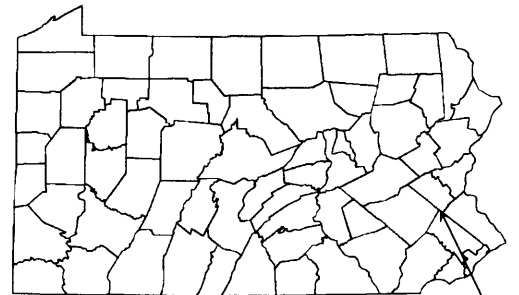


FLOOD INSURANCE STUDY

VOLUME 1 of 2



LEHIGH COUNTY, PENNSYLVANIA (ALL JURISDICTIONS)



Lehigh County

COMMUNITY NAME	COMMUNITY NUMBER
ALBURTIS, BOROUGH OF	420584
ALLENTOWN, CITY OF	420585
CATASAUQUA, BOROUGH OF	420586
COOPERSBURG, BOROUGH OF	420587
COPLAY, BOROUGH OF	421807
EMMAUS, BOROUGH OF	420588
FOUNTAIN HILL, BOROUGH OF	421808
HANOVER, TOWNSHIP OF	422261
HEIDELBERG, TOWNSHIP OF	421809
LOWER MACUNGIE, TOWNSHIP OF	420589
LOWER MILFORD, TOWNSHIP OF	421039
LOWHILL, TOWNSHIP OF	421811
LYNN, TOWNSHIP OF	421812
MACUNGIE, BOROUGH OF	420590
NORTH WHITEHALL, TOWNSHIP OF	421813
SALISBURY, TOWNSHIP OF	420591
SLATINGTON, BOROUGH OF	420592
SOUTH WHITEHALL, TOWNSHIP OF	420593

COMMUNITY NAME	COMMUNITY NUMBER
UPPER MACUNGIE, TOWNSHIP OF	421044
UPPER MILFORD, TOWNSHIP OF	421815
UPPER SAUCON, TOWNSHIP OF	420594
WASHINGTON, TOWNSHIP OF	421816
WEISENBERG, TOWNSHIP OF	421817
WHITEHALL, TOWNSHIP OF	420595

REVISED:
JULY 16, 2004



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
42077CV001B

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: November 7, 2001

Revised Countywide FIS Dates: July 2, 2003
July 16, 2004

TABLE OF CONTENTS

Table of Contents - Volume 1 – July 16, 2004

	<u>Page</u>
1.0 <u>INTRODUCTION</u>	1
1.1 Purpose of Study	1
1.2 Authority and Acknowledgments	1
1.3 Coordination	5
2.0 <u>AREA STUDIED</u>	6
2.1 Scope of Study	6
2.2 Community Description	8
2.3 Principal Flood Problems	8
2.4 Flood Protection Measures	10
3.0 <u>ENGINEERING METHODS</u>	11
3.1 Hydrologic Analyses	11
3.2 Hydraulic Analyses	22
3.3 Vertical Datum	27
4.0 <u>FLOODPLAIN MANAGEMENT APPLICATIONS</u>	28
4.1 Floodplain Boundaries	28
4.2 Floodways	29
5.0 <u>INSURANCE APPLICATIONS</u>	54
6.0 <u>FLOOD INSURANCE RATE MAP</u>	56
7.0 <u>OTHER STUDIES</u>	56
8.0 <u>LOCATION OF DATA</u>	60
9.0 <u>BIBLIOGRAPHY AND REFERENCES</u>	60

Table of Contents - Volume 1 - continued

Page

FIGURES

Figure 1 - Frequency-Discharge, Drainage Area Curves	15-16
Figure 2 - Floodway Schematic	54

TABLES

Table 1 - CCO Meeting Dates	5
Table 2 - Streams Studied by Detailed Methods	6
Table 3 - Letters of Map Change	7
Table 4 - Summary of Discharges	17-21
Table 5 - Floodway Data	31-53
Table 6 - Community Map History	57-59

EXHIBITS

Exhibit 1 - Flood Profiles	
Breinig Run	Panels 01P-02P
Catasauqua Creek	Panels 03P-05P
Cedar Creek	Panels 06P-10P
Coplay Creek	Panels 11P-19P
Fells Creek	Panels 19(a)P-19(c)P
Hassen Creek	Panel 20P
Hosensack Creek	Panels 21P-24P
Indian Creek	Panels 25P-27P
Iron Run	Panels 28P-29P
Jordan Creek	Panels 30P-42P
Lehigh Canal (abandoned)	Panel 43P
Lehigh River	Panels 44P-53P

Table of Contents - Volume 2 – July 16, 2004

EXHIBITS - continued

Exhibit 1 - Flood Profiles (continued)	
Leibert Creek	Panels 54P-55P
Little Cedar Creek	Panels 56P-58P

Table of Contents - Volume 2 - continued

EXHIBITS - continued

Exhibit 1 - Flood Profiles (continued)

Little Lehigh Creek	Panels 59P-76P
Ontelaunee Creek	Panels 77P-80P
Saucon Creek	Panels 81P-88P
Schaefer Run	Panels 89P-90P
School Creek	Panel 91P
Spring Creek No.1	Panel 92P
Swabia Creek	Panels 93P-98P
Swabia Creek Tributary	Panels 99P-100P
Toad Creek	Panel 101P
Tributary No. 1 to Little Lehigh Creek	Panels 102P-104P
Tributary to Hosensack Creek	Panels 105P-107P
Tributary to Lehigh River	Panels 108P-109P
Tributary to Little Lehigh Creek	Panels 110P-111P
Trout Creek No. 1	Panels 112P-114P
Trout Creek No. 2	Panel 115P
West Branch Trout Creek No.1	Panels 116P-122P

Exhibit 2 - Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
LEHIGH COUNTY, PENNSYLVANIA (ALL JURISDICTIONS)

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and updates the previous FIS/Flood Insurance Rate Map (FIRM) for the geographic area of Lehigh County, Pennsylvania, including: the Boroughs of Alburtis, Catasauqua, Coopersburg, Coplay, Emmaus, Fountain Hill, Macungie, and Slatington; the City of Allentown; and the Townships of Hanover, Heidelberg, Lower Macungie, Lower Milford, Lowhill, Lynn, North Whitehall, Salisbury, South Whitehall, Upper Macungie, Upper Milford, Upper Saucon, Washington, Weisenberg, and Whitehall (hereinafter referred to collectively as Lehigh County). The City of Bethlehem is not contained in its entirety within Lehigh County. Because the City of Bethlehem lies predominantly outside Lehigh County, it is not included on the Lehigh County (All Jurisdictions) FIRM. The City of Bethlehem is shown on the Northampton County, Pennsylvania (All Jurisdictions) FIRM (including the portion that lies in Lehigh County).

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

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.

The original November 7, 2001, countywide FIS was prepared to include incorporated communities within Lehigh County into a countywide FIS. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown on the following pages.

Allentown, City of:	the hydrologic and hydraulic analyses for the original FIS report dated December 1, 1981, were prepared by the U.S. Army Corps of Engineers (USACE), Philadelphia District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-10-77, and completed in March 1981. The hydrologic and hydraulic analyses of Trout Creek, for the FIS report dated January 6, 1995, were prepared by USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement Nos. EMW-90-E-3286 and EMW-91-E-3529, Project Order No. 1C, Task Letter No. 91-13. That work was completed in September 1992.
Catasauqua, Borough of:	the hydrologic and hydraulic analyses for the FIS dated November 1, 1979, were prepared by USACE, Philadelphia District, for the FIA under Inter-Agency Agreement Nos. IAA-H-19-74 and IAA-H-16-75, Project Order Nos. 17 and 6, Agreement No. 3, respectively. That work was completed in November 1977.
Emmaus, Borough of:	the hydrologic and hydraulic analyses for the FIS dated September 1, 1977, were prepared by Justin & Courtney, Inc., for the FIA, under Contract No. H-3747. Survey and topographic data was collected and compiled by Quinn and Associates, in association with Phillips, O'Brien & Gere, under sub-contract from Justin & Courtney, Inc.
Fountain Hill, Borough of:	the hydrologic and hydraulic analyses for the May 15, 1986, FIS, were prepared by Dewberry & Davis for FEMA, using the July 3, 1978, FIS prepared for the City of Bethlehem.
Lower Macungie, Township of:	the hydrologic and hydraulic analyses for the FIS dated August 1976, were prepared by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-2-73, Project order Nos. 13 and 14.
Lower Milford, Township of:	the hydrologic and hydraulic analyses for the FIS dated November 2, 1979, were prepared by USACE, Philadelphia District, for the FIA, under

Inter-Agency Agreement No. IAA-H-16-75, Project Order No. 16. That work was completed in November 1976.

Lynn, Township of:

the hydrologic and hydraulic analyses for the FIS dated September 30, 1987, were prepared by the U.S. Geological Survey (USGS) for FEMA, under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 6. That work was completed in June 1986.

Macungie, Borough of:

the hydrologic and hydraulic analyses for the FIS dated April 15, 1980, were prepared by USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 16, Amendment No. 2. That work was completed in October 1978.

North Whitehall,
Township of:

the hydrologic and hydraulic analyses for the FIS dated September 30, 1981, were prepared by Pickering, Corts and Summerson, Inc., for the FIA, under Contract No. H-4758. That work was completed in October 1979.

Salisbury, Township of:

the hydrologic and hydraulic analyses for the FIS dated February 1, 1984, were prepared by the DRBC for the FIA under Contract No. H-3747. That work was completed in March 1976.

Slatington, Borough of:

the hydrologic and hydraulic analyses for the FIS dated March 13, 1981, were prepared by Pickering, Corts and Summerson, Inc., for the FIA, under Contract No. H-4758. That work was completed in October 1979.

South Whitehall,
Township of:

the hydrologic and hydraulic analyses for the FIS dated February 1, 1978, were prepared by the DRBC for the FIA under Contract No. H-3747.

Upper Macungie,
Township of:

the hydrologic and hydraulic analyses for the FIS dated April 2, 1979, were prepared by Gannett Fleming Corddry and Carpenter, Inc., for the FIA under Contract No. H-3813. That work was completed in July 1977.

- Upper Milford,
Township of: the hydrologic and hydraulic analyses for the FIS dated May 19, 1981, was prepared by Pickering, Corts and Summerson, Inc., for the FIA under Contract No. H-4758. That work was completed in October 1979.
- Washington, Township of: the hydrologic and hydraulic analyses for the FIS dated April 15, 1981, were prepared by Pickering, Corts and Summerson, Inc., for the FIA under Contract No. H-4758. That work was completed in October 1979.
- Whitehall, Township of: the hydrologic and hydraulic analyses for the FIS dated February 15, 1984, were prepared by Justin & Courtney, Inc., Consulting Engineers and coordinated by the DRBC for the FIA under Contract No. H-3747. That work was completed in May 1976.

The authority and acknowledgments for the Boroughs of Alburtis, Coopersburg, and Coplay and the Townships of Hanover, Heidelberg, Lowhill, Upper Saucon, and Weisenburg are not included because there were no previously printed FIS reports for these communities.

For the November 7, 2001, FIS, the new hydrologic and hydraulic analyses for the Lehigh River, Jordan Creek, Little Lehigh Creek, and Saucon Creek were performed by USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement No. EMW-95-E-4756, Project Order No. 9. That work was completed in December 1997. The new hydrologic and hydraulic analyses for Fells Creek were prepared by the USACE, Philadelphia District, for FEMA under Inter-Agency Agreement No. EMW-97-IA-0154, Task Letter 97-8. That work was completed in April 1999. New hydrologic and hydraulic analyses for Tributary No. 1 to Little Lehigh Creek were prepared by the USACE, Philadelphia District. That work was completed in April 1996.

