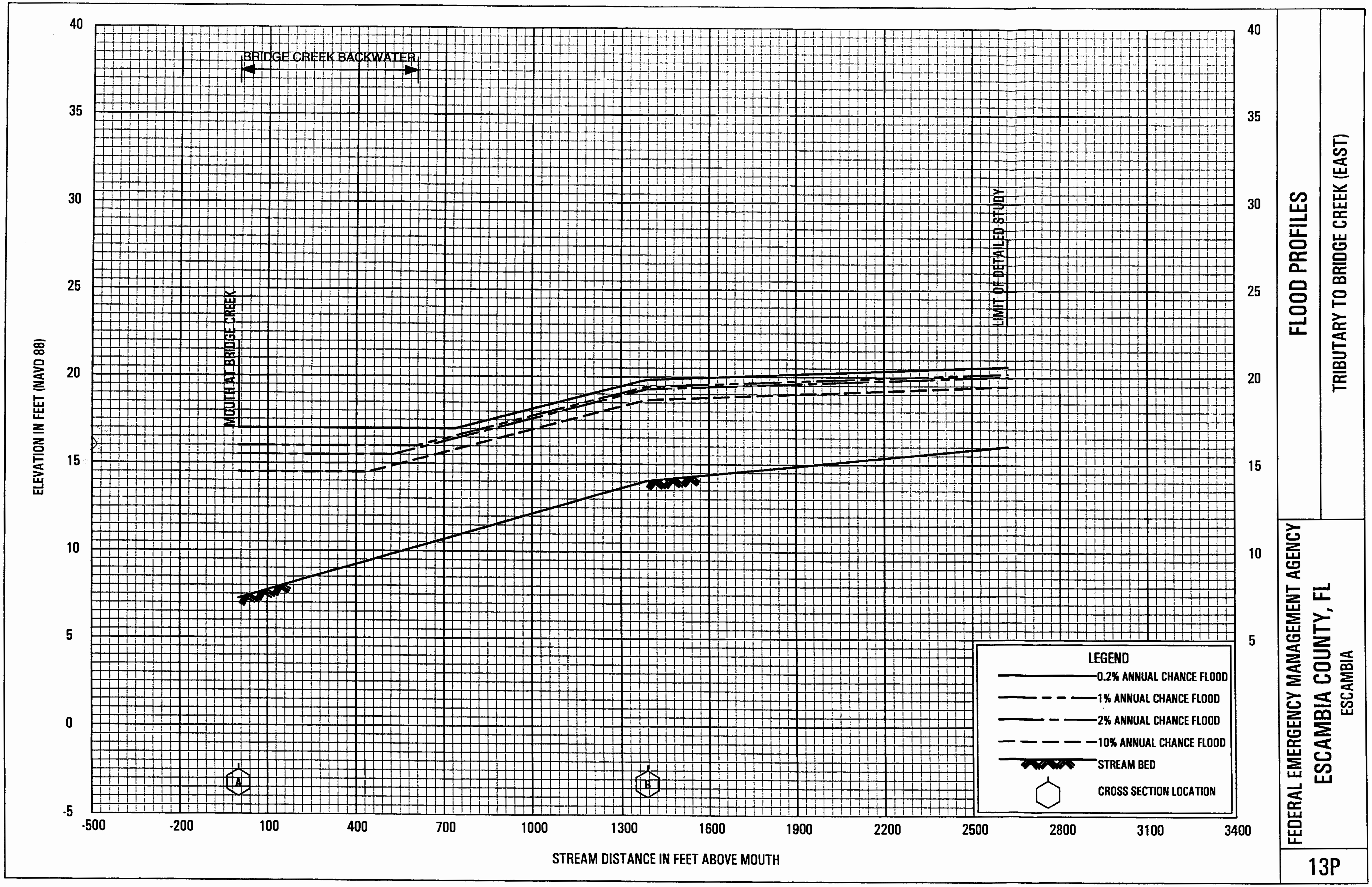
TRIBUTARY TO BRIDGE CREEK

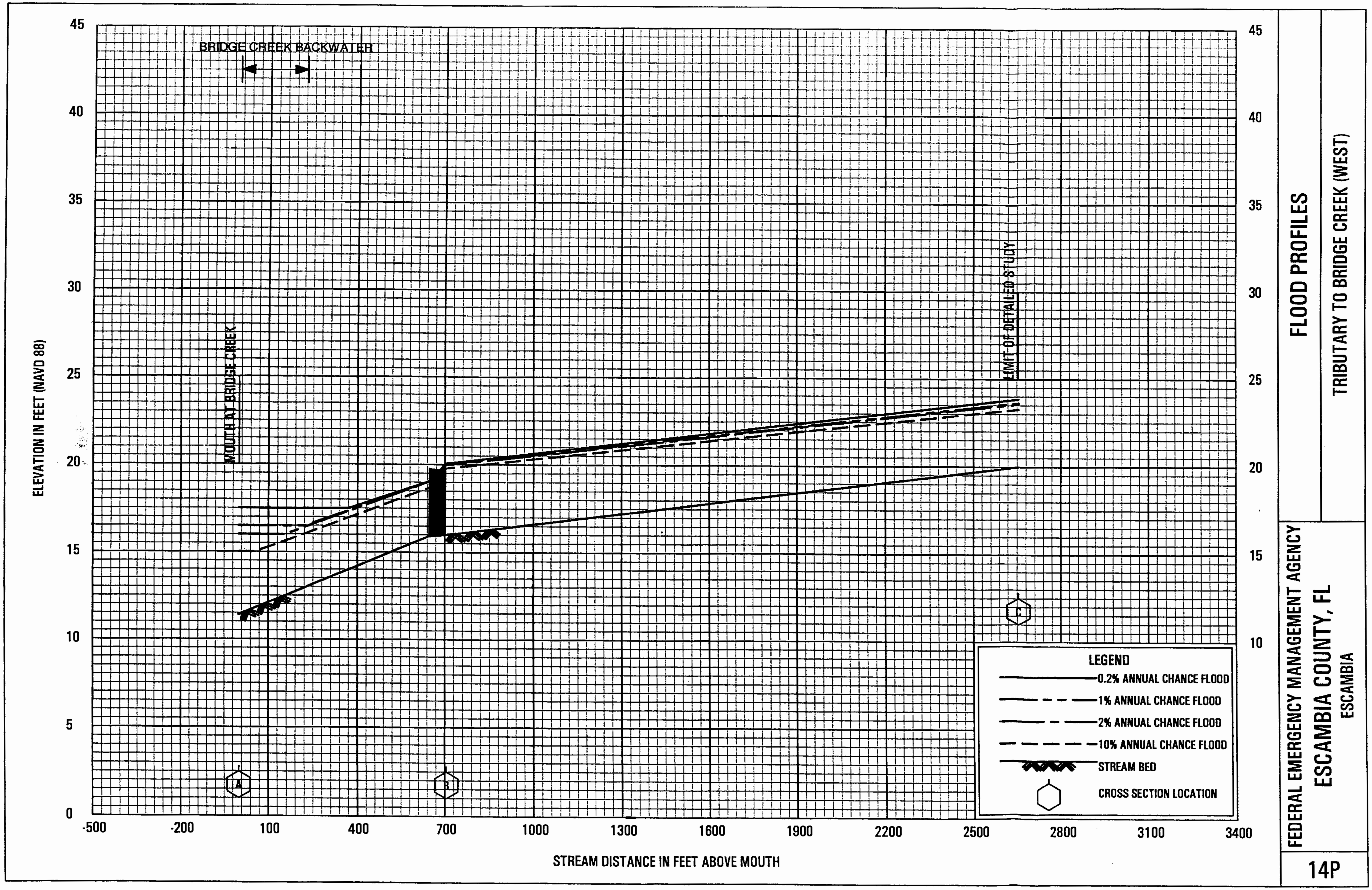
FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

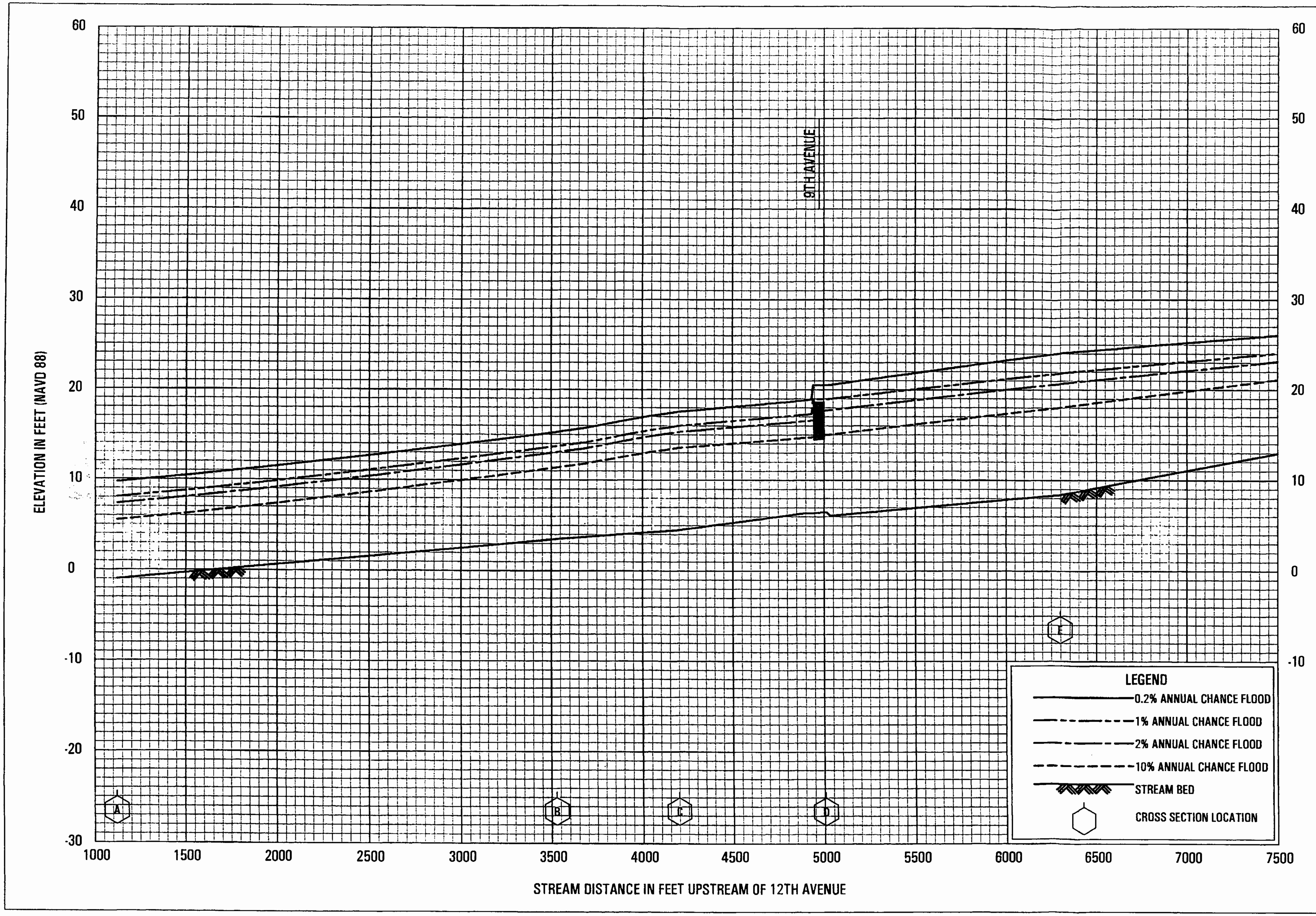
AND INCORPORATED AREAS

12P


BRIDGE CREEK BACKWATER
MOUTH AT BRIDGE CREEK
LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE MOUTH
-500
-200
100
400
700
1000
1300
1600
1900
2200
2500
2800
3100
3400
-5
0
5
10
15
20
25
30
35
40
A
B
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
TRIBUTARY TO BRIDGE CREEK (EAST)
FEDERAL EMERGENCY MANAGEMENT AGENCY
ESCAMBIA COUNTY, FL
ESCAMBIA
13P



BRIDGE CREEK BACKWATER
MOUTH AT BRIDGE CREEK
LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE MOUTH
45
40
35
30
25
20
15
10
5
0
-500
-200
100
400
700
1000
1300
1600
1900
2200
2500
2800
3100
3400
A
B
C
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
TRIBUTARY TO BRIDGE CREEK (WEST)
FEDERAL EMERGENCY MANAGEMENT AGENCY
ESCAMBIA COUNTY, FL
ESCAMBIA
14P



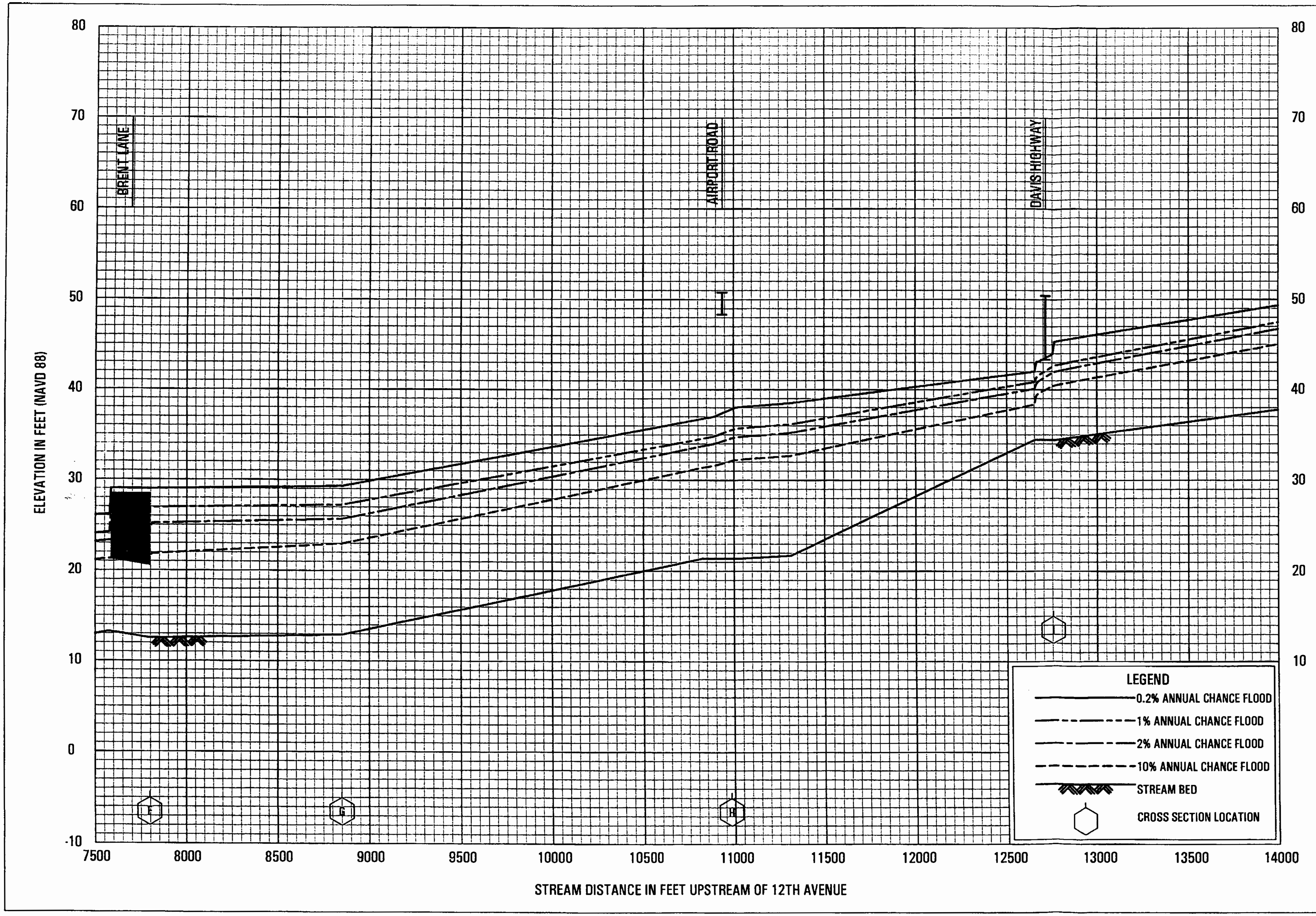
FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

FLOOD PROFILES

CARPENTER CREEK



FLOOD PROFILES

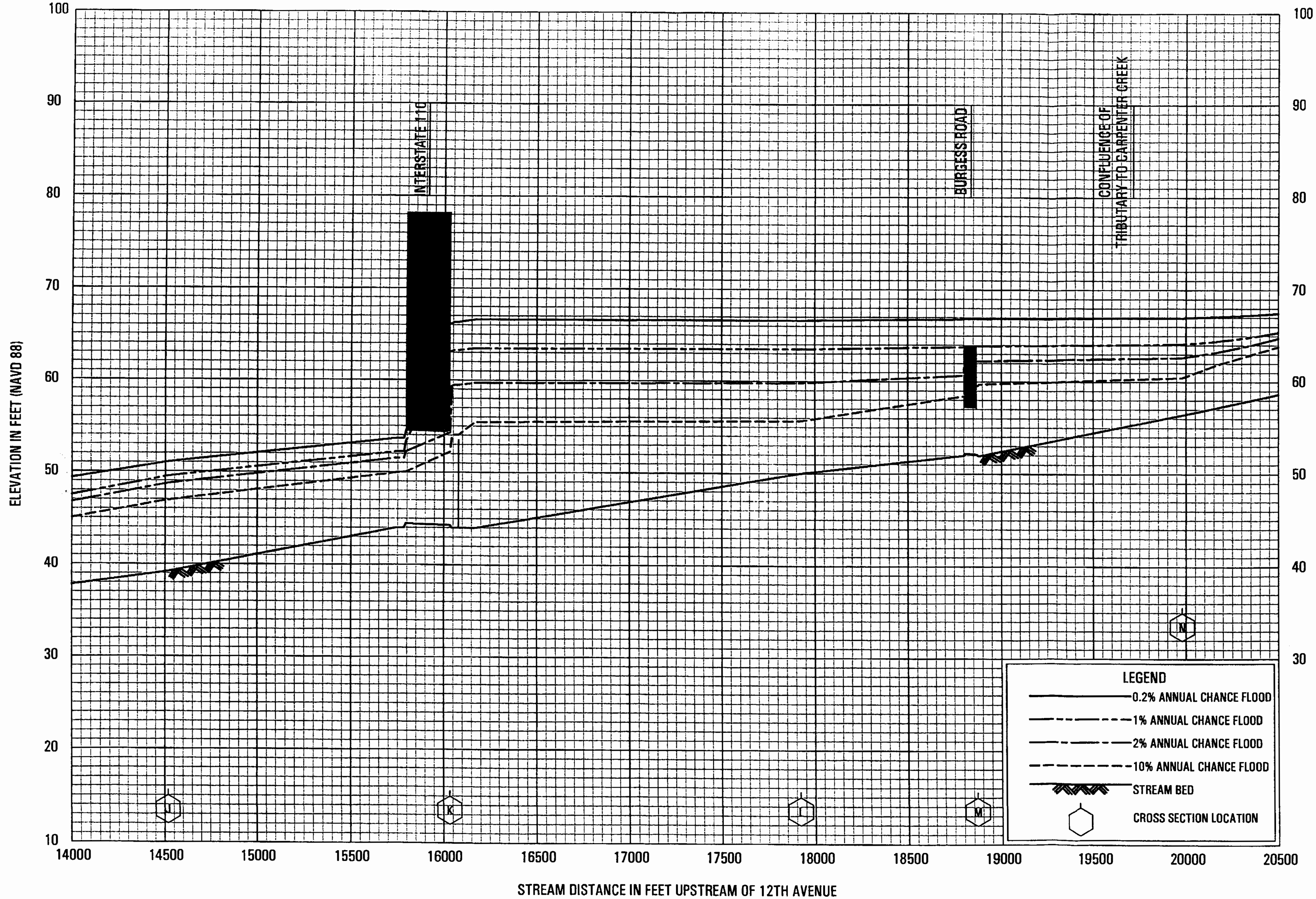
CARPENTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