For the July 2, 2003, FIS, the Letter of Map Revision (LOMR) effective on June 17, 2002, was incorporated to reflect the impacts of an uncertified levee along the east bank of the Lehigh River. The levee had been shown as providing protection against the 1% annual chance (100-year) flood when, in fact, the levee does not meet the minimum requirements of Section 65.10 of the NFIP regulations. The hydraulic modeling prepared by the USACE, Philadelphia District, was modified by Dewberry & Davis LLC for this LOMR.

This revision was performed to incorporate new planimetric digital base map files provided by the Lehigh County GIS Bureau, Lehigh County Government Center, 17 South Seventh Street, Allentown, Pennsylvania, 18101. The base map

information was photogrammetrically compiled at scales of 1:1,200 and 1:4,800 from aerial photography, dated March 2000, that was also provided by the Lehigh County GIS Bureau.

The digital FIRM was produced in Universal Transverse Mercator Zone 18 coordinates referenced to the North American Datum of 1983 and the GRS80 spheroid.

This revision also incorporates the effects of two LOMRs. The first, dated May 19, 2003, for Iron Run, which redelineated the 100-year floodplain for approximately 4,000 feet along Iron Run in the Township of Upper Macungie. The second, dated January 28, 2004, for Cedar Creek, which redelineated the floodway, 100-, and 500-year floodplains for approximately 4,800 feet along Cedar Creek in the Township of South Whitehall. This revision also updates corporate limits and the county boundary.

1.3 Coordination

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

The dates of the initial and final CCO meetings held for the incorporated communities within the boundaries of Lehigh County are shown in Table 1, "CCO Meeting Dates."

TABLE 1 - CCO MEETING DATES

<u>Community</u>	<u>Initial CCO Date</u>	<u>Final CCO Date</u>
Allentown, City of	August 30, 1976	October 24, 1980
Catasauqua, Borough of	December 3, 1974	September 13, 1978
Emmaus, Borough of	*	April 26, 1976
Fountain Hill, Borough of	*	June 25, 1985
Lower Milford, Township of	December 4, 1974	November 9, 1976
Lynn, Township of	November 19, 1984	December 1, 1986
Macungie, Borough of	September 29, 1976	February 12, 1979
North Whitehall, Township of	April 28, 1978	October 24, 1980
Salisbury, Township of	*	April 15, 1976
Slatington, Borough of	April 27, 1978	March 28, 1980
South Whitehall, Township of	*	April 9, 1976
Upper Macungie, Township of	March 1975	February 17, 1978
Upper Milford, Township of	April 28, 1978	April 18, 1980
Washington, Township of	April 27, 1978	April 18, 1980
Whitehall, Township of	April 15, 1975	April 15, 1976

* Data not available

For the City of Allentown FIS dated January 6, 1995, the city was notified by letter on March 15, 1993, that a FIS would be prepared using the analyses of the USACE.

For the City of Allentown FIS dated February 2, 1996, the city was notified by letter on January 2, 1996, that a FIS would be prepared to correct outdated data.

For the November 7, 2001, FIS, an initial CCO meeting was held on July 6, 1994. This meeting was attended by representatives of the City of Allentown, the Townships of Upper Saucon, North Whitehall, Salisbury, Washington, Whitehall, and Hanover; and the Boroughs of Catasauqua, Coplay, Fountain Hill, and Slatington. A final CCO meeting was held on October 5, 1999, and was attended by representatives from all of the communities within Lehigh County and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Lehigh County, Pennsylvania.

All or portions of the flooding sources listed in Table 2, "Streams Studied by Detailed Methods," were studied by detailed methods.

TABLE 2 - STREAMS STUDIED BY DETAILED METHODS

Breinig Run	Saucon Creek
Catasauqua Creek	Schaeffer Run
Cedar Creek	School Creek
Coplay Creek	Spring Creek No. 1
Fells Creek	Swabia Creek
Hassen Creek	Swabia Creek Tributary
Hosensack Creek	Toad Creek
Indian Creek	Tributary No. 1 to Little
Iron Run	Lehigh Creek
Jordan Creek	Tributary to Hosensack Creek
Lehigh Canal (abandoned)	Tributary to Lehigh River
Lehigh River	Tributary to Little Lehigh Creek
Leibert Creek	Trout Creek No. 1
Little Cedar Creek	Trout Creek No. 2
Little Lehigh Creek	West Branch Trout Creek No. 1
Ontelaunee Creek	

For the November 7, 2001, FIS, approximately 3.4 miles of Fells Creek, 50 miles of the Lehigh River, 15 miles of Saucon Creek, 21 miles of Little Lehigh Creek,

and 13 miles of Jordan Creek were studied by detailed methods. Fells Creek was studied from the confluence of the Lehigh River to a point approximately 800 feet upstream of Neffs-Laurys Road. The Lehigh River was studied for its entire length within the community. Saucon Creek was studied from its confluence with the Lehigh River in Bethlehem to the Lower Milford Township/Upper Saucon Township line in Lehigh County. Little Lehigh Creek was studied from its confluence with the Lehigh River in Allentown to the Lehigh County/Berks County line. Jordan Creek was studied from its confluence with Little Lehigh Creek in Allentown to the North Whitehall Township/South Whitehall Township line. In addition, Tributary No. 1 to Little Lehigh Creek was newly studied by detailed methods from a point approximately 450 feet downstream of East Berger Street to a point approximately 230 feet upstream of Minor Street within the Borough of Emmaus. Toad Creek was revised from the confluence with Little Lehigh Creek to the county boundary.

The November 7, 2001, FIS also incorporated the determination of Letters of Map Change (LOMR, and Letter of Map Amendment [LOMA]) issued by FEMA as shown on Table 3, "Letters of Map Change for November 7, 2001, FIS."

TABLE 3 - LETTERS OF MAP CHANGE FOR NOVEMBER 7, 2001, FIS

<u>Community</u>	<u>Flooding Source(s)/Project Identifier</u>	<u>Date Issued</u>	<u>Type</u>
Township of Upper Macungie	Iron Run Lehigh Valley Industrial Subdivision placement of fill/revision of Zone A area	June 3, 1996	LOMR
Township of Upper Macungie	Iron Run Lehigh Valley West Industrial Subdivision - Lot 2 Placement of fill/Revision of Zone A area	December 21, 1995	LOMR
Township of Upper Milford	Leibert Creek Grist Mill/Restudy of Zone A area	October 3, 1990	LOMR

For the July 2, 2003, revision, a previously issued LOMR effective on June 17, 2002, was incorporated to reflect the impacts of an uncertified levee in the Township of Salisbury along the Lehigh River, from a point approximately 2.7 miles downstream of the confluence of Little Lehigh Creek to a point approximately 0.8 mile downstream of the confluence of Little Lehigh Creek. These revisions occur only to the landside of the uncertified levee along the east bank.

This revision also incorporates the determination of a LOMR effective on May 19, 2003, which redelineated the 100-year floodplain for approximately 4,000 feet along Iron Run in the Township of Upper Macungie, as well as a LOMR effective on January 28, 2004, which redelineated the floodway, 100-year and 500-year floodplains for approximately 4,800 feet along Cedar Creek in the Township of South Whitehall.

Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2). The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

The following tabulation lists streams that have names in this countywide FIS other than those used in the previously printed precountywide FISs for the communities in which they are located:

<u>Community</u>	<u>Old Name</u>	<u>New Name</u>
Allentown	Trout Creek	Trout Creek No. 1
Allentown	West Branch Trout Creek	West Branch Trout Creek No.1
Slatington	Trout Creek	Trout Creek No.2
Lower Macungie	Spring Creek	Spring Creek No.1

Numerous streams were studied by approximate methods. 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 Lehigh County.

2.2 Community Description

Lehigh County is located in southeast Pennsylvania. Lehigh County is bordered by Carbon County to the north, Northampton County to the northeast, Bucks County to the southeast, Montgomery County to the south, Berks County to the southwest, and Schuylkill County to the northwest. According to the U.S. Census Bureau, the population of Lehigh County in 2000 was 312,090.

2.3 Principal Flood Problems

Flooding in Lehigh County occurs in all seasons from both extra-tropical (storms produced from the passage of either a cold front or a warm front) and tropical storms. Flood conditions may be aggravated by the rapid melting of an existing snow pack, and/or by reduction in infiltration losses due to frozen ground.

Extra-tropical storms associated with cold fronts occur mostly during the warmer months of the year. Precipitation accompanying the passage of a cold front tends to be intense and of short duration, occurring in the form of thunderstorms or snowfall. Major basin-wide floods are rarely caused by cold front rainfall;

however, the majority of floods along the smaller tributaries and in the headwater areas of the main streams are produced by cold front storms.

Extra-tropical storms associated with warm fronts may be expected at any time during the year; however, they are more prevalent during the winter and colder portions of the year. Warm front storms, producing less intense but more protracted rainfall, have produced most of the basin-wide floods. A special case of flooding associated with a warm front storm is produced when rain falls on a winter snow pack. The rapid spring melting of a deep snow pack combined with heavy rainfall can be the cause of significant runoff.

Tropical storms, notably hurricanes, have produced several basin-wide floods in their relatively rare excursions into this region. In August of 1955 precipitation from hurricanes "Connie" and "Diane," which occurred within a week of each other, produced high runoff and record-breaking floods throughout the basin.

Much of the county experienced flooding along the Lehigh River in 1902, 1942, and 1955. The flood of August 19, 1955, attained a maximum discharge of 77,800 cubic feet per second at the Walnutport gaging station (#01451000 since beginning operation in October 1946). The Walnutport gaging station is approximately 2 miles upstream of North Whitehall on the Lehigh River. Each of these floods crested higher than the 100-year flood and caused damage to structures adjacent to the river (Reference 1).

The elevation of a high-water mark experienced during the August 19, 1955, flood at the Walnutport gaging station was 367.95 feet. The elevation of the water surface of the estimated 100-year flood at this same location is 364.50 feet (Reference 1).

Within the Borough of Catasauqua, CONRAIL lies directly between the Lehigh River and Canal, and Catasauqua Creek. At this point, both the canal and railroad cross Catasauqua Creek. It is at this location, according to borough officials, that the borough had experienced flooding in June 1972. Also, major flooding has occurred in the vicinity of Race Street over Catasauqua Creek. According to House Document No. 522, the Lehigh Navigation Canal, which extends from Jim Thorpe to Easton, Pennsylvania, was inundated at numerous places by major floods in 1902, 1942, and 1955 (Reference 2). Accompanying flood damage included about 90 acres of industrial and residential areas.

Within the Township of Salisbury, Trout Creek No.1 is subject to wide variation in flow with flood flows being caused by the rapid runoff from surrounding mountain slopes. In this area flood related damage has been limited to occasional residential damage, such as basement flooding, caused in part by local drainage problems.

Jordan Creek flows across the Township of South Whitehall in a meandering narrow channel with well-defined banks and wide flood plain areas. There are

numerous instances of flooding in the past, the maximum recorded being at 15,300 cubic feet per second on June 23, 1972. Cedar Creek and Little Cedar Creek, also of similar topographic characteristics, have had numerous floods in the past. Some of the flooding is caused by the inadequate capacity of drainage culverts and bridges to carry the flood flows.