16P



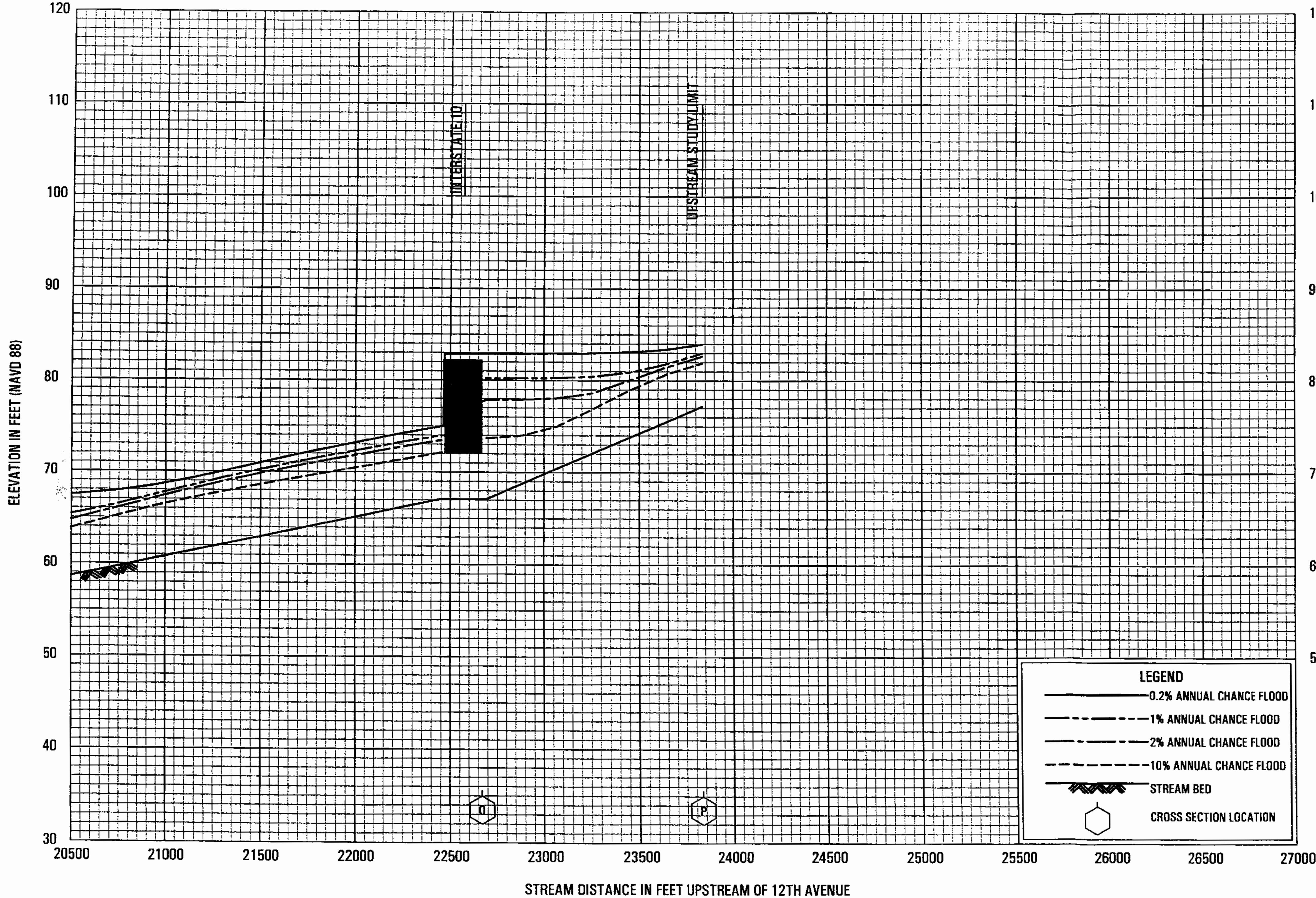
FLOOD PROFILES

CARPENTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



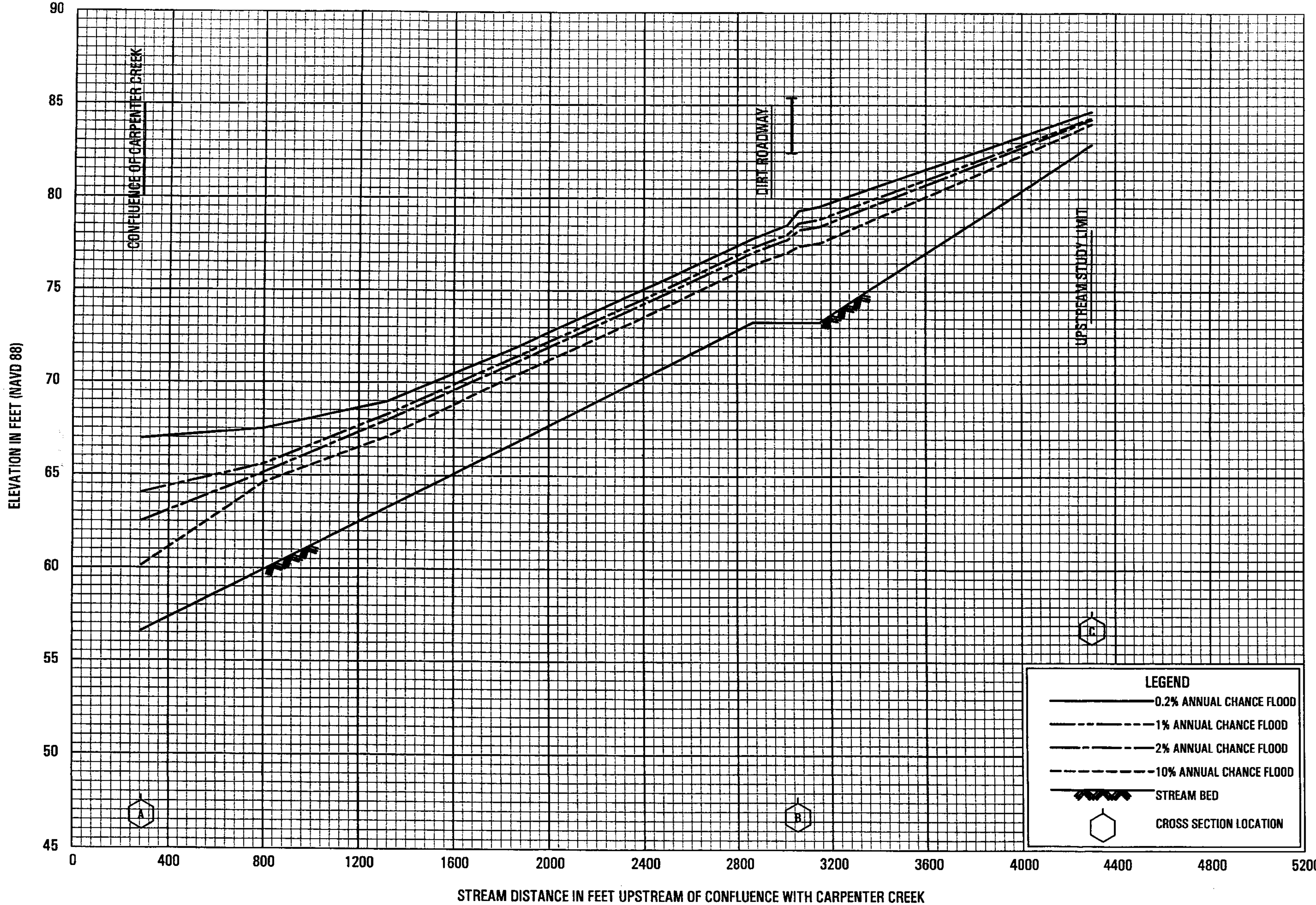
FLOOD PROFILES

CARPENTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



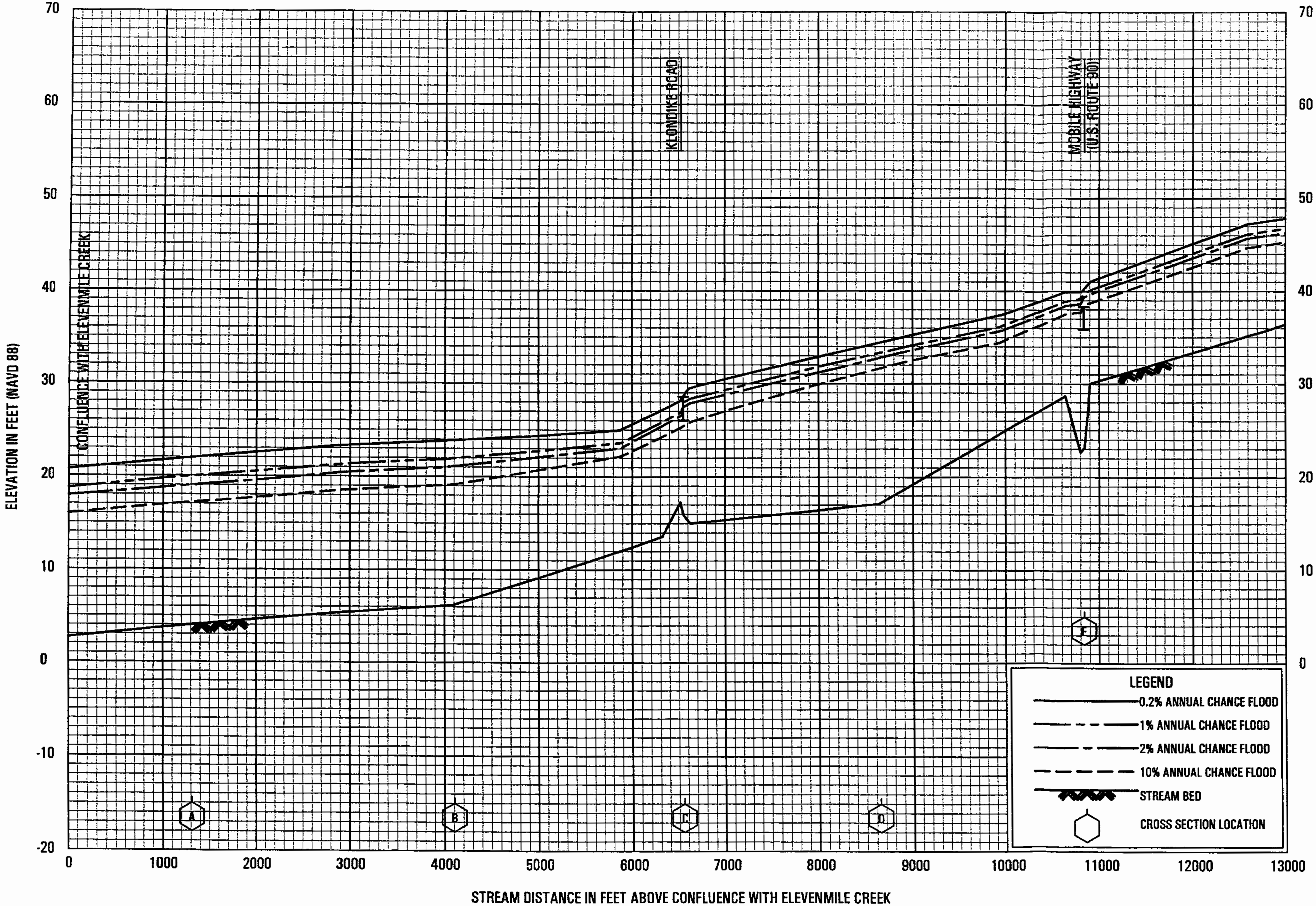
FLOOD PROFILES

TRIBUTARY TO CARPENTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



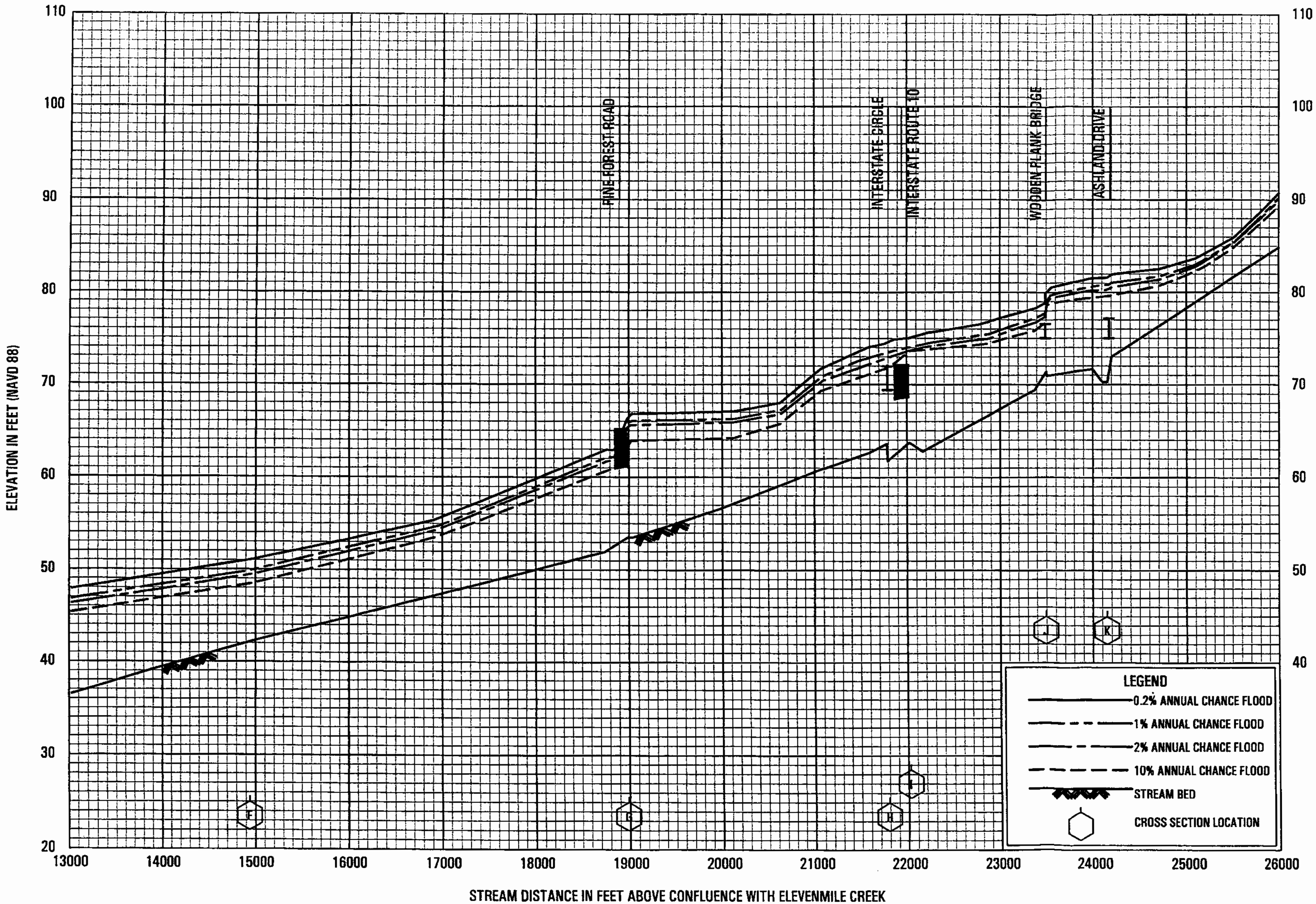
FLOOD PROFILES

EIGHTMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FLORIDA

ESCAMBIA



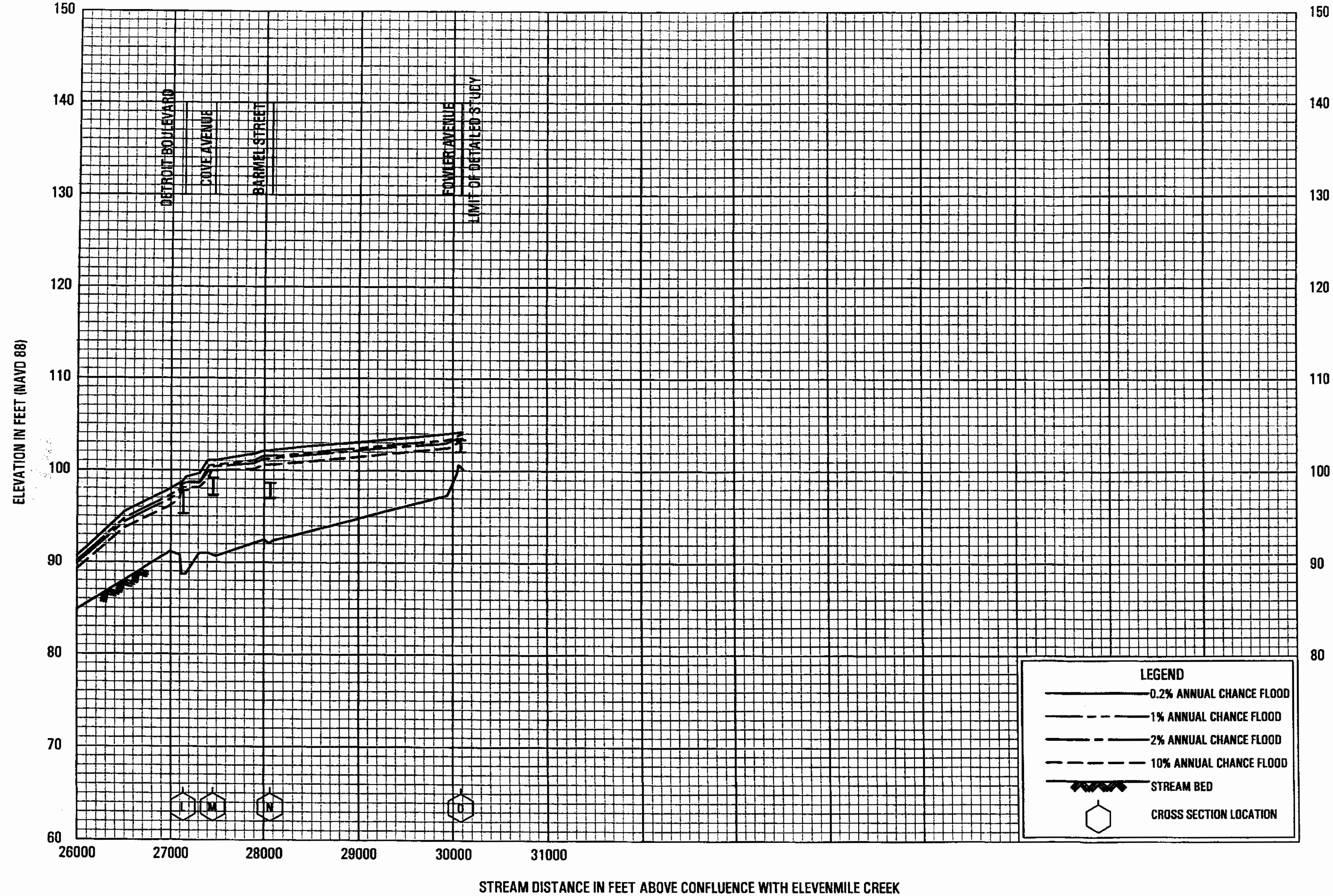
FLOOD PROFILES

EIGHTMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FLORIDA

ESCAMBIA



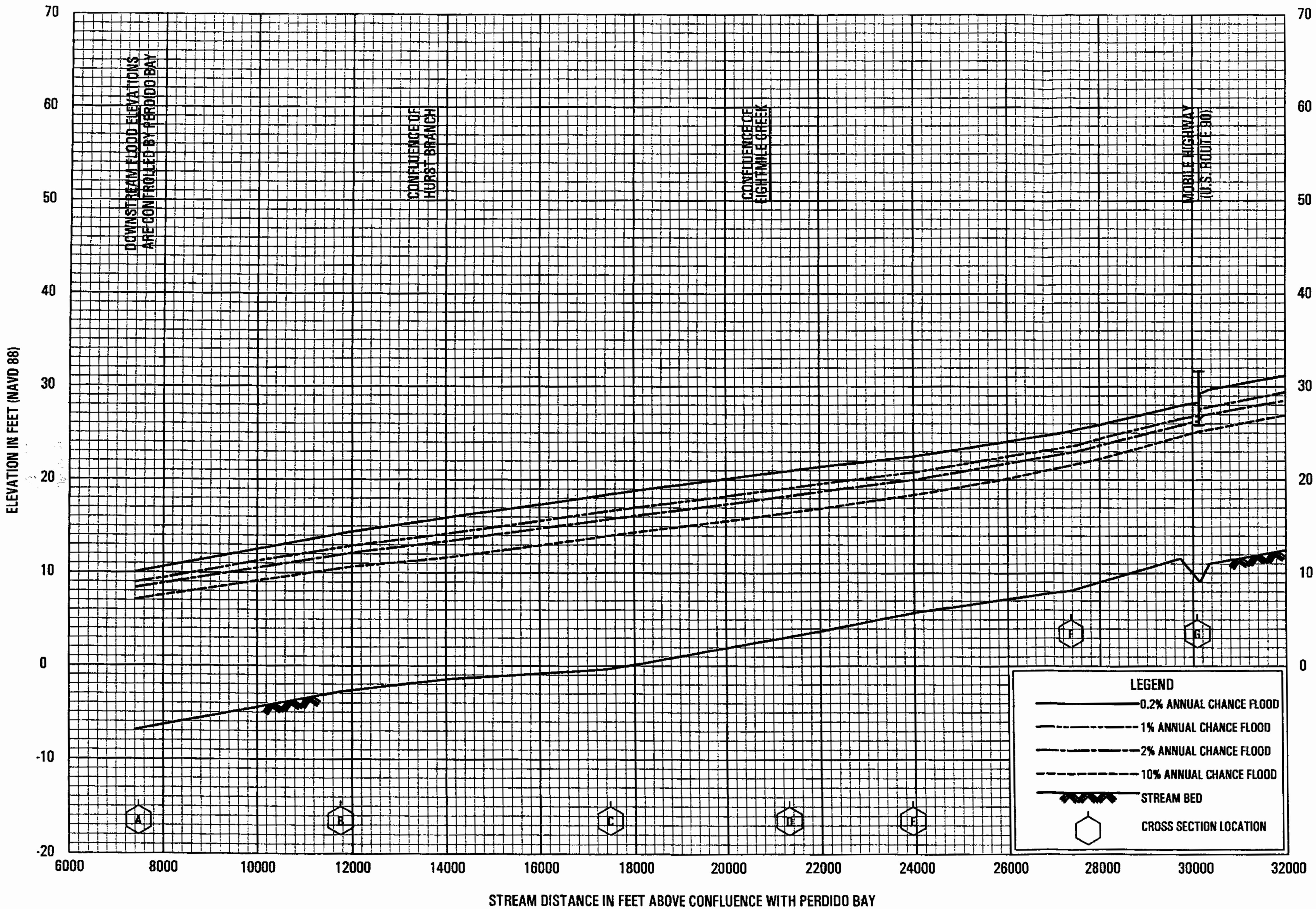
FLOOD PROFILES

EIGHTMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FLORIDA

ESCAMBIA



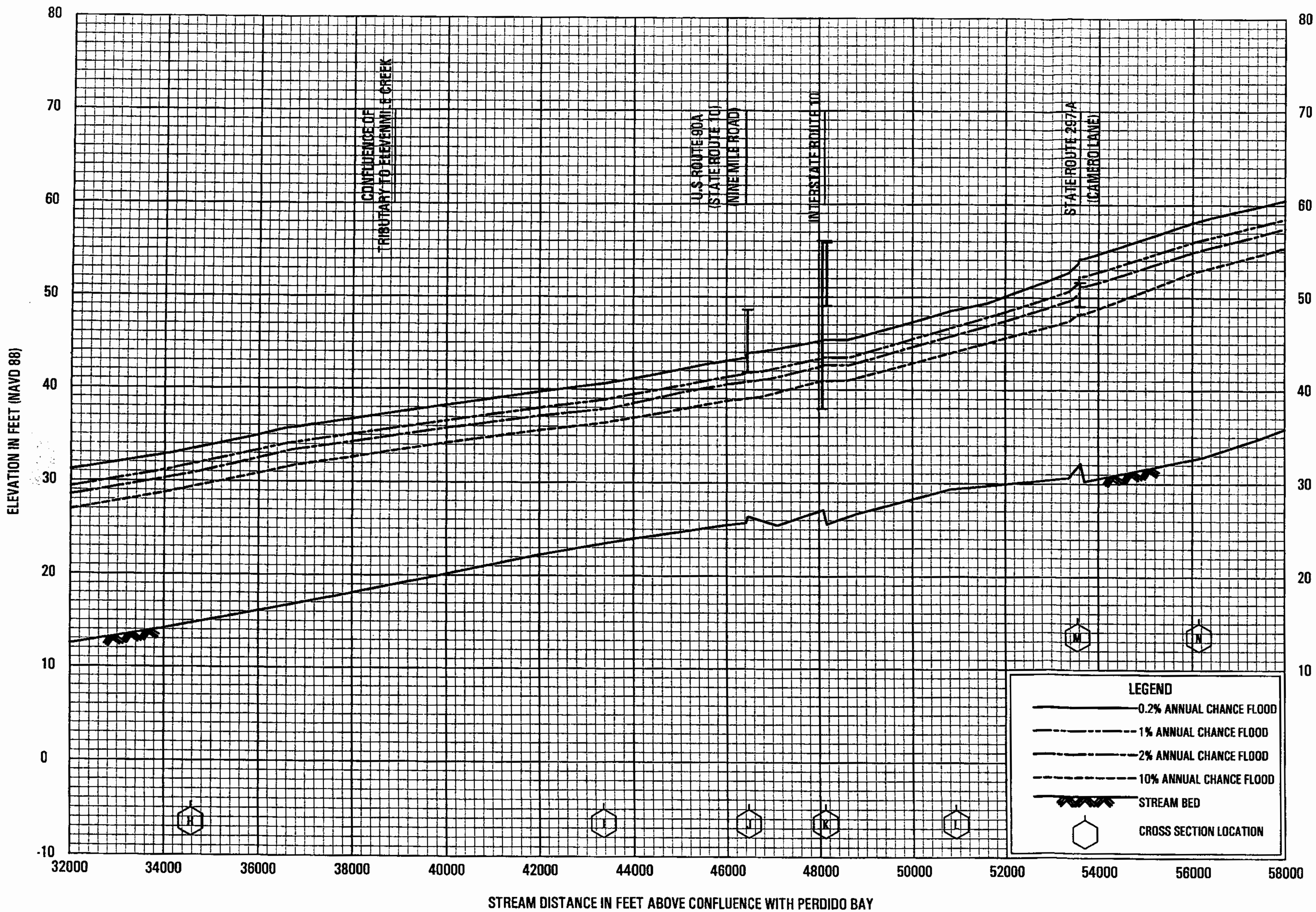
FLOOD PROFILES

ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



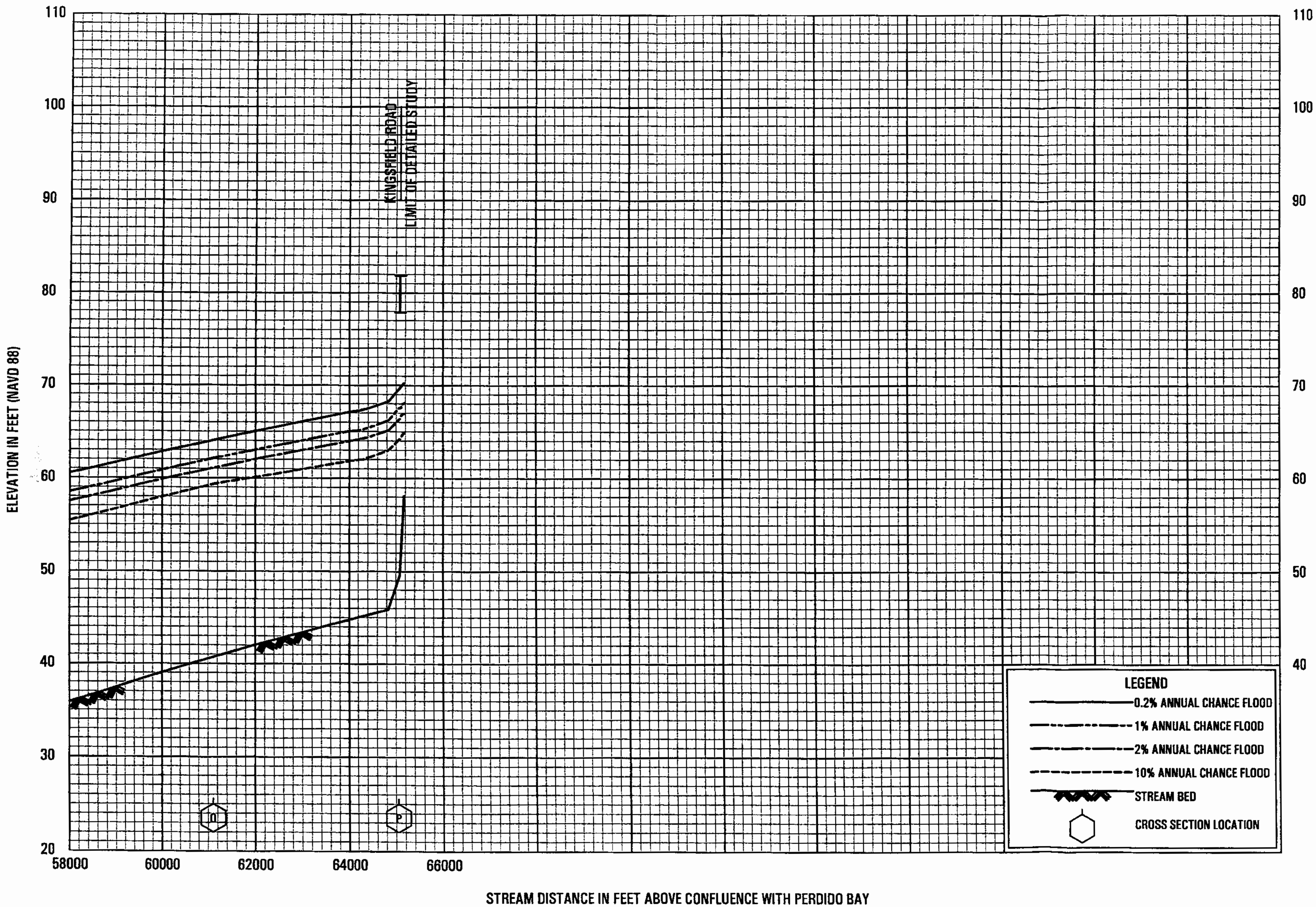
FLOOD PROFILES

ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS

24P



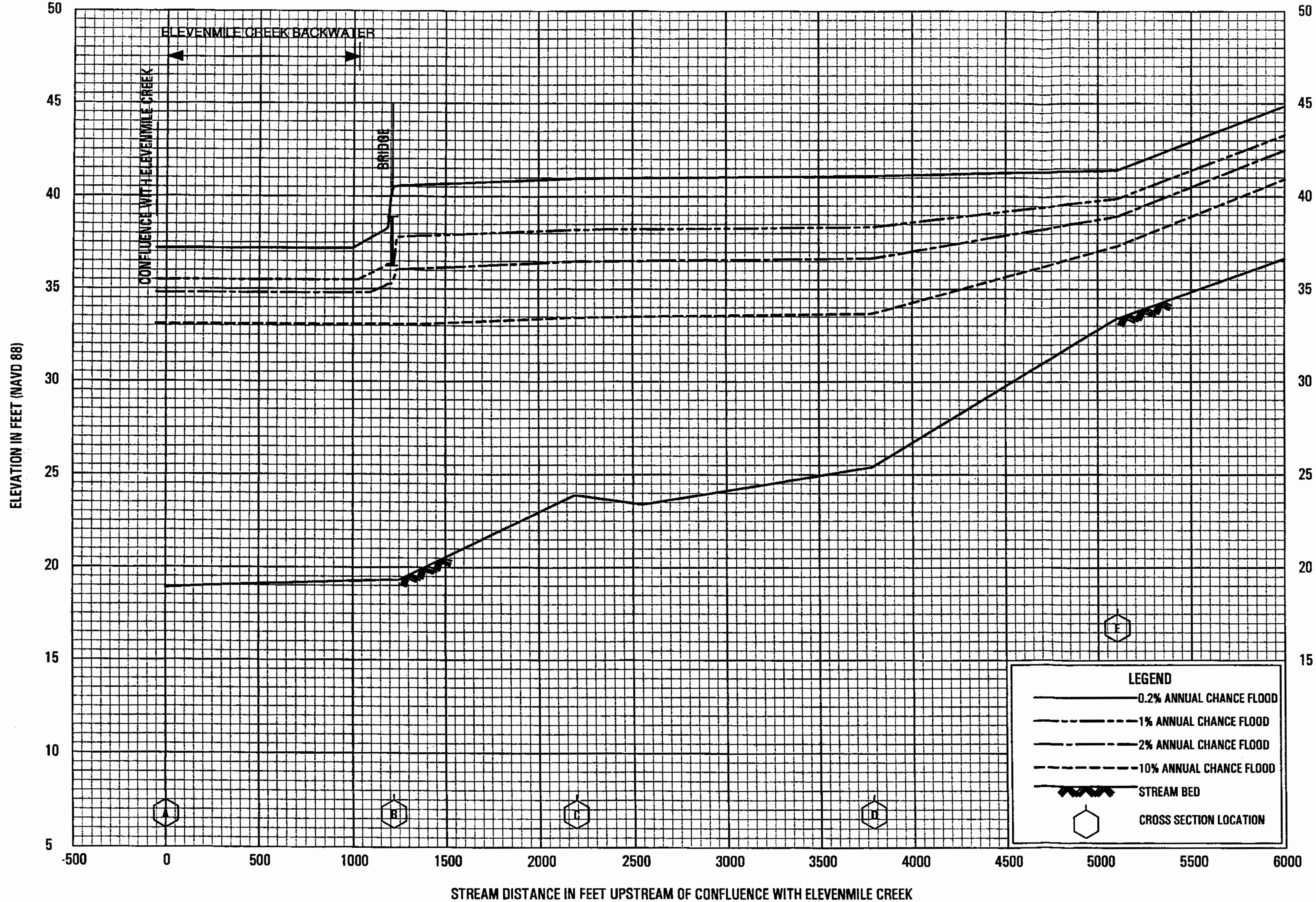
FLOOD PROFILES

ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

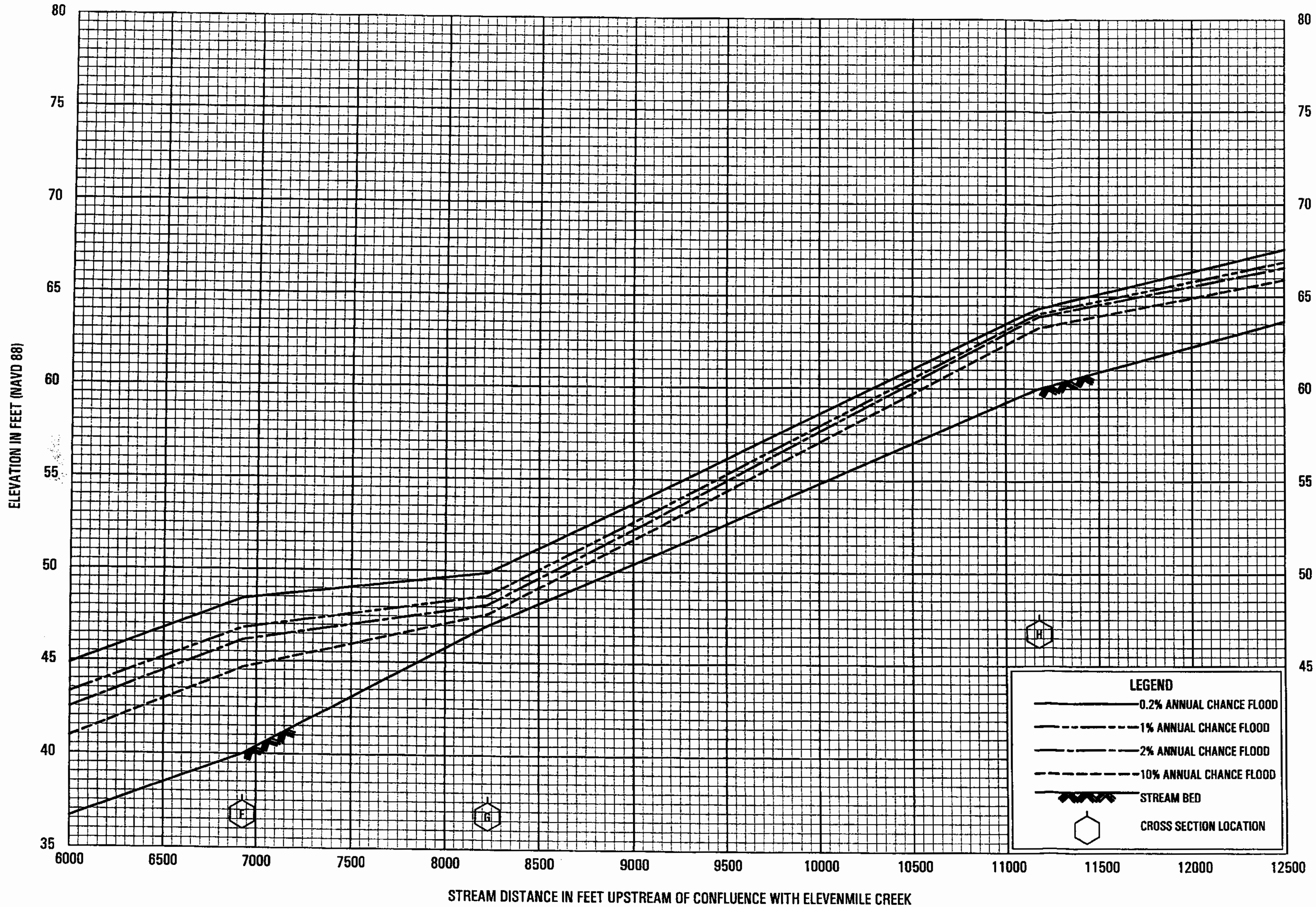


FLOOD PROFILES

TRIBUTARY TO ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS



FLOOD PROFILES

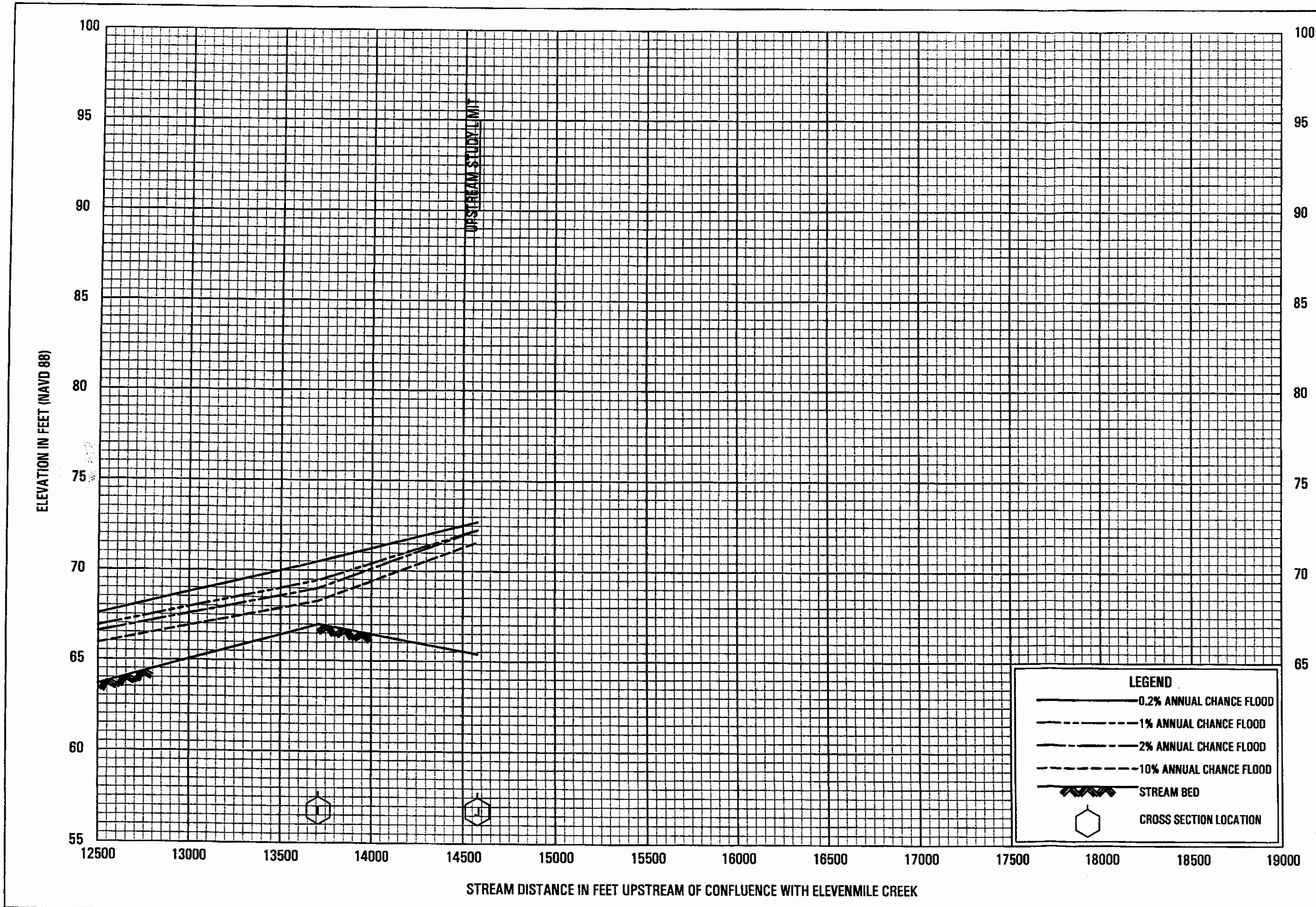
TRIBUTARY TO ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