The high elevations of the Township of Upper Milford effectively ease the threat of flooding, in that its streams have not had the opportunity to collect runoff over large areas. Hurricane Diane occurred in August 1955 and brought rains to the Lehigh Valley of a magnitude experienced on the average only once in 150 years. While bridges and homes were being swept down the Delaware River, the streams in Upper Milford overflowed their banks at only a few places and no structure suffered flood damage. The Perkiomen River overflowed for its entire length, covering Yeakels Mill Road to a depth of 2 feet and Chesnut Street up to 1.5 feet. Indian Creek overflowed in the vicinity of Chesnut Street, covering it to a depth of about 6 inches, and again in the Powder Valley area. Leibert Creek had accumulated more water than its channel could accommodate by the time it crossed Chesnut Street, flooding the road to a depth of 1.5 feet. Further downstream Airport Road was closed by 4 feet of water (Reference 3).

2.4 Flood Protection Measures

FEMA specifies that all levees must have a minimum of 3 foot freeboard against 100-year flooding to be considered a safe flood protection structure.

Levees exist in the study area that provided several communities with some degree of protection against flooding. However, it has been ascertained that none of the levees located in the Cities of Allentown and Bethlehem and the Township of Salisbury will protect these communities from rare events such as the 100-year flood. The criteria used to evaluate protection against the 100-year flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 100-year flood are not considered in the hydraulic analysis of the 100-year floodplain.

Two USACE dams currently operate in Lehigh County. The Francis E. Walter Dam is located on the Lehigh River in Carbon and Luzerne Counties, approximately 77 river miles above the confluence with the Delaware River. Beltzville Lake is located on Pohopoco Creek in Carbon County, approximately 4 miles upstream from the confluence with the Lehigh River. These two projects are designed for low-flow augmentation, recreation, and flood control. They reduce flood stages on the Lehigh River, thereby decreasing the backwater effect that aggravates flooding at the mouth of Little Lehigh Creek.

In addition to the two flood control dams, several local flood protection projects have been constructed along the Lehigh River. In the City of Allentown, along the right bank of the Lehigh River, a project consisting of a 750-foot long, low levee, on a relatively high bank at the upstream end of the project; a concrete

floodwall extending 204 feet upstream of the Old Hamilton Street bridge abutment; a short levee spanning 69 feet between abutments of the Old and New Hamilton Street bridges; a levee extending 1,125 feet, connecting with Kline's Island Levee, and a training dike approximately 1,300 feet long that was constructed around a sharp bend to reduce backwater stages in Little Lehigh Creek. A local flood control project consisting of a straightened and deepened main channel extending 8,280 feet and revetted where necessary also exists in the City of Allentown. Within the Township of Salisbury, a dike was built along the south side of the Lehigh River to protect the floodplain in the loop of the river. This dike has protected against severe flooding in the past, but is not certified for 100-year flood protection.

Flood protection measures have been taken along other flooding sources in Lehigh County. A quarry in the Township of North Whitehall at Walnut Street along Coplay Creek, although not intended to provide flood protection, nonetheless provides flood protection to properties adjoining Coplay Creek downstream of Walnut Street to the corporate boundary. This flood protection is the result of flood flows reaching elevations higher than the left bank of the Coplay Creek and discharging into the quarry. This protection will occur during floods having a recurrence interval of 20 years and greater.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the Lehigh 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 community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

Precountywide Analyses

The hydrologic analyses for each community within Lehigh County that had a previously printed FIS report have been compiled and are summarized below.

For the detailed study of Breinig Run, the hydrologic analysis was performed using the Penn State University's, "Flood Peak Frequency Design Manual - PSU III" for Pennsylvania as prepared in September 1971, for the Department of Transportation. This procedure relates basin characteristics, such as drainage area, and soil classifications to estimate the resulting discharge values by empirical equations. An adjustment was also made to account for the loss of water due to the abundance of limestone underlying this region (Reference 4).

The hydrologic analysis for Catasauqua Creek for the selected recurrence intervals of the 10-, 50-, and 100-year storms consisted of developing a rainfall-runoff model using the USACE HEC-1 computer program (Reference 5). The 500-year discharge was determined by straight-line extrapolation of a single-log graph of flood discharges for frequencies up to 100 years.

Hydrologic data for Cedar Creek and Little Cedar Creek were obtained from two previous floodplain information reports (References 6 and 7). Analysis of other portions of Cedar Creek and Little Cedar Creek were based on "Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District, November 1974," prepared by the Hydrologic Engineering Center, USACE (Reference 8). This method of analysis follows the standard log-Pearson Type III method as outlined by the Water Resources Council (WRC) (Reference 9).

For Coplay Creek, the hydrologic analyses were based on the USACE regional frequency study of the Upper Delaware and Hudson River basins and follows the same method as that used for Cedar Creek (References 8 and 9). The methodologies used to calculate flood flow relate the magnitude of instantaneous peak stream discharges for the selected recurrence intervals to statistically significant drainage basin characteristics. These characteristics include channel slope, annual precipitation, and drainage area as determined from USGS topographic maps and Water Resources Bulletin No. 6 (References 10 and 11). Flood-flow frequency data for other portions of Coplay Creek were based on statistical analysis of stage-discharge records covering a 32 year period at gaging stations operated by the USGS (Reference 12). This analysis was based on the USACE frequency study mentioned above (Reference 8). The study was modified to correlate it with regional readings and flood data. This method of analysis followed the standard log-Pearson Type III method as outlined by the WRC (Reference 9).

Hydrologic analyses for Hassen Creek, Leibert Creek, and Trout Creek also utilized the regional study prepared by USACE in conjunction with the log-Pearson Type III analysis as outlined by the WRC (References 8 and 9). To determine the various recurrence flood flows for Trout Creek No. 2, missing flood

peaks were estimated by correlation with the nearest long-record gaging stations, and the statistics were then computed.

Because there are no stream gages located along either Hosensack Creek or Indian Creek, the hydrologic analyses consisted of formulating a Rainfall-Runoff Model for the basin using the USACE "HEC-1, Computer Program, Flood Hydrograph Package" (Reference 5). From the model, hydrographs were computed and peak flows were determined for hypothetical storms having recurrence intervals of 10, 50, and 100 years. Discharges for the 500-year flood were determined by extrapolation of a graph of flood discharges computed for frequencies up to 100 years.

For the detailed study of Iron Run and Schaefer Run, the hydrologic analysis was performed using the Penn State University's, "Flood Peak Frequency Design Manual - PSU III" for Pennsylvania as prepared in September 1971, for the Department of Transportation. This procedure relates basin characteristics, such as drainage area, and soil classifications to estimate the resulting discharge values by empirical equations. An adjustment was also made to account for the loss of water due to the abundance of limestone underlying this region (Reference 4).

The flood frequency discharge values for Ontelaunee Creek and School Creek were determined utilizing regional regression equations developed in the USGS Water Resources Investigations 82-21 (Reference 13).

The hydrologic data for Swabia Creek, Spring Creek No. 1, Swabia Creek Tributary, and Toad Creek were based on streamflow records obtained from a USGS recording gage located approximately 3.4 miles above the mouth of Little Lehigh Creek, northeast of Macungie. Swabia Creek is a tributary to Little Lehigh Creek. This gaging station has been in operation since 1945. Discharges for floods of the selected recurrence intervals were computed by means of the method found in Beard's Statistical Methods in Hydrology (Reference 14). Flows in Swabia Creek were determined assuming a direct relationship between discharges and square root ratios of drainage areas. Due to an insignificant variation in the drainage area between the study limits, only point values are depicted for Swabia Creek Tributary, Spring Creek No. 1, and Toad Creek.

For Tributary to Hosensack Creek and Tributary to Little Lehigh Creek, hydrologic analyses were performed following the methodology of WRC Bulletin No. 13, which relates drainage basin characteristics to streamflow characteristics (Reference 15).

The Bulletin No. 13 regression model for streams similar to Tributary to Hosensack Creek is based upon 20 gaging stations, and the regression model for streams similar to Tributary to Little Lehigh Creek is based upon 128 gaging stations. The models relate magnitude of instantaneous peak stream discharge for selected recurrence intervals to statistically significant drainage basin characteristics. These characteristics include the drainage area as determined from USGS topographic maps, channel slope, storage, and the annual precipitation (Reference 10).

Hydrologic data for Tributary to Lehigh River was based upon discharge-drainage area relationships performed by USACE for streams studied for the 1995 FIS for the City of Allentown.

For Trout Creek No. 1, hydrologic data were obtained from a drainage area/discharge curve from West Branch Trout Creek, Tributary to Lehigh River, Cedar Creek, and Little Cedar Creek.

Hydrologic data for West Branch Trout Creek No. 1 were determined by the Rational Method.

For streams studied by approximate methods within the Borough of Emmaus, the 100-year recurrence flow used was the same as that determined for Leibert Creek.

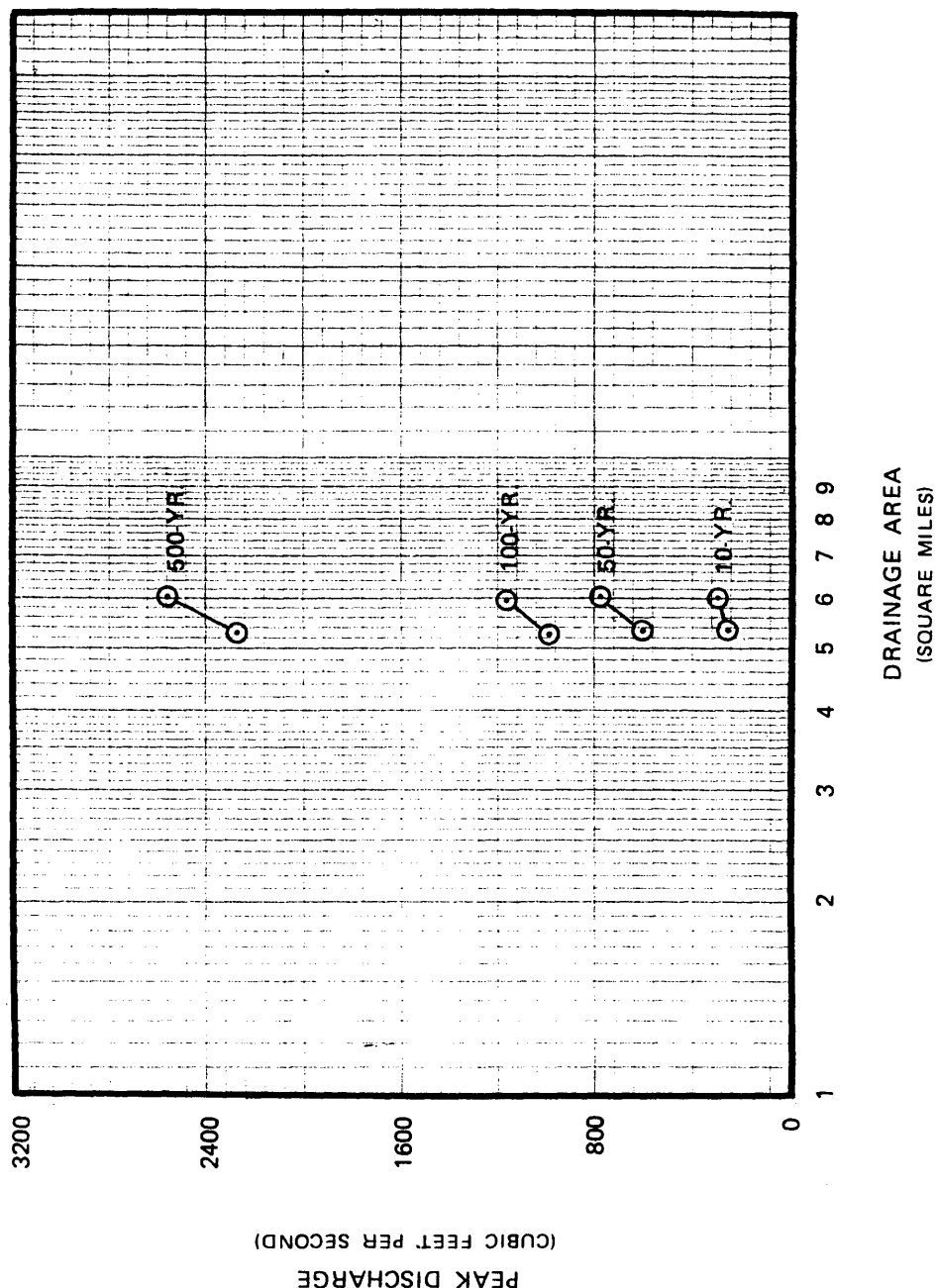
For Little Cedar Creek, Cedar Creek, Hassen Creek and the other tributaries within the township of South Whitehall, the same method of analysis was used to determine the various recurrence flood flows, the 100-year recurrence flow being used for the approximate study streams. For the Township of Salisbury, the 100-year recurrence flow was used for the approximate study on Trout Creek. For those within the Township of Upper Macungie, discharges were calculated from data presented in the USGS Open-File Report 76-391, "Floods in Pennsylvania: A Manual for Estimation of Their Magnitude and Frequency," which is a regional method using regression equations relating drainage area, channel slope, percent area of storage and an index of average annual excess precipitation (Reference 16). Within the Township of Whitehall, the 100-year recurrence flow used was the same as that determined for Coplay Creek.

Revised Analyses for the November 7, 2001, Countywide FIS

The hydrologic analyses for the Lehigh River and Fells Creek were derived directly from the "Modification of the Francis E. Walter Dam and Reservoir, General Design Memorandum, August 1985, Appendix J - Hydrology and Hydraulics" (Reference 17). Data from the same analysis is also presented in "F.E. Walter Reservoir, Lehigh River, PA, Water Control Manual (Revised), October 1994" (Reference 18). The analyses for Jordan and Little Lehigh Creeks consisted of an updated log-Pearson Type III frequency analysis of the gages along with an updated Northeastern Pennsylvania regional study. The analysis for Saucon Creek consisted solely of the updated regional study since no gages exist on the creek.

The hydrologic analysis for Tributary No. 1 to Little Lehigh Creek was conducted using USGS Water Resources Bulletin No. 13 (Reference 15).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods except Leibert Creek, Spring Creek No. 1, Swabia Creek Tributary, and Toad Creek are shown in Table 4, "Summary of Discharges." Discharge data for Leibert Creek, Spring Creek No. 1, Swabia Creek Tributary, and Toad Creek are shown in Figure 1, "Frequency-Discharge, Drainage Area Curves."



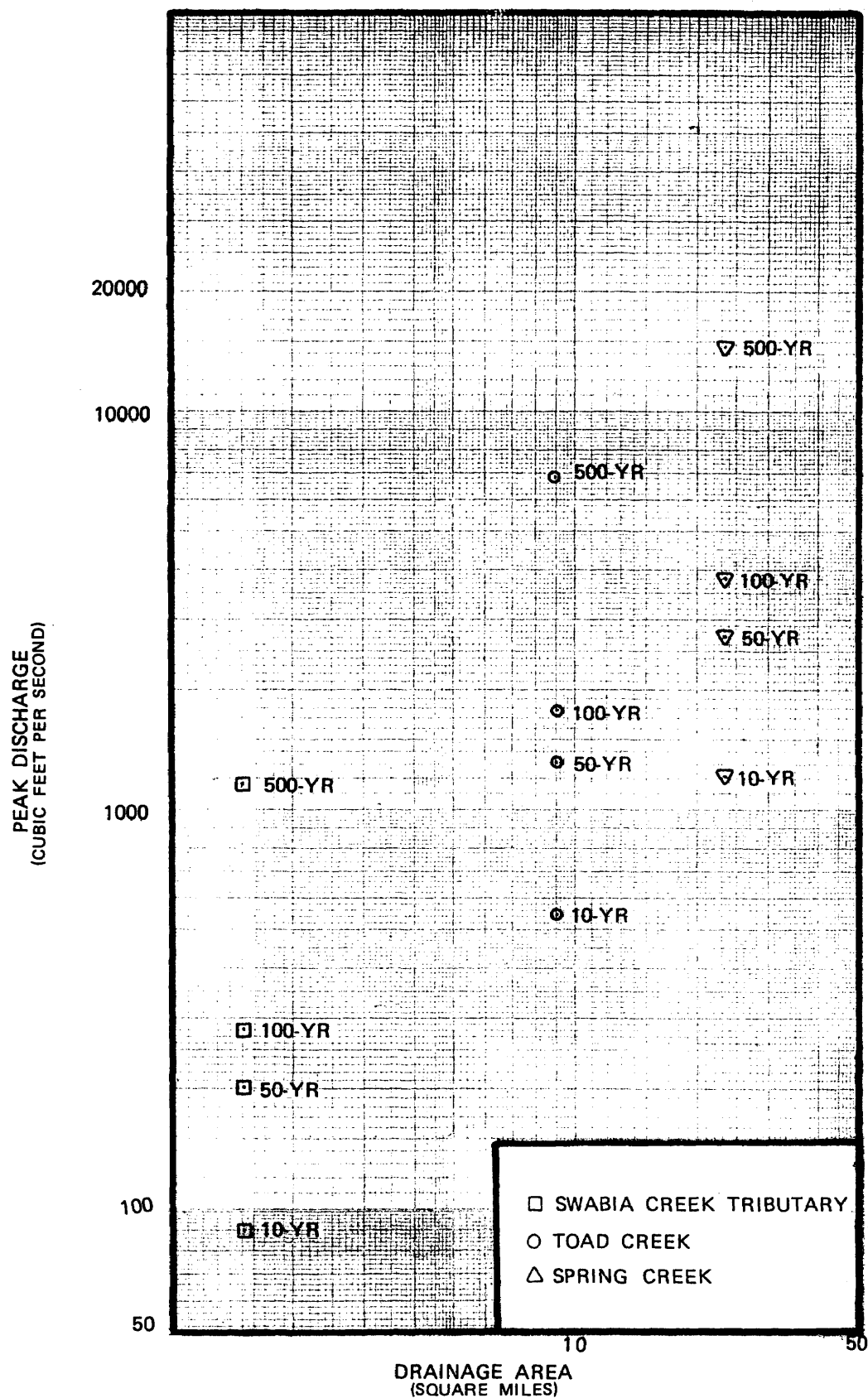
FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES

LEIBERT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FIGURE 1



FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES

SWABIA CREEK TRIBUTARY, TOAD CREEK, SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FIGURE 1

TABLE 4 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
BREINIG RUN					
At confluence with Schaefer Run	1.3	144	216	252	317
CATASAUQUA CREEK					
Upstream of confluence with Lehigh River	15.70	2,200	4,900	7,000	13,100
At County Boundary	8.89	1,300	2,900	4,000	7,800
CEDAR CREEK					
At confluence with Little Lehigh Creek	15.0	2,100	2,900	3,300	8,300
Downstream of confluence of Little Cedar Creek	10.2	1,700	2,400	2,700	5,500
COPLAY CREEK					
At confluence with Lehigh River	18.1	1,200	2,600	3,600	7,000
At stream crossing on Route 145	11.8	950	2,100	2,800	5,600
At Township of North Whitehall downstream corporate limits	11.3	930	1,400	1,400	1,400
At Walnut Street	10.1	750	1,800	2,550	5,050
At Willow Street	7.9	690	1,530	2,100	4,260
At Golf Course Road	7.4	660	1,480	2,000	4,080
At Coffetown Road	6.3	580	1,300	1,800	3,640
At Levans Road	5.5	520	1,170	1,620	3,320
At North Whitehall Township Route 691	4.9	475	1,080	1,500	3,060
At the downstream crossing of North Whitehall Township Route 674	4.4	430	990	1,370	2,860
At upstream crossing of North Whitehall Township Route 674	3.6	370	850	1,200	2,500
At stream junction with unnamed tributary north- west of Arlington Knolls	3.6	310	730	1,020	2,170
At State Route 329	2.9	310	720	1,000	2,150
FELLS CREEK					
At confluence with the Lehigh River	3.1	550	1,300	1,800	3,200

TABLE 4 - SUMMARY OF DISCHARGES - continued

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
HASSEN CREEK					
At confluence with Jordan Creek	7.45	660	1,500	2,150	4,430
HOSENSACK CREEK					
At county boundary	17.0	3,000	6,400	8,700	15,400
INDIAN CREEK					
Above confluence with Hosensack Creek	4.6	950	2,000	2,600	4,300
IRON RUN					
At confluence with Spring Creek No. 1	10.71	672	1,008	1,176	1,478
JORDAN CREEK					
At confluence with Little Lehigh Creek	81.0	6,960	12,960	16,380	27,040
At USGS gage (Jordan Creek at Allentown)	75.8	6,630	12,400	15,700	26,000
At Whitehall/South Whitehall corporate limits	70.4	6,220	11,460	14,420	23,550
At South Whitehall/North Whitehall corporate limits	58.0	5,270	9,320	11,540	18,170
At USGS gage (Jordan Creek near Schnecksville)	53.0	4,880	8,470	10,400	16,100
LEHIGH RIVER					
At Glendon gage	1,359	40,000	60,000	69,000	98,000
At Bethlehem gage	1,279	38,500	59,000	69,000	98,000
At Allentown gage	1,033	34,500	55,000	66,000	98,000
At Walnutport gage	889	32,500	53,000	64,000	98,000
At Lehighon gage	591	25,500	41,500	50,500	78,000
At Tannery gage	322	9,000	9,000	9,000	14,300
LITTLE CEDAR CREEK					
At confluence with Cedar Creek	5.0	1,200	1,700	1,900	3,200

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
LITTLE LEHIGH CREEK					
At confluence with Lehigh River	188.0	8,870	19,970	26,810	50,180
Downstream of Jordan Creek	178.6	8,540	19,310	25,940	48,680
Upstream of Jordan Creek	97.6	5,510	12,920	17,610	34,010
Downstream of Cedar Creek	95.9	5,440	12,770	17,410	33,650
Upstream of Cedar Creek	80.9	4,800	11,410	15,610	30,420
At USGS gage (Little Lehigh Creek near Allentown)	80.8	4,800	11,400	15,600	30,400
Downstream of Swabia Creek	66.2	4,150	9,990	13,730	27,010
Upstream of Swabia Creek	53.9	3,580	8,710	12,030	23,910
Downstream of Schaefer Run/Spring Creek No. 1	45.3	3,150	7,760	10,760	21,560
Upstream of Schaefer Run/Spring Creek No.1	21.6	1,840	4,750	6,690	13,890
At Lehigh/Berks County boundary	8.0	890	2,450	3,540	7,710
ONTELAUNEE CREEK					
At Township of Lynn downstream corporate limits	27.3	*	*	5,650	*
At State Route 863	18.0	*	*	4,170	*
Above confluence of School Creek	4.89	*	*	1,620	*
SAUCON CREEK					
At confluence with Lehigh River	57.9	4,620	8,620	10,910	17,990
At cross section A, City of Bethlehem	56.5	4,540	8,480	10,740	17,730
Downstream of confluence of East Branch Saucon Creek	56.0	4,510	8,430	10,680	17,640
Upstream of confluence of East Branch Saucon Creek	45.7	3,890	7,370	9,370	15,630