27P

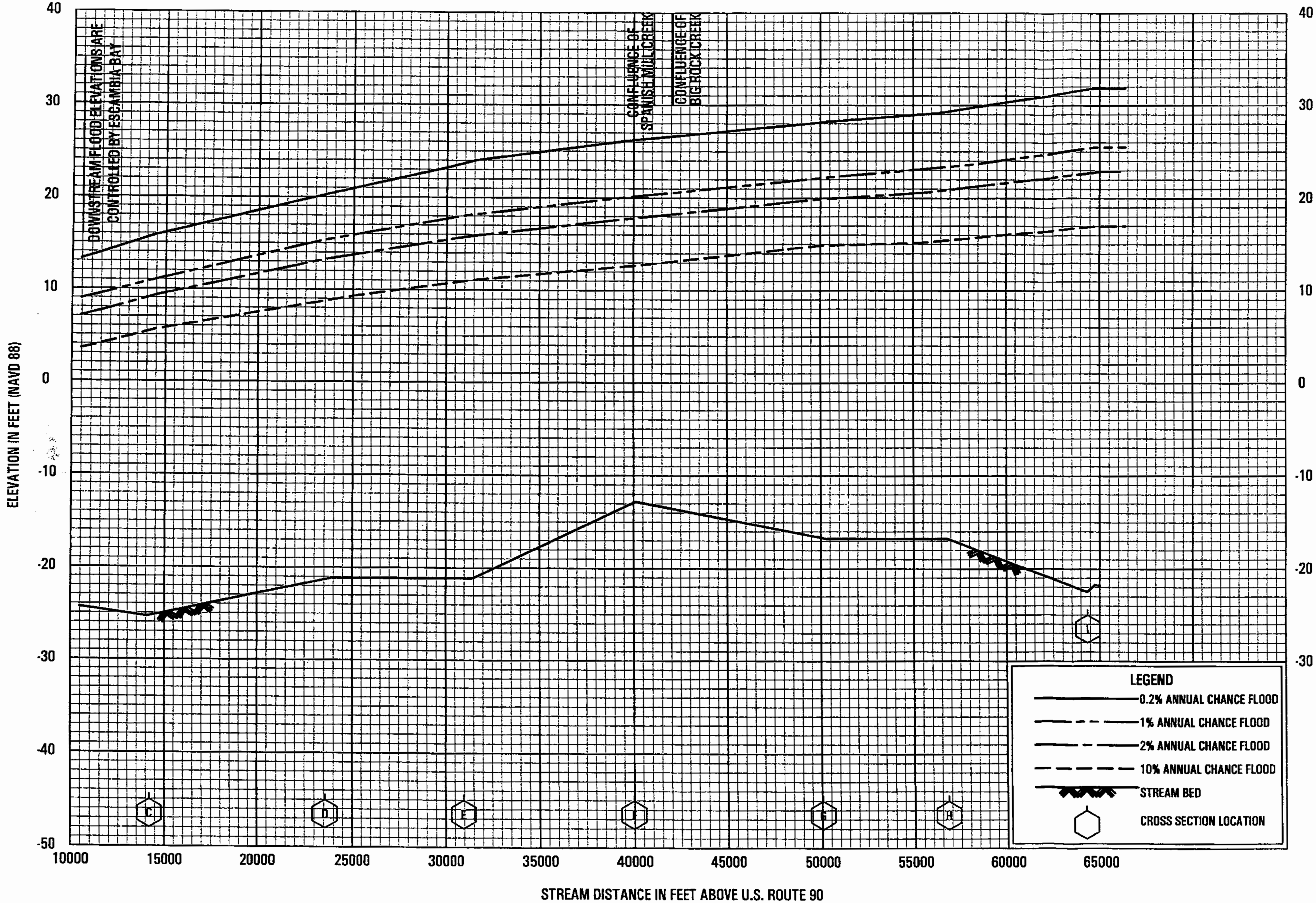


FLOOD PROFILES

TRIBUTARY TO ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS



FLOOD PROFILES

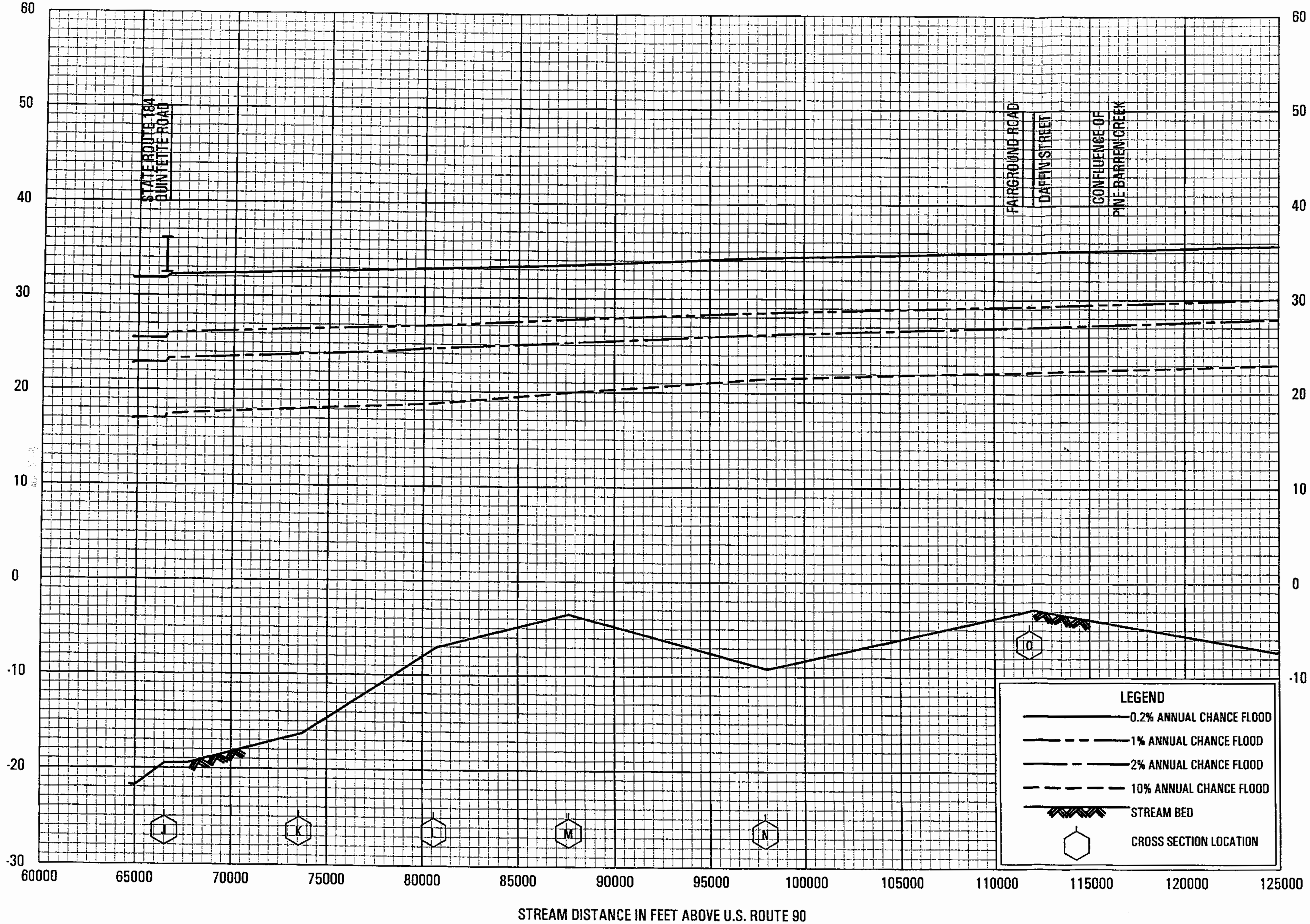
ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