*Data not available

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
SAUCON CREEK (continued)					
Downstream of confluence of Silver Creek (Friendsville Road)	38.0	3,400	6,520	8,320	14,010
Upstream of confluence of Silver Creek (Friendsville Road)	35.1	3,210	6,180	7,910	13,370
Downstream of confluence of South Branch Saucon Creek	26.6	2,630	5,140	6,620	11,340
Upstream of confluence of South Branch Saucon Creek	16.1	1,820	3,680	4,800	8,420
At Township of Lower Milford boundary	3.9	640	1,420	1,920	3,600
SCHAEFER RUN (SPRING CREEK NO. 1)					
At Township of Upper Macungie downstream corporate limits	24.86	1,200	1,800	2,100	2,640
At upstream limit of detailed study	8.57	576	864	1,008	1,267
SCHOOL CREEK					
At confluence with Ontelaunee Creek	4.78	*	*	1,575	*
At State Route 143, east of New Tripoli	2.24	*	*	910	*
SWABIA CREEK					
Above confluence with Little Lehigh Creek	11.97	700	1,620	2,270	8,880
At Borough of Macungie upstream boundary	7.44	440	1,030	1,440	5,600

*Data not available

TABLE 4 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY NO. 1 TO LITTLE LEHIGH CREEK					
Approximately 1,200 feet downstream of Harrison Street	1.8	*	823	1,083	2,100
At Harrison Street	1.6	*	753	991	1,990
At Ridge Street	0.74	*	419	555	1,150
At CONRAIL	0.38	*	255	335	670
TRIBUTARY TO HOSENSACK CREEK					
At Upper Milford Township Route 378	1.4	620	1,150	1,470	2,200
TRIBUTARY TO LEHIGH RIVER					
At confluence with Lehigh River	3.7	1,025	1,425	1,625	2,500
TRIBUTARY TO LITTLE LEHIGH CREEK					
At Airport Road extended	1.5	250	450	550	900
TROUT CREEK NO. 1					
At confluence with Little Lehigh Creek	8.1	1,525	2,130	2,410	4,510
Downstream of confluence of West Branch Trout Creek No. 1	5.6	1,260	1,800	2,000	3,450
TROUT CREEK NO. 2					
At confluence with Lehigh River	22.4	2,200	4,500	6,000	11,000
WEST BRANCH TROUT CREEK NO. 1					
At confluence with Trout Creek No. 1	1.4	610	930	1,075	1,460

*Data not available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

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).

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.

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

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

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

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

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

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

Precountywide Analyses

The hydraulic analyses for each community within Lehigh County that had a previously printed FIS report have been compiled and are summarized below.

Cross sections for the backwater analyses of Breinig Run, portions of Cedar Creek, Catasauqua Creek, portions of Hassen Creek, Hosensack Creek, Indian Creek, Iron Run, portions of Little Cedar Creek, Ontelaunee Creek, Schaefer Run (Spring Creek), School Creek, Spring Creek No. 1, Swabia Creek, Swabia Creek Tributary, Tributary to Lehigh River, Toad Creek and West Branch Trout Creek No. 1 were obtained from field surveys (Reference 19). All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry in order to compute the significant backwater effects of these structures.

Cross sections for Trout Creek No. 2 were obtained from aerial photographs taken in April 1974 and April 1976 at a scale of 1"=1,000' (Reference 20).

For the following streams, cross sections were determined by aerial photogrammetry for overbank areas and by field survey for corresponding stream channel locations: portions of Cedar Creek, Coplay Creek (Reference 20), portions of Hassen Creek, Leibert Creek, portions of Little Cedar Creek, Monocacy Creek. Cross sections were also taken at close intervals above and below bridges in order to compute the significant backwater effects of these structures.

Cross sections for the backwater analyses of Tributary to Hosensack Creek and Tributary to Little Lehigh Creek were obtained from aerial photographs (Reference 20). Streambed sections were obtained by field measurement. All bridges and culverts were surveyed to obtain elevation data and structural geometry. Cross sections were located above and below bridges, at control locations along the stream lengths, and at significant changes in ground relief, land use, or land cover.

Hydraulic data for that portion of Cedar Creek within the Township of Salisbury was extracted from two studies made by USACE (Reference 21 and 22).

Cross sections for the following streams studied by approximate methods, were determined from the USGS-7.5 Minute Series Topographic Maps: Black River, Cedar Creek, East Branch, Little Cedar Creek, portions of Trout Creek No. 2, Spring Creek, and unnamed tributaries within the City of Bethlehem, the Townships of South Whitehall and Whitehall, and the Borough of Emmaus (Reference 10).

Water-surface elevations of the floods of selected recurrence intervals for the following streams were computed using the USACE HEC-2 step-backwater program (Reference 23): Breinig Run, Catasauqua Creek, Cedar Creek, Coplay Creek, Hassen Creek, Hosensack Creek, Indian Creek, Iron Run, Leibert Creek, Little Cedar Creek, Monocacy Creek, Schaefer Run, Spring Creek No. 1, Swabia Creek, Swabia Creek Tributary, Toad Creek, Tributary to Hosensack Creek, Tributary to Little Lehigh River, Tributary to Little Lehigh Creek, Trout Creek No. 1, Trout Creek No. 2, and West Branch Trout Creek No. 1.

Water-surface elevations of floods for the selected recurrence intervals for Ontelaunee Creek from the lower corporate limits of the Township of Lynn to approximately 7.7 miles upstream were computed by modeling bridge hydraulics with the USGS WSPRO step-backwater computer program (References 24 and 25). This program was also used to model bridges on the lower 1.17-mile portion of School Creek. Manual computations were used to compute the profiles at culverts (Reference 26).

Starting water-surface elevations for Catasauqua Creek were taken from computed water-surface elevations on Lehigh River. Within the City of Allentown, starting water-surface elevations were calculated using the normal depth method. Starting water-surface elevations for Shaeffer Run were taken from computed water-surface elevations on Little Lehigh Creek. For Hosensack Creek, starting water-surface elevations were determined using the critical depth method. Starting water-surface elevations for Indian Creek were obtained from backwater calculations on Hosensack Creek. Starting water-surface elevations for portions of Coplay Creek, Trout Creek No. 2, Tributary to Hosensack Creek, and Tributary to Little Lehigh Creek were calculated using the slope/area method. Other portions of Coplay Creek were based on coincident condition elevations at the Lehigh River with adjustments for increased elevations due to backwater-producing structures. Starting water-surface elevations for Cedar Creek and Little Cedar Creek were coordinated with previous flood insurance and floodplain information studies made by the USACE. Starting water-surface elevations for Swabia Creek, Swabia Creek Tributary, Spring Creek, and Toad Creek were taken from the USACE study for the Township of Lower Macungie. Starting elevations for Breinig Run and Iron Run were taken from the Schaefer Run profiles (Reference 27).

Channel roughness (Manning's "n") used in the hydraulic computations were chosen by field inspection of the floodplain areas, engineering judgement and previously published reports (References 28, 29, 30, and 31). The tabulation

showing the channel and overbank “n” values for the streams studied by detailed methods can be found on pages 26 and 27.

Within the Township of Lynn, for the reaches of Ontelaunee and School Creeks between the bridges, normal depths of flooding for the 100-year recurrence interval were estimated from the regional relationship between drainage area and flood depth prepared by the USGS (Reference 32). This relationship was developed by the USGS by means of regional regression analyses of basin areas and 100-year within-channel depths observed at stream gages. Depths were adjusted, on the basis of hydraulic calculations, to account for increased depth due to backwater from hydraulic structures, such as bridges and culverts (References 24 and 33).

The approximate 100-year elevation for the tributary to Little Lehigh Creek was obtained from the 100-year water-surface elevation on Little Lehigh Creek. For the Black River, the upstream reach of Coplay Creek, East Branch, Trout Creek No. 1, Spring Creek, tributaries to Coplay Creek and Lehigh River, and unnamed tributaries within the City of Bethlehem, the Township of South Whitehall, and the Borough of Emmaus, the 100-year flood was approximated by the use of the Nordep computer program which calculated water depth and water-surface elevations using data obtained from the USGS Quadrangle Sheets (References 10 and 34).

For Trout Creek No. 2 and those streams studied by approximate methods within the Townships of North Whitehall, Upper Milford, and Washington, the 100-year elevations for were developed by field inspection, engineering judgement, examination of available topographic mapping, and the use of the Flood Hazard Boundary Map published in 1974 (References 35, 36, and 37). The effects of bridges, culverts, and other structures on the flood elevations were considered. Approximate flood limits were then interpolated between each location.

For the streams studied by approximate methods within the Township of Upper Macungie, the boundary of the 100-year flood was developed from normal depth calculations based upon information obtained from field reconnaissance and available topographic mapping (Reference 10).

Flooding along the Lehigh River Canal within the Borough of Catasauqua was determined by engineering judgement and correlation with other streams studied methods. From the upstream corporate limit to Pine Street the flooding on the canal was based on the flooding on the Lehigh River. Upstream of the Borough of Catasauqua along the Lehigh River Canal, the Lehigh River forms the canal. The flooding from the Lehigh River flows into the canal at this point. Downstream from Pine Street to Catasauqua Creek, the flooding along the canal was determined as backwater of Catasauqua Creek.

Revised Analyses for the November 7, 2001, Countywide FIS

Cross sections for Little Lehigh Creek, Jordan Creek, Lehigh River and Saucon Creek were obtained from a Digital Terrain Model (DTM), which was developed from aerial photographs taken in April 1996 (References 38, 39, and 40). The below water portion of these DTMs for the Lehigh River was developed from existing HEC-2 models using CHANNEL, an ARC/INFO software application (References 41 and 42). Bridge geometry was obtained from existing HEC-2 models, new bridge surveys, and as-built drawings provided by Penn-DOT. Cross sections for Fells Creek were obtained from a digital terrain model developed for the restudy of Fells Creek (References 42 and 43).

Water-surface elevations for the selected recurrence intervals were computed using the USACE HEC-RAS (River Analysis System) program (Reference 44). The HEC-RAS hydraulic models for Jordan Creek, Lehigh River, and Little Lehigh Creek were calibrated against available gage information. The final profiles all match gage rating curves within acceptable tolerances. Comparisons were made with high watermarks that were also modeled within acceptable limits.

For Tributary No. 1 to Little Lehigh Creek, water-surface elevations for the selected recurrence intervals were computed using the HEC-2 step-backwater computer program (Reference 23). Starting water-surface elevations were determined using the slope/area method. Cross sections were obtained using photogrammetric data submitted by the Borough of Emmaus, prepared by Aerial Data Reduction Associates, Inc.

Roughness factors (Manning's "n") were chosen by engineering judgment and were based on inspection of the photography and field visits.

Revised Analyses for the July 2, 2003, Countywide Revision

For the July 2, 2003, revision, the HEC-RAS hydraulic model used in the November 7, 2001, FIS was modified for the Lehigh River, revising the effects of the levee that was previously shown as protecting against the 100-year flood.

The channel and overbank "n" values for all of the streams studied by detailed methods are shown in the following tabulation.

<u>Stream</u>	<u>Channel "n"</u>	<u>Overbank "n"</u>
Breinig Run	0.018-0.045	0.055-0.085
Catasauqua Creek	0.023-0.035	0.070
Cedar Creek	0.035	0.060-0.100
Coplay Creek	0.025-0.045	0.050-0.120
Fells Creek	0.012-0.045	0.050-0.080
Hassen Creek	0.018-0.045	0.055-0.120
Hosensack Creek	0.035-0.045	0.050-0.070
Indian Creek	0.035-0.045	0.050-0.070
Iron Run	0.018-0.045	0.055-0.085

<u>Stream</u>	<u>Channel “n”</u>	<u>Overbank “n”</u>
Jordan Creek	0.030-0.045	0.040-0.150
Lehigh River	0.025-0.050	0.035-0.120
Leibert Creek	0.035-0.045	0.070-0.150
Little Cedar Creek	0.035-0.050	0.060-0.120
Little Lehigh Creek	0.020-0.030	0.040-0.100
Ontelaunee Creek	0.034-0.048	0.045-0.100
Saucon Creek	0.030-0.040	0.050-0.100
Schaefer Run	0.018-0.045	0.055-0.085
School Creek	0.034-0.048	0.045-0.100
Spring Creek No. 1	0.035-0.045	0.030-0.060
Swabia Creek	0.035-0.045	0.030-0.060
Swabia Creek Tributary	0.035-0.045	0.030-0.060
Toad Creek	0.035-0.045	0.030-0.060
Tributary to Hosensack Creek	0.040	0.070
Tributary to Lehigh River	0.035-0.040	0.050-0.080
Tributary to Little Lehigh Creek	0.035-0.045	0.030-0.060
Tributary No. 1 to Little Lehigh Creek	0.020-0.050	0.040-0.500
Trout Creek No. 1	0.025-0.035	0.055-0.100
Trout Creek No. 2	0.040	0.080-0.150
West Branch Trout Creek No. 1	0.015-0.035	0.050

3.3 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 NGVD 29. Structure and ground elevations in the community must, therefore, be referenced to NGVD 29. It is important to note that adjacent communities may be referenced to NAVD 88. 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 the streams studied in detail, the 100- and 500-year floodplains have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps and previously printed FISs (References 10, 45, 46, 47, and 48).

For the November 7, 2001, FIS, boundaries were interpolated between cross sections using the aforementioned DTMs mentioned in section 3.2 and DFMAP, an ARC/INFO software application (Reference 49). For Tributary No. 1 to Little Lehigh Creek, boundaries were interpolated between cross sections using a USGS topographic map (Reference 10).

For the July 2, 2003, revision, floodplain boundaries along the revised portion of Lehigh River were interpolated between cross sections using a topographic map at a scale of 1"=400', with a contour interval of 4 feet (Reference 60).

For this revision, floodplain boundaries along the portion of Iron Run revised by the LOMR effective on May 19, 2003, were interpolated between cross sections using topographic maps at a scale of 1"=200', with a contour interval of 2 feet (Reference 61). Floodplain boundaries on the portion of Cedar Creek revised by the LOMR effective January 28, 2004, were interpolated between cross sections using topographic maps at a scale of 1"=40', with a contour interval of 1 foot (Reference 61).

For the tributary to Little Lehigh Creek, the approximate 100-year floodplain boundary was delineated on the topographic maps using the elevations obtained from the detailed analyses on Little Lehigh Creek (Reference 50).

Within the Township of Lower Milford, for streams studied by approximate methods, the boundary of the 100-year flood elevation was obtained by field inspection of the area and comparison with streams of similar characteristics.

Floodplain boundaries for streams studied by approximate methods within the Township of Lynn were delineated using the Flood Hazard Boundary Map for the township and the Official Zoning Map (References 51 and 52).

For the Townships of North Whitehall, Upper Milford and Washington, the boundaries of the 100-year floods for streams studied by approximate methods were delineated by field inspection, engineering judgment, and USGS topographic maps (Reference 10).

For Trout Creek No. 1, studied by approximate methods for the 1984 Township of Salisbury FIS, the flood boundaries were delineated on the USGS topographic maps using the information developed by the "NORDEP" computer program. For the approximate study of Trout Creek No. 2 within the Township of Slatington, the boundary of the 100-year flood was delineated by field inspection, engineering judgment, and USGS topographic maps (Reference 10).

Within the Township of Upper Macungie, for the streams studied by approximate methods, the boundary of the 100-year flood was developed from normal depth calculations based on information obtained from field reconnaissance and available topographic mapping (Reference 10).

For all other streams studied by approximate methods, the boundaries of the 100-year floodplain were delineated using cross sections taken from USGS 7.5-Minute Topographic Maps (Reference 10).

The 100- and 500-year floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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

4.2 Floodways

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

increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 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 floodway presented in this study was 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 5, "Floodway Data"). The computed floodway is 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. Floodways were not determined for Ontelaunee Creek, School Creek, and Tributary No. 1 to Little Lehigh Creek and Lehigh Canal (abandoned). Portions of the floodways for the Lehigh River extend beyond the county boundary.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 5, "Floodway Data." To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 5 for certain downstream cross sections of Cedar Creek, Coplay Creek, Jordan Creek, Little Lehigh Creek, Spring Creek No. 1, Swabia Creek, Tributary to Lehigh River, Trout Creek No. 1, Trout Creek No. 2, and West Branch Trout Creek No. 1 are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Breinig Run	A	138	313	0.8	401.4	401.4	402.1	0.7
	B	30	86	2.9	404.7	404.7	405.6	0.9
	C	20	66	3.8	406.6	406.6	407.1	0.5
	D	23	66	3.8	411.5	411.5	411.5	0.0
	E	21	45	5.6	413.1	413.1	413.1	0.0
Catasauqua Creek	A	360	1,150	6.1	281.1	281.1	281.1	0.0
	B	370	2,330	3.0	287.3	287.3	288.1	0.8
	C	190	1,080	3.7	293.0	293.0	293.6	0.6
	D	120	490	8.1	299.2	299.2	299.8	0.6
Cedar Creek	A	102	460	7.2	266.1	257.4 ⁴	258.4	1.0
	B	121	660	5.0	266.1	263.5 ⁴	264.4	0.9
	C	113	520	6.4	266.7	266.7	267.3	0.6
	D	122	800	4.1	273.5	273.5	274.3	0.8
	E	118	760	4.1	276.9	276.9	277.9	1.0
	F	215	540	5.9	279.0	279.0	279.8	0.8
	G	87	370	8.3	285.6	285.6	286.6	1.0
	H	130	390	7.0	290.2	290.2	290.8	0.6
	I	85	262	7.3	295.2	295.2	295.4	0.2
	J	300	2,080	0.9	305.6	305.6	305.8	0.2
	K	90	317	7.0	310.9	310.9	311.1	0.2
	L	330	1,517	1.5	318.4	318.4	318.4	0.0
	M	517	3,621	0.5	324.5	324.5	325.5	1.0
	N	206	351	5.4	330.0	330.0	330.8	0.8

¹Feet above confluence with Schaefer Run

²Feet above confluence with Lehigh River

³Feet above confluence with Little Lehigh Creek

⁴Elevation computed without consideration of backwater effects from Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

BREINIG RUN – CATASAUQUA CREEK – CEDAR CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Coplay Creek								
A	180	62	340	10.6	281.4	281.1 ²	281.4	0.3
B	340	48	547	6.6	282.5	282.5	283.0	0.5
C	2,850	40	406	8.9	289.4	289.4	290.0	0.6
D	3,180	36	485	7.4	293.0	293.0	293.6	0.6
E	3,605	291	2,335	1.5	294.0	294.0	294.5	0.5
F	3,755	298	2,423	1.5	294.8	294.8	295.1	0.3
G	4,640	226	1,190	3.0	295.1	295.1	295.3	0.2
H	5,105	46	402	9.0	296.0	296.0	296.6	0.6
I	7,090	130	608	5.9	301.9	301.9	302.5	0.6
J	7,208	275	1,302	2.8	303.5	303.5	304.2	0.7
K	7,770	86	633	5.7	304.3	304.3	304.8	0.5
L	8,030	133	977	3.7	306.2	306.2	306.5	0.3
M	10,020	165	970	2.9	308.9	308.9	309.4	0.5
N	11,380	59	410	6.8	310.9	310.9	311.4	0.5
O	11,520	54	463	6.0	312.9	312.9	313.0	0.1
P	13,840	176	571	4.9	318.2	318.2	318.7	0.5
Q	14,010	206	660	4.2	322.1	322.1	322.1	0.0
R	15,720	50	230	12.2	325.8	325.8	325.8	0.0
S	16,690	277	738	3.8	332.3	332.3	332.3	0.0
T	16,825	375	1,708	1.6	336.2	336.2	336.2	0.0

¹Feet above confluence with Lehigh River

²Elevation computed without consideration of backwater effects from Lehigh River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**LEHIGH COUNTY, PA
(ALL JURISDICTIONS)**

FLOODWAY DATA

COPLAY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Coplay Creek (continued)	2,020	81	417	3.4	371.9	371.9	372.5	0.6
	2,930	122	291	4.8	375.4	375.4	375.5	0.1
	3,430	40	317	4.4	379.2	379.2	380.0	0.8
	4,090	56	430	3.3	382.8	382.8	383.4	0.6
	4,730	163	808	1.7	383.4	383.4	384.0	0.6
	5,240	45	299	4.7	385.8	385.8	386.2	0.4
	5,680	48	260	5.4	388.0	388.0	388.2	0.2
	6,030	62	273	5.1	388.9	388.9	389.1	0.2
	6,770	108	480	2.9	390.8	390.8	391.3	0.5
	7,620	65	500	2.8	394.2	394.2	394.8	0.6
	8,500	38	313	4.5	394.6	394.6	395.2	0.6
	9,180	58	418	3.3	394.9	394.9	395.8	0.9
	10,320	230	1,201	2.1	396.3	396.3	396.8	0.5
	11,690	263	1,017	2.1	401.7	401.7	401.8	0.1
	12,770	220	639	3.3	402.2	402.2	402.7	0.5
	13,800	250	906	2.3	405.1	405.1	405.8	0.7
	15,020	300	967	2.2	406.6	406.6	407.6	1.0
	15,900	186	439	4.6	408.2	408.2	408.6	0.4
	16,400	260	1,329	1.5	410.4	410.4	411.1	0.7
	17,460	434	1,213	1.6	410.4	410.4	411.3	0.9
18,190	244	801	2.4	414.0	414.0	414.3	0.3	
18,940	104	261	7.3	416.3	416.3	416.4	0.1	
19,840	100	281	6.8	424.0	424.0	424.5	0.5	
20,320	136	537	3.5	426.9	426.9	427.4	0.5	
21,180	95	315	6.0	429.2	429.2	429.7	0.5	
21,940	146	451	4.2	433.5	433.5	434.1	0.6	

¹Feet above Reliance Street

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

COPLAY CREEK

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)		
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Coplay Creek (continued)								
AU	22,800	200	1,147	1.6	441.7	441.7	442.4	0.7
AV	23,790	297	782	2.3	442.8	442.8	443.4	0.6
AW	24,760	100	237	7.6	451.5	451.5	451.7	0.2
AX	25,030	80	298	6.0	454.0	454.0	454.9	0.9
AY	25,710	50	217	7.5	460.2	460.2	460.2	0.0
AZ	26,090	58	314	5.2	465.3	465.3	465.8	0.5
BA	26,710	100	214	7.6	471.0	471.0	471.0	0.0
BB	28,150	101	295	5.5	484.4	484.4	484.5	0.1
BC	29,530	150	295	5.1	493.9	493.9	494.0	0.1
BD	30,300	101	217	6.9	502.8	502.8	502.8	0.0
BE	31,350	160	478	3.1	511.0	511.0	511.7	0.7
BF	31,660	70	290	5.2	512.4	512.4	512.9	0.5
BG	32,030	56	237	6.3	517.3	517.3	517.5	0.2
BH	32,560	185	712	1.9	525.0	525.0	525.0	0.0
BI	33,370	95	190	7.2	528.8	528.8	528.8	0.0
BJ	34,340	93	303	4.5	537.0	537.0	537.4	0.4
BK	35,250	100	513	2.3	546.4	546.4	546.4	0.0
BL	35,920	85	241	5.0	547.7	547.7	548.5	0.8
BM	36,970	114	457	2.6	556.4	556.4	557.1	0.7
BN	37,880	82	186	6.4	559.5	559.5	560.1	0.6
BO	38,908	154	561	1.8	569.1	569.1	569.1	0.0