29P



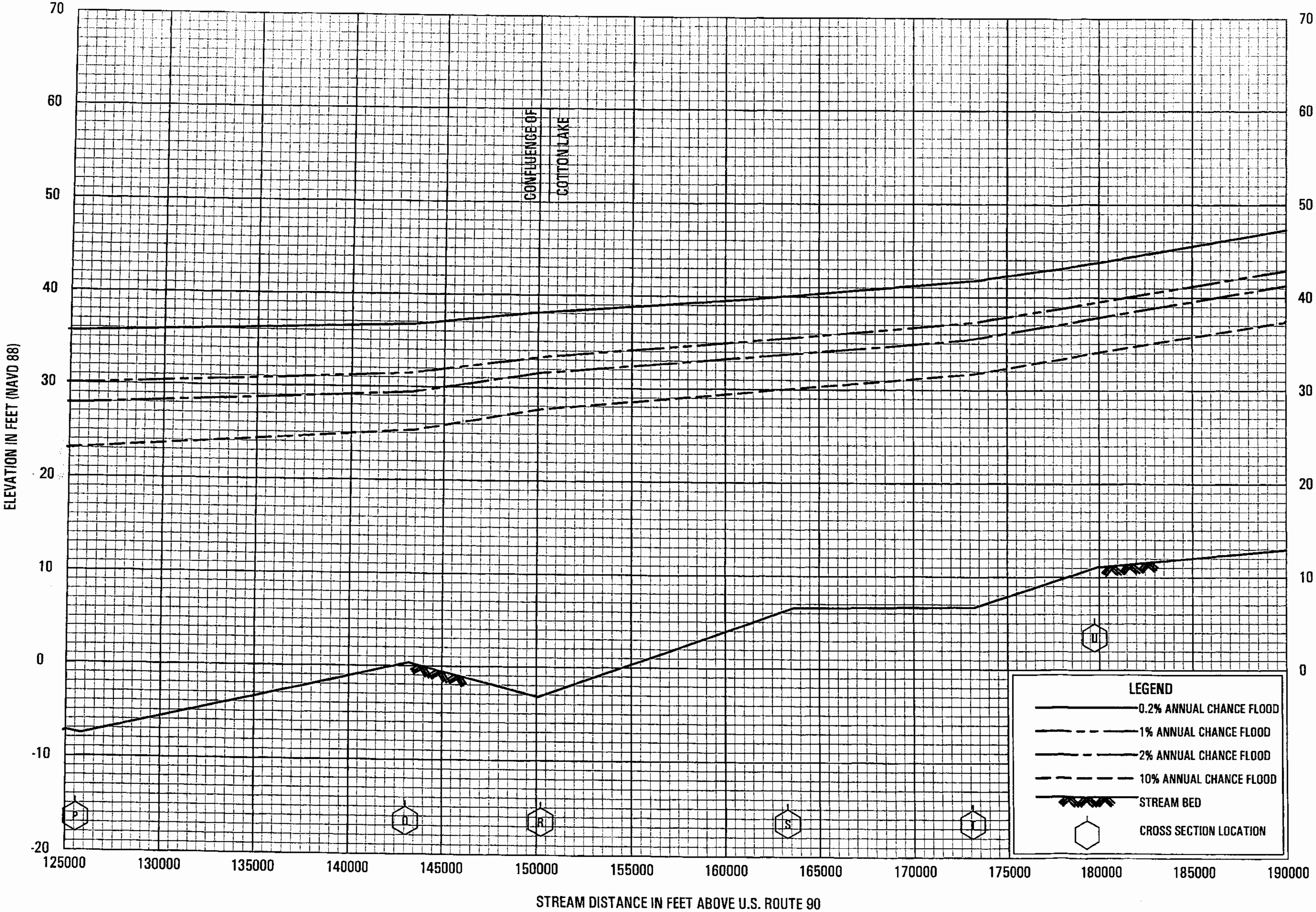
FLOOD PROFILES

ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



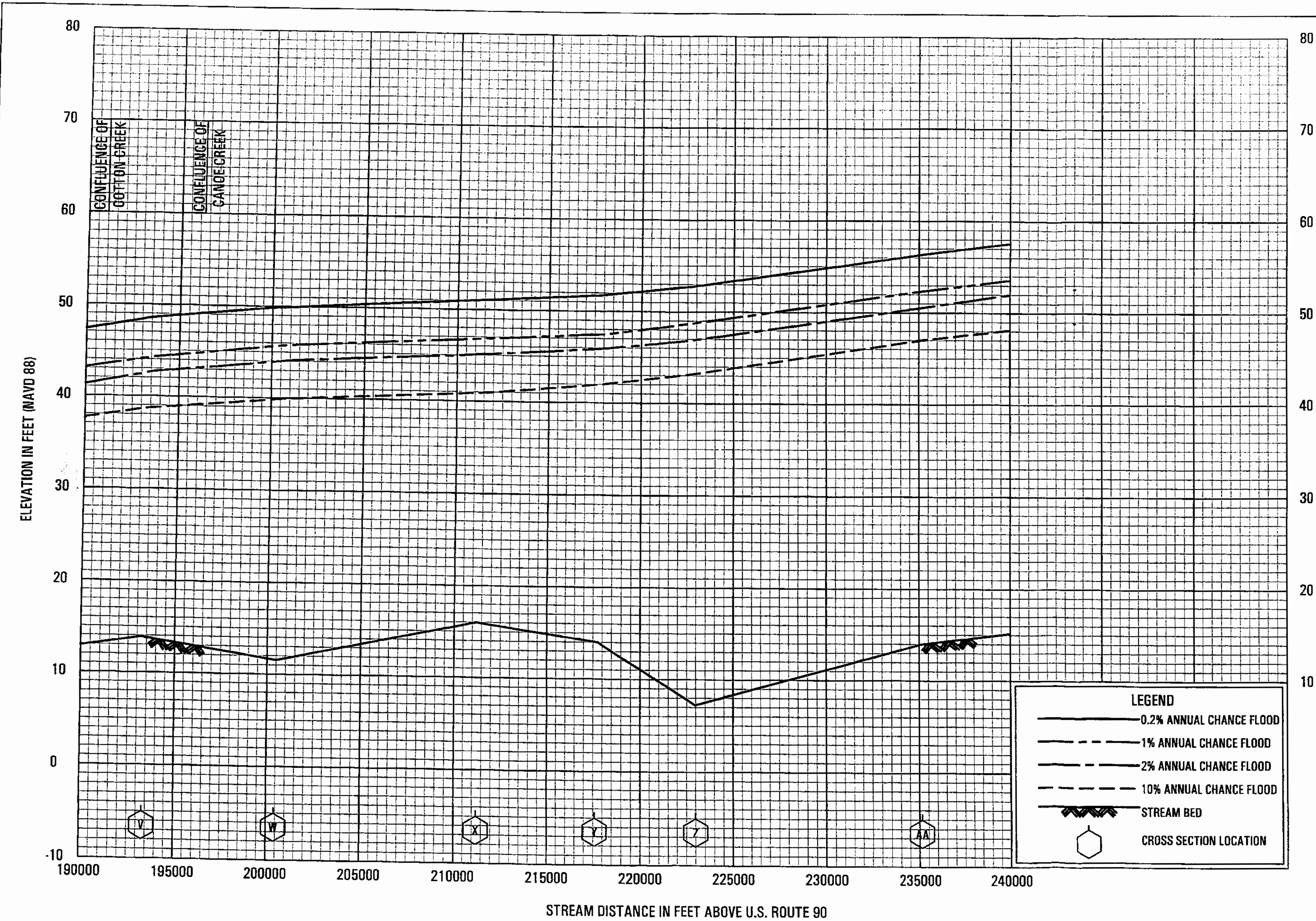
FLOOD PROFILES

ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



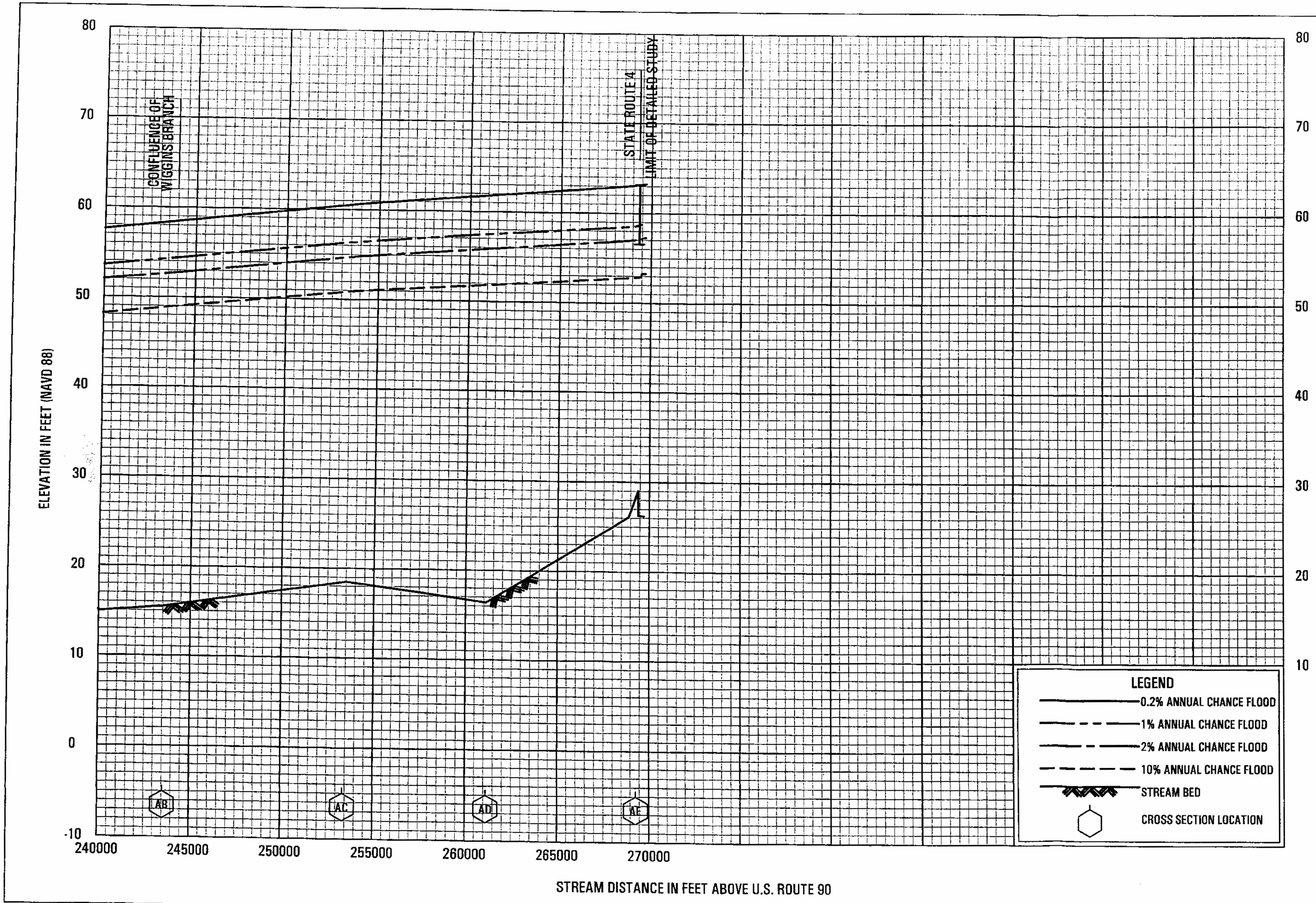
FLOOD PROFILES

ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



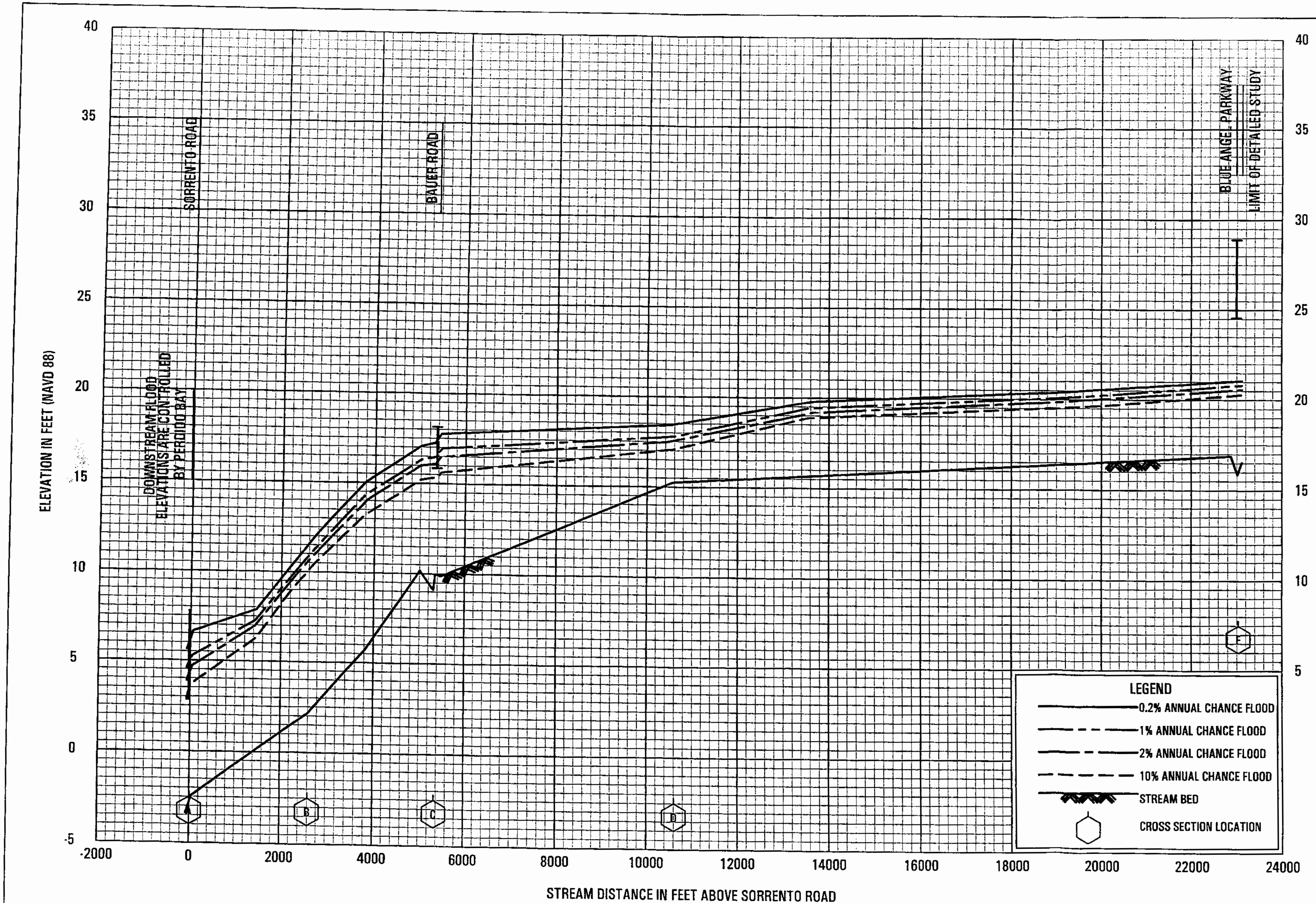
FLOOD PROFILES

ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS

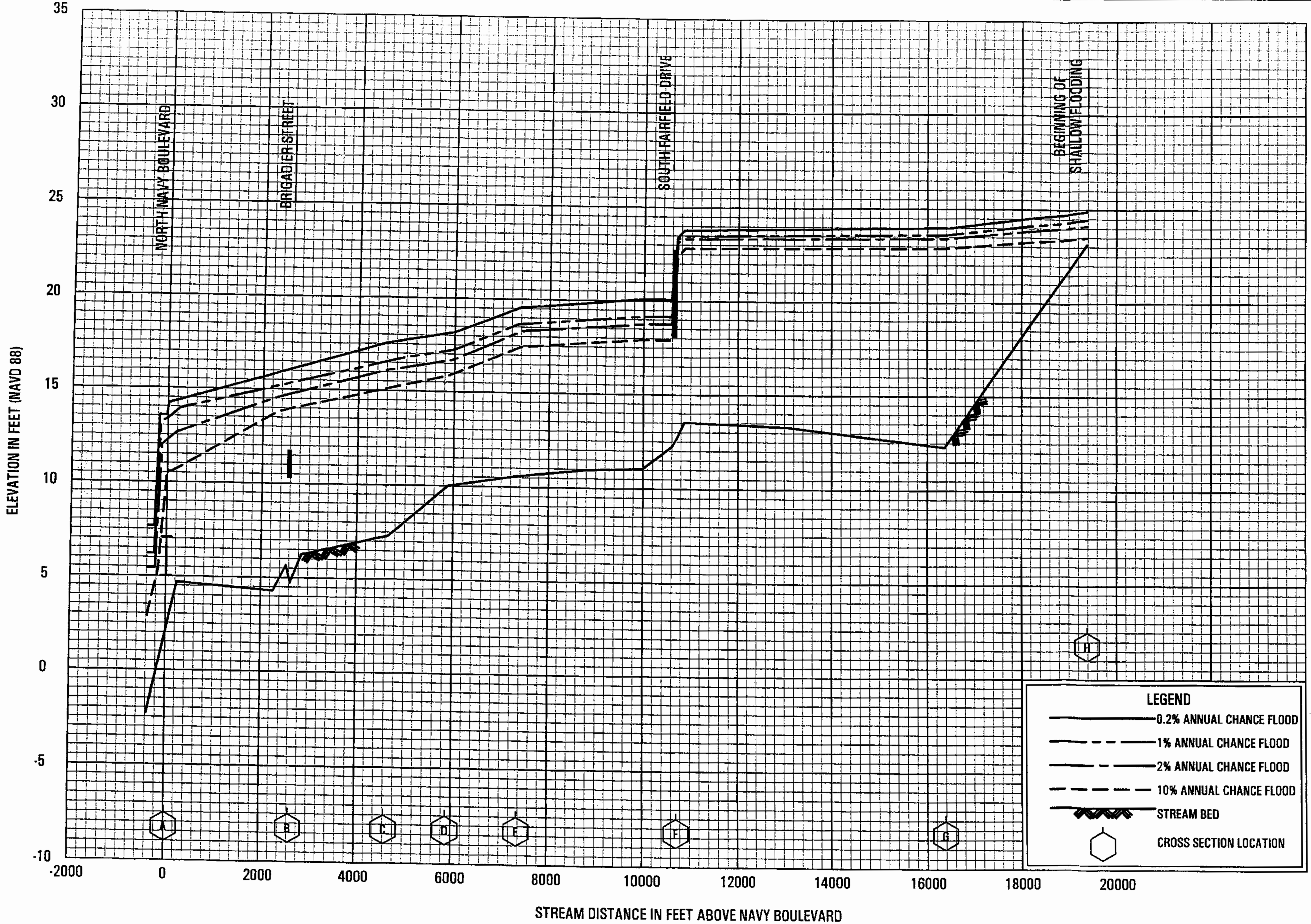


FLOOD PROFILES

GARCON SWAMP

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS

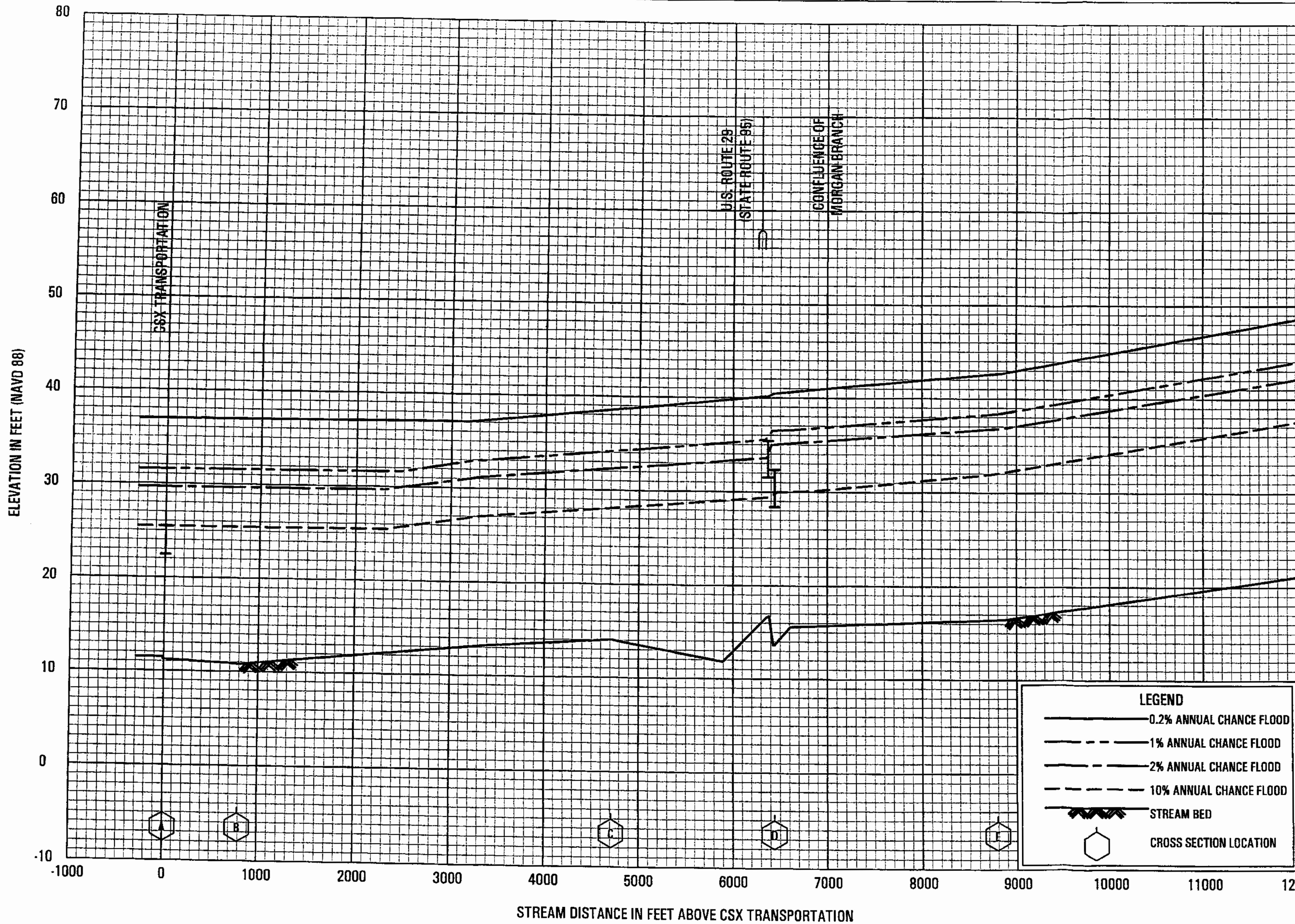


FLOOD PROFILES

JONES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS

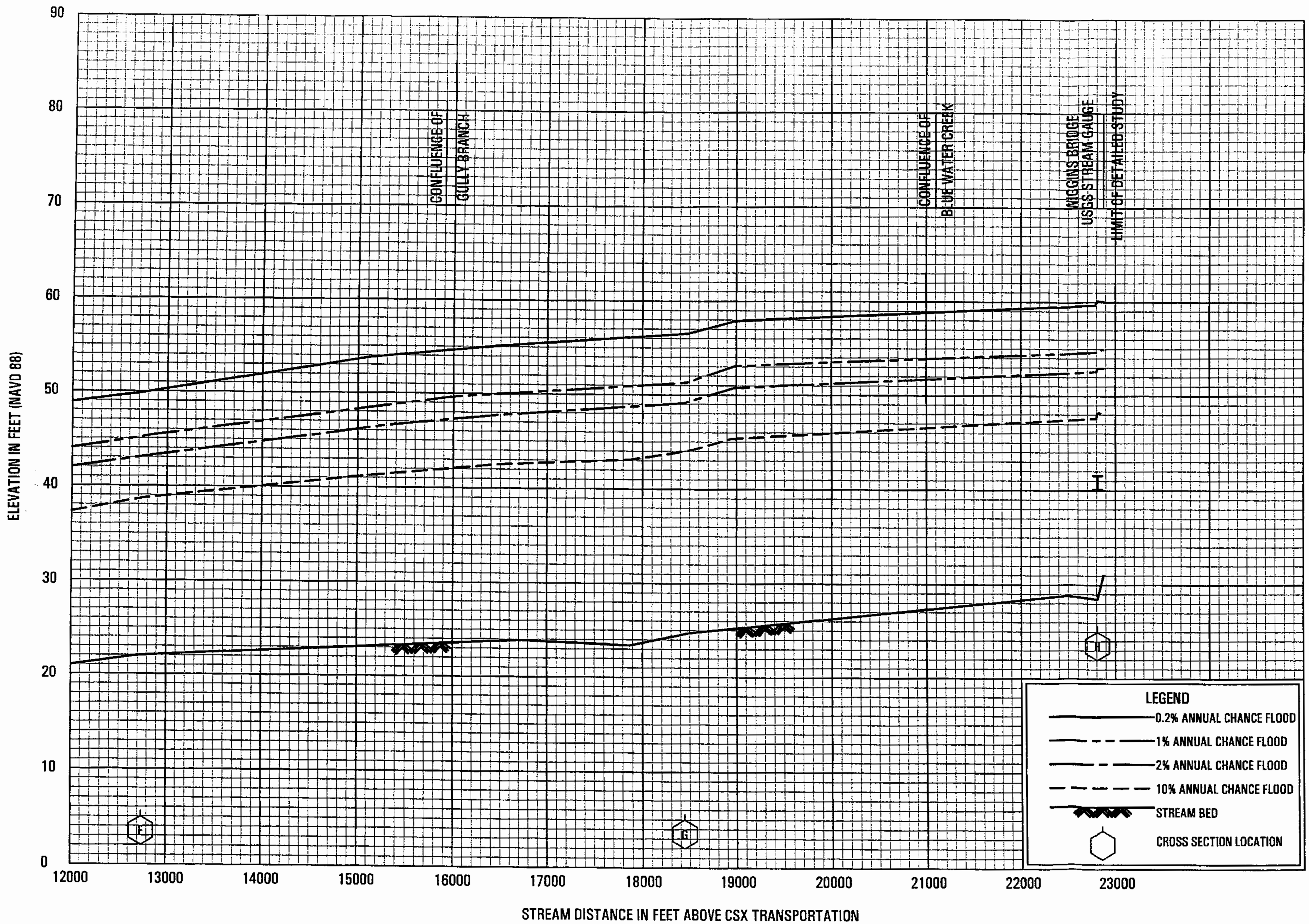


FLOOD PROFILES

PINE BARREN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL
AND INCORPORATED AREAS