¹Feet above Reliance Street

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**LEHIGH COUNTY, PA
(ALL JURISDICTIONS)**

FLOODWAY DATA

COPLAY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fells Creek								
A	260	44	164	11.3	318.7	318.7	318.7	0.0
B	350	48	393	5.1	323.5	323.5	323.5	0.0
C	492	42	258	7.5	323.6	323.6	323.6	0.0
D	539	42	369	7.5	326.2	326.2	326.2	0.0
E	630	36	334	5.3	326.3	326.3	326.3	0.0
F	686	93	350	5.4	326.7	326.7	326.8	0.1
G	1,219	65	318	5.1	327.2	327.2	327.2	0.0
H	1,837	47	169	6.6	330.9	330.9	330.9	0.0
I	2,431	60	213	11.1	338.9	338.9	339.0	0.1
J	2,865	95	314	8.4	342.6	342.6	342.8	0.2
K	3,580	100	301	6.0	351.9	351.9	352.0	0.1
L	3,813	45	167	11.4	356.0	356.0	356.0	0.0
M	4,424	58	183	10.5	362.2	362.2	362.2	0.0
N	6,163	34	151	11.9	389.1	389.1	389.1	0.0
O	6,238	54	368	5.8	394.2	394.2	394.2	0.0
P	6,593	42	169	12.2	398.8	398.8	398.8	0.0
Q	6,892	60	201	11.3	406.4	406.4	406.4	0.0
R	7,466	43	170	11.8	414.3	414.3	414.3	0.0
S	7,652	54	539	3.6	422.4	422.4	422.9	0.5
T	8,295	50	174	11.2	424.3	424.3	424.3	0.0
U	8,751	62	235	9.3	430.1	430.1	430.4	0.3
V	9,678	62	189	10.2	441.6	441.6	441.6	0.0
W	9,817	106	661	2.9	446.3	446.3	447.1	0.8
X	11,340	49	181	11.5	467.4	467.4	467.6	0.2
Y	12,023	51	245	8.9	474.1	474.1	474.3	0.2
Z	13,299	44	172	11.9	491.8	491.8	491.8	0.0

¹Feet above the confluence with Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

FELLS CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fells Creek (continued)								
AA	13,478	48	318	6.4	495.6	495.6	496.6	1.0
AB	14,041	51	181	11.6	499.1	499.1	499.4	0.3
AC	15,838	80	236	9.2	519.7	519.7	520.0	0.3
AD	15,951	93	564	4.3	523.7	523.7	524.6	0.9
AE	16,504	67	201	10.7	527.5	527.5	527.7	0.2
AF	17,014	68	281	6.9	532.1	532.1	532.7	0.6
AG	17,337	65	443	4.9	539.5	539.5	539.7	0.2
AH	17,636	45	166	10.9	541.8	541.8	541.8	0.0

¹Feet above the confluence with Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

FELLS CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Hassen Creek								
A	170 ¹	270	1,689	1.3	355.4	355.4	356.2	0.8
B	520 ¹	351	1,222	1.8	355.7	355.7	356.5	0.8
C	1,580 ¹	46	190	11.3	359.7	359.7	359.7	0.0
D	1,772 ¹	186	654	3.3	361.0	361.0	361.9	0.9
E	4,732 ¹	35	157	12.1	377.3	377.3	377.4	0.1
Hosensack Creek								
A	4,625 ²	250	1,450	4.2	384.4	384.4	385.0	0.6
B	7,250 ²	170	550	7.1	397.7	397.7	398.2	0.5
C	9,000 ²	130	510	7.7	412.0	412.0	412.9	0.9
D	12,437 ²	390	1,950	1.3	444.2	444.2	444.2	0.0
Indian Creek								
A	1,000 ³	140	400	6.6	376.3	376.3	376.4	0.1
B	3,187 ³	190	450	5.7	411.0	411.0	411.8	0.8
Iron Run								
A	3,000 ⁴	42	184	6.4	383.9	383.9	384.7	0.8
B	3,195 ⁴	90	392	3.0	384.6	384.6	385.6	1.0
C	3,575 ⁴	71	371	3.2	386.3	386.3	387.2	0.9
D	4,455 ⁴	50	219	5.4	390.1	390.1	390.7	0.6
E	4,660 ⁴	150	773	1.5	392.0	392.0	392.9	0.9

¹Feet above confluence with Jordan Creek

²Feet above county boundary

³Feet above confluence with Hosensack Creek

⁴Feet above confluence with Spring Creek No. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TABLE 5

**LEHIGH COUNTY, PA
(ALL JURISDICTIONS)**

FLOODWAY DATA

HASSEN CREEK - HOSENSACK CREEK - INDIAN CREEK - IRON RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jordan Creek								
A	546	404	3,409	4.8	256.3	253.8 ²	254.8	1.0
B	1,405	212	2,865	5.7	256.3	255.1 ²	256.0	0.9
C	2,163	175	2,387	6.9	257.6	257.6	258.1	0.5
D	4,266	212	2,460	6.7	262.7	262.7	263.2	0.5
E	5,315	211	3,268	5.0	264.5	264.5	265.0	0.5
F	6,763	164	2,455	6.7	264.8	264.8	265.6	0.8
G	8,436	242	3,404	4.6	266.2	266.2	266.8	0.6
H	11,717	234	3,082	5.1	269.3	269.3	269.9	0.6
I	13,029	247	2,129	7.4	269.7	269.7	270.4	0.7
J	14,481	218	1,967	8.0	273.1	273.1	273.9	0.8
K	15,536	348	3,308	5.3	275.8	275.8	276.2	0.4
L	16,192	320	3,078	5.1	278.1	278.1	278.3	0.2
M	18,299	299	2,697	5.8	283.5	283.5	283.5	0.0
N	20,078	188	1,996	7.9	288.3	288.3	288.9	0.6
O	23,664	257	3,522	4.1	296.7	296.7	297.5	0.8
P	28,724	428	3,549	4.1	305.4	305.4	305.8	0.4
Q	29,689	126	2,193	6.6	307.0	307.0	307.2	0.2
R	32,253	478	4,685	3.1	309.1	309.1	309.6	0.5
S	33,985	225	2,590	5.6	310.8	310.8	311.3	0.5
T	35,495	227	2,871	5.0	312.7	312.7	313.3	0.6
U	36,805	347	3,722	3.9	314.2	314.2	314.7	0.5
V	40,248	285	3,122	4.6	317.5	317.5	318.4	0.9
W	42,366	319	3,465	3.8	319.9	319.9	320.6	0.7
X	44,624	225	2,088	6.2	321.6	321.6	322.5	0.9
Y	44,983	217	2,417	5.4	323.0	323.0	323.6	0.6
Z	46,662	431	5,214	2.5	328.4	328.4	328.5	0.1
AA	48,372	644	5,807	2.2	328.8	328.8	329.2	0.4
AB	51,565	378	4,453	2.9	333.1	333.1	333.7	0.6

¹Feet above confluence with Little Lehigh Creek

²Elevation computed without consideration of backwater effects from Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

JORDAN CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jordan Creek (continued)								
AC	51,977	385	4,623	2.8	333.4	333.4	334.0	0.6
AD	52,865	386	4,063	3.2	333.7	333.7	334.3	0.6
AE	53,789	385	3,728	3.5	334.6	334.6	335.1	0.5
AF	55,067	432	3,442	3.8	335.9	335.9	336.4	0.5
AG	56,555	566	4,130	3.1	338.7	338.7	338.9	0.2
AH	58,644	590	3,877	3.0	340.7	340.7	341.1	0.4
AI	60,207	557	3,845	3.0	343.5	343.5	343.7	0.2
AJ	60,550	553	4,231	2.7	343.7	343.7	344.0	0.3
AK	61,285	613	4,056	2.8	345.0	345.0	345.2	0.2
AL	64,107	744	3,880	3.0	347.9	347.9	348.7	0.8
AM	65,036	813	3,339	3.5	349.1	349.1	350.0	0.9
AN	66,061	739	3,387	3.4	351.3	351.3	352.3	1.0
AO	66,979	625	2,745	4.2	353.5	353.5	354.1	0.6
AP	68,038	300	2,046	5.6	355.7	355.7	356.6	0.9
AQ	69,036	292	2,618	4.4	358.8	358.8	359.5	0.7
AR	69,186	272	1,740	6.3	359.6	359.6	360.4	0.8
AS	69,796	188	1,852	5.9	362.3	362.3	363.2	0.9
AT	70,516	149	920	12.0	362.7	362.7	363.2	0.5
AU	71,156	301	2,799	3.9	365.8	365.8	366.7	0.9
AV	71,866	309	2,856	3.9	366.5	366.5	367.3	0.8
AW	73,126	259	2,155	5.1	367.4	367.4	368.0	0.6
AX	74,286	195	1,676	6.6	369.3	369.3	369.8	0.5
AY	74,986	116	1,463	7.5	370.6	370.6	371.5	0.9

¹Feet above confluence with Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

JORDAN CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lehigh River								
A*	11.63	247	5,298	12.8	230.4	230.4	231.3	0.9
B*	11.90	322	7,393	9.2	233.0	233.0	233.9	0.9
C*	12.30	348	7,564	9.0	235.0	235.0	235.8	0.8
D	12.62	449 ²	10,195	6.7	236.3	236.3	237.1	0.8
E	13.45	398 ²	8,107	9.4	238.3	238.3	239.1	0.8
F	13.78	622 ²	9,271	8.2	239.9 ⁴ /239.9 ⁵	239.9	240.6	0.7
G	14.57	1,397	16,745	4.7	242.8 ⁴ /241.9 ⁵	241.9	242.8	0.9
H	15.12	450	8,975	7.6	244.5 ⁴ /243.6 ⁵	243.6	244.5	0.9
I	15.88	353	8,135	8.7	247.0 ⁶	246.4	247.2	0.8
J	16.42	331	7,651	9.4	249.0 ⁶	248.6	249.5	0.9
K	16.91	391	7,586	9.6	251.9 ⁶	251.6	252.4	0.8
L	17.09	505	9,146	7.3	253.8 ⁶	253.6	254.5	0.9
M	17.45	652	13,296	5.0	260.3	260.3	261.2	0.9
N	17.72	505	10,268	6.5	260.5	260.5	261.4	0.9
O	18.14	263	5,907	11.2	261.9	261.9	262.8	0.9
P	18.53	312	6,889	9.6	264.6	264.6	265.4	0.8
Q	18.96	288	6,219	10.7	265.8	265.8	266.7	0.9
R	19.47	297	6,529	10.2	269.1	269.1	269.8	0.7
S	19.74	211	4,794	13.8	269.9	269.9	270.8	0.9
T	20.22	188	4,365	15.2	274.0	274.0	274.3	0.3
U	20.66	249	5,641	11.7	278.2	278.2	279.0	0.8
V	20.79	295	6,934	9.5	280.7	280.7	281.4	0.7
W	21.34	314 ³	5,101	13.0	282.0	282.0	282.7	0.7
X	22.14	323 ³	6,754	9.8	287.8	287.8	288.6	0.8
Y	22.41	322 ³	6,117	10.8	288.9	288.9	289.9	1.0
Z	22.48	338 ³	7,603	8.6	291.7	291.7	292.5	0.8

¹Miles above confluence with Delaware River

²Width extends into the City of Bethlehem (ANI)