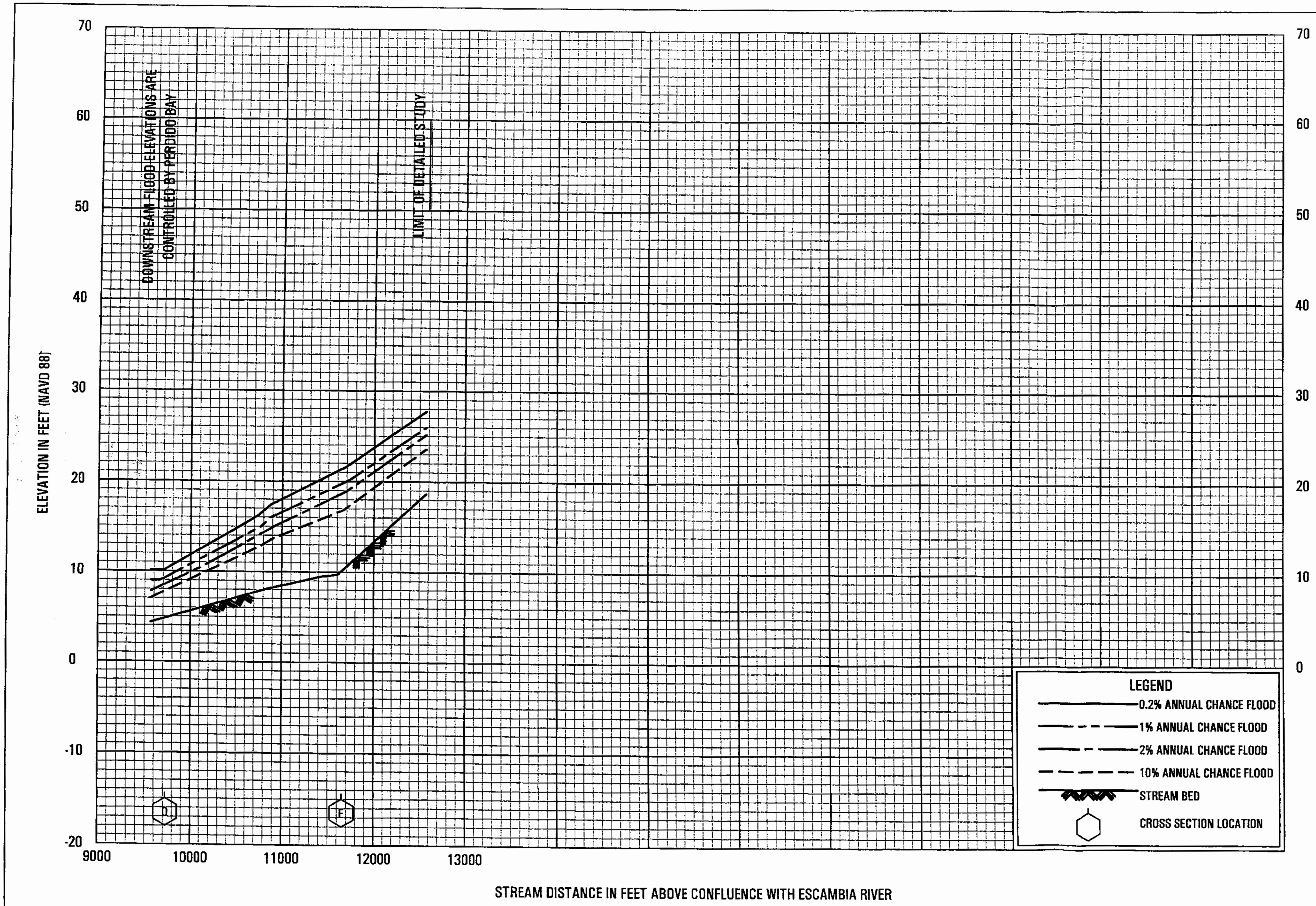
FLOOD PROFILES

PINE BARREN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



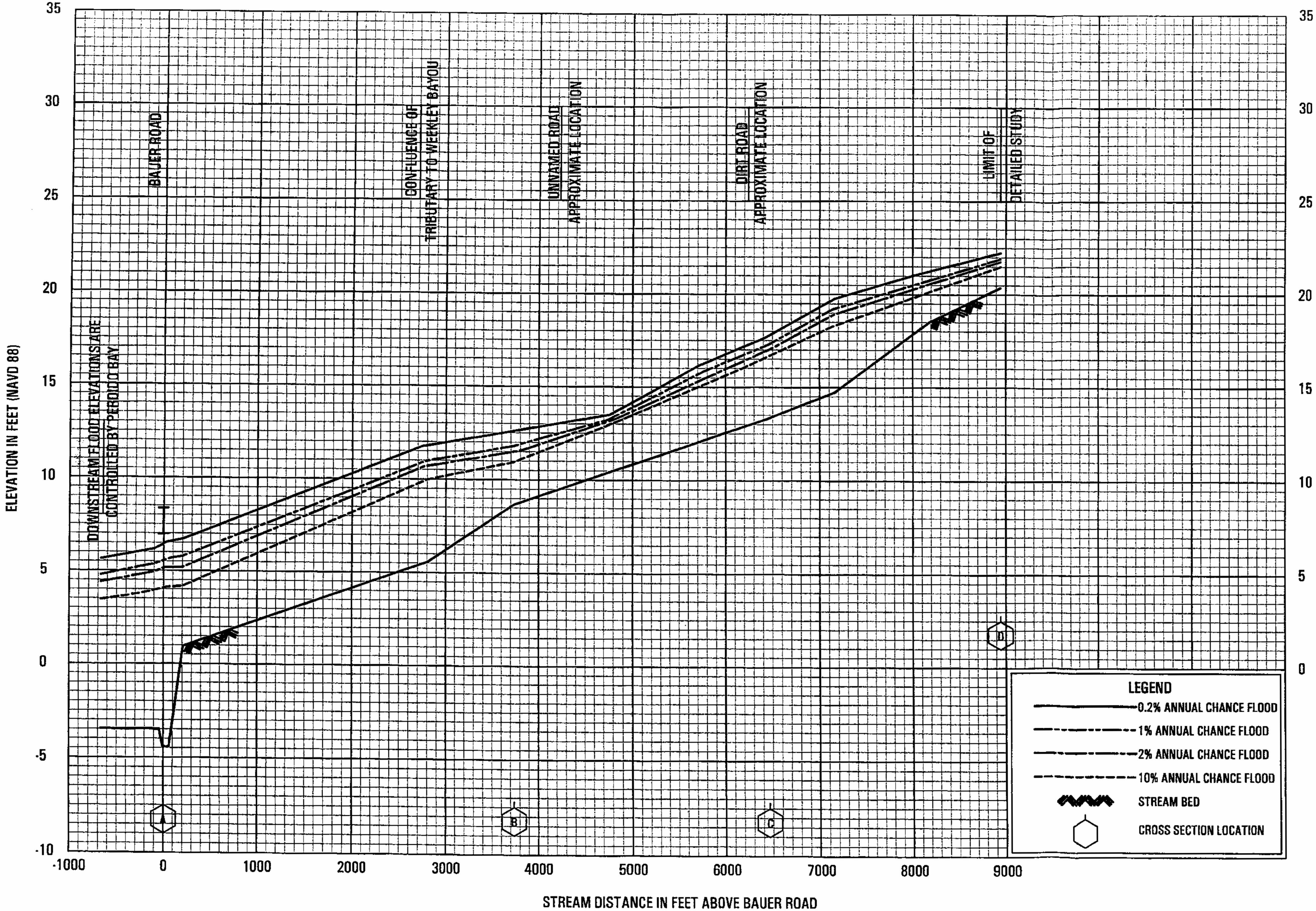
FLOOD PROFILES

THOMPSON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



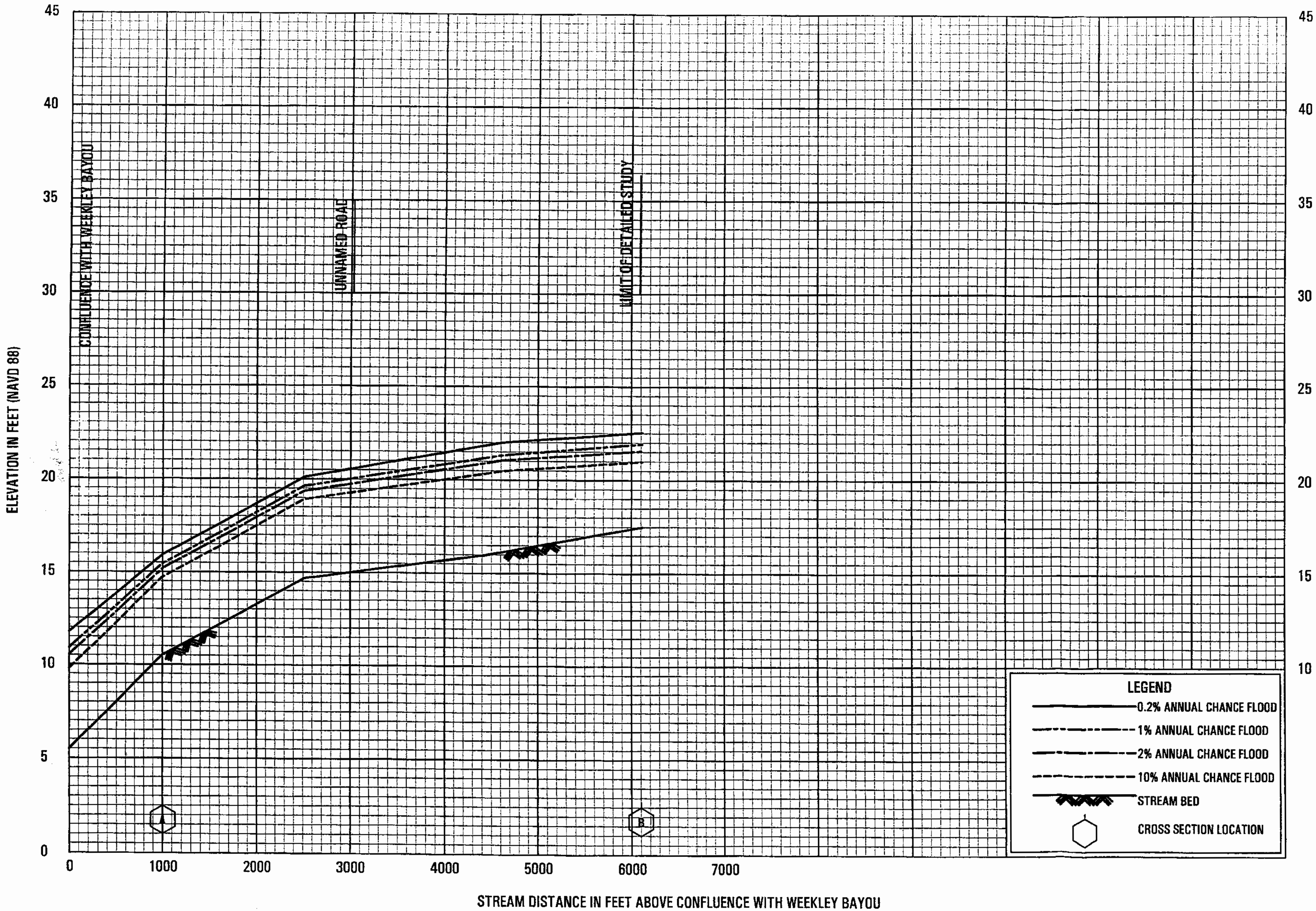
FLOOD PROFILES

WEEKLEY BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

AND INCORPORATED AREAS



FLOOD PROFILES

TRIBUTARY TO WEEKLEY BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

ESCAMBIA

40P