³Width extends beyond county boundary

⁴Elevation considers the flood height on the unprotected side of the levee caused by levee itself

⁵Elevation computed as if the levee did not exist

⁶Elevation considers backwater effect of downstream levee

*Located within City of Bethlehem (Area Not Included)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

LEHIGH RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lehigh River (continued)								
AA	23.05	522	8,142	8.1	293.7	293.7	294.6	0.9
AB	23.56	346	6,240	10.5	294.9	294.9	295.9	1.0
AC	23.76	323	5,861	11.2	295.7	295.7	296.5	0.8
AD	24.14	440	7,773	8.5	301.8	301.8	302.5	0.7
AE	24.87	419	6,542	10.0	303.2	303.2	304.2	1.0
AF	25.41	397	6,574	10.0	306.1	306.1	306.9	0.8
AG	25.90	565	5,709	11.5	309.6	309.6	309.9	0.3
AH	26.57	377	5,237	12.5	316.7	316.7	316.7	0.0
AI	27.43	287	5,073	13.0	321.9	321.9	322.7	0.8
AJ	28.12	249	4,745	13.8	329.0	329.0	329.0	0.0
AK	28.48	343	7,020	9.4	332.9	332.9	333.8	0.9
AL	29.12	462	7,956	8.3	341.2	341.2	341.9	0.7
AM	29.56	336	5,831	11.3	342.8	342.8	343.7	0.9
AN	30.09	590	12,715	5.2	346.1	346.1	346.9	0.8
AO	30.74	387	7,127	9.2	346.8	346.8	347.5	0.7
AP	31.16	384	6,867	9.6	349.2	349.2	349.9	0.7
AQ	31.57	299	5,291	12.4	350.9	350.9	351.7	0.8
AR	32.04	215	4,781	13.7	353.7	353.7	354.7	1.0
AS	32.64	337	7,055	9.3	358.2	358.2	358.9	0.7
AT	33.13	425	6,901	9.5	360.4	360.4	361.4	1.0
AU	33.67	381	5,537	11.6	364.4	364.4	365.3	0.9
AV	34.30	253	4,432	14.4	369.1	369.1	369.6	0.5
AW	34.76	346	5,774	11.1	375.7	375.7	376.7	1.0
AX	35.14	700	9,171	7.0	380.6	380.6	381.5	0.9
AY	35.65	381	4,749	13.5	383.5	383.5	384.1	0.6
AZ	35.95	389	7,375	8.7	387.7	387.7	388.3	0.6

¹Miles above confluence with Delaware River

²Width extends beyond county boundary

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

LEHIGH RIVER

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Leibert Creek								
A	4,108	22	98	12.0	355.0	355.0	355.0	0.0
B	4,228	22	131	8.9	357.8	357.8	357.8	0.0
C	4,768	100	191	6.0	362.1	362.1	362.3	0.2
D	5,058	106	244	4.7	364.4	364.4	364.7	0.3
E	5,178	253	365	3.2	365.6	365.6	365.9	0.3
F	6,488	37	126	9.1	376.8	376.8	377.2	0.4
G	6,693	26	165	7.0	380.5	380.5	381.5	1.0
H	7,036	26	162	7.1	385.8	385.8	385.8	0.0
I	7,488	280	212	5.4	391.1	391.1	391.1	0.0
J	7,688	135	222	5.2	391.9	391.9	391.9	0.0
K	8,698	22	136	8.5	402.8	402.8	403.1	0.3
L	8,798	151	446	2.6	407.5	407.5	408.0	0.5
M	10,728	38	331	3.5	432.7	432.7	433.7	1.0

¹Feet above confluence with Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

LEIBERT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Cedar Creek A B C D E F G H I J K L M	125	150 ²	480	3.9	290.9	290.9	291.7	0.8
	1,370	200	360	5.4	297.5	297.5	297.9	0.4
	4,194	346	2,277	7.7	309.7	309.7	310.4	0.7
	4,010	82	250	7.4	317.2	317.2	317.7	0.5
	6,000	118	530	3.2	332.3	332.3	333.3	1.0
	8,530	117	350	4.8	343.9	343.9	344.5	0.6
	10,730	82	385	3.4	363.5	363.5	364.2	0.7
	12,150	70	365	3.6	379.1	379.1	379.5	0.4
	12,490	20	109	10.1	383.4	383.4	383.4	0.0
	13,760	50	289	3.8	389.1	389.1	389.6	0.5
	13,888	124	915	1.2	393.5	393.5	393.9	0.4
	15,320	60	313	3.5	409.0	409.0	409.5	0.5
	15,600	18	117	9.4	412.4	412.4	412.6	0.2

¹Feet above confluence with Cedar Creek

²Combined Cedar Creek/Little Cedar Creek floodway

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

LITTLE CEDAR CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Lehigh Creek								
A	2,030	177	2,509	10.7	248.5	243.5 ²	244.3	0.8
B	3,384	256	2,791	9.6	251.8	251.8	251.8	0.0
C	4,194	346	2,277	7.7	256.3	256.3	256.5	0.2
D	5,569	368	3,830	4.8	259.2	259.2	259.3	0.1
E	7,343	490	5,428	3.2	261.4	261.4	261.4	0.0
F	10,995	318	3,734	4.7	263.3	263.3	264.2	0.9
G	12,841	310	3,653	4.8	264.1	264.1	265.0	0.9
H	13,938	353	3,164	5.5	265.0	265.0	265.6	0.6
I	14,881	391	4,233	3.7	266.3	266.3	266.8	0.5
J	22,796	242	3,164	4.9	274.4	274.4	275.3	0.9
K	26,616	297	3,650	4.3	282.6	282.6	283.4	0.8
L	28,924	195	2,067	7.6	286.0	286.0	286.4	0.4
M	31,369	385	4,305	3.6	295.0	295.0	295.8	0.8
N	34,891	183	2,271	6.9	303.3	303.3	304.1	0.8
O	35,427	162	1,943	8.0	303.9	303.9	304.6	0.7
P	36,792	241	2,585	6.0	307.1	307.1	307.7	0.6
Q	38,465	256	2,810	4.9	311.2	311.2	311.8	0.6
R	40,585	222	2,547	5.4	313.4	313.4	313.7	0.3
S	43,435	206	1,792	7.7	318.9	318.9	319.6	0.7
T	46,777	187	2,560	5.4	329.6	329.6	330.5	0.9
U	48,987	350	3,604	3.8	331.6	331.6	332.3	0.7
V	52,694	263	3,696	3.7	339.5	339.5	340.2	0.7
W	55,138	249	2,989	4.6	341.3	341.3	341.9	0.6
X	57,081	281	3,023	4.5	343.6	343.6	344.4	0.8
Y	58,531	237	2,885	4.8	347.8	347.8	348.1	0.3
Z	61,585	314	3,875	3.5	351.0	351.0	351.6	0.6

¹Feet above confluence with Lehigh River

²Elevation computed without consideration of backwater effects from Lehigh River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**LEHIGH COUNTY, PA
(ALL JURISDICTIONS)**

FLOODWAY DATA

LITTLE LEHIGH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Lehigh Creek (continued)								
AA	63,734	303	3,357	3.6	352.6	352.6	353.4	0.8
AB	65,603	291	3,425	3.5	354.3	354.3	355.2	0.9
AC	67,648	280	2,934	4.1	356.2	356.2	356.9	0.7
AD	69,012	340	3,340	3.6	358.2	358.2	359.1	0.9
AE	71,008	283	3,354	3.6	361.3	361.3	361.8	0.5
AF	72,481	263	2,868	4.2	362.6	362.6	362.8	0.2
AG	74,225	300	3,957	3.0	366.2	366.2	366.6	0.4
AH	77,801	278	2,666	4.0	366.9	366.9	367.9	1.0
AI	81,037	361	3,592	3.0	371.1	371.1	371.7	0.6
AJ	82,494	277	2,339	4.6	371.8	371.8	372.7	0.9
AK	84,848	398	3,653	3.0	375.3	375.3	375.9	0.6
AL	89,076	561	5,055	2.1	377.4	377.4	378.3	0.9
AM	92,057	566	4,745	1.4	380.6	380.6	381.4	0.8
AN	93,808	760	5,577	1.2	381.7	381.7	382.6	0.9
AO	96,218	364	1,990	3.4	383.5	383.5	384.0	0.5
AP	98,166	400	3,449	1.9	387.0	387.0	387.8	0.8
AQ	99,887	412	2,811	2.4	387.7	387.7	388.5	0.8
AR	102,009	344	1,973	1.8	389.8	389.8	390.3	0.5
AS	103,990	295	1,717	2.1	391.4	391.4	391.9	0.5
AT	106,259	324	1,185	3.0	393.2	393.2	393.9	0.7
AU	107,456	235	1,098	3.2	395.8	395.8	396.5	0.8
AV	110,241	300	1,176	3.0	402.7	402.7	403.4	0.7
AW	110,567	250	1,022	3.5	403.1	403.1	404.0	0.9

¹Feet above confluence with Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

LITTLE LEHIGH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Saucon Creek								
A	37,847	208	1,665	4.4	337.2	337.2	337.8	0.6
B	38,843	338	2,121	3.4	337.8	337.8	338.7	0.9
C	39,808	255	2,006	3.6	341.5	341.5	342.5	1.0
D	40,893	194	1,450	5.0	342.7	342.7	343.5	0.8
E	42,303	242	2,043	3.6	346.2	346.2	346.8	0.6
F	43,184	340	2,088	3.5	346.7	346.7	347.6	0.9
G	43,956	390	1,807	4.0	347.6	347.6	348.4	0.8
H	44,614	400	1,671	4.4	348.6	348.6	349.6	1.0
I	45,654	374	1,876	3.9	351.1	351.1	351.6	0.5
J	46,456	564	2,558	2.8	352.1	352.1	352.7	0.6
K	47,787	436	2,573	1.9	357.0	357.0	357.0	0.0
L	49,055	310	1,422	3.4	357.4	357.4	357.7	0.3
M	49,755	258	1,544	3.1	360.0	360.0	360.4	0.4
N	50,308	423	3,196	1.5	363.3	363.3	364.0	0.7
O	51,217	554	3,163	1.5	363.6	363.6	364.5	0.9
P	52,399	104	496	8.8	365.2	365.2	365.2	0.0
Q	53,659	217	1,459	3.0	371.4	371.4	372.4	1.0
R	55,150	332	2,161	2.0	372.9	372.9	373.9	1.0
S	56,290	290	985	4.4	374.3	374.3	375.2	0.9
T	57,009	300	1,339	3.2	377.9	377.9	378.0	0.1

¹Feet above confluence with Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

SAUCON CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Saucon Creek (continued)								
U	57,611	330	1,405	3.1	379.3	379.3	379.6	0.3
V	58,528	222	1,179	3.7	381.2	381.2	382.2	1.0
W	59,095	314	1,499	2.9	383.4	383.4	383.7	0.3
X	60,233	452	3,039	1.4	387.6	387.6	388.4	0.8
Y	61,449	426	1,958	2.2	388.4	388.4	389.1	0.7
Z	62,429	467	2,515	1.0	390.5	390.5	391.3	0.8
AA	63,608	488	1,615	1.5	391.0	391.0	391.8	0.8
AB	64,618	560	3,394	0.7	397.2	397.2	397.4	0.2
AC	65,122	850	2,417	1.0	397.2	397.2	397.5	0.3
AD	65,626	836	1,057	2.3	397.8	397.8	398.8	1.0
AE	66,743	402	643	3.9	405.3	405.3	405.4	0.1
AF	67,743	404	1,018	2.4	409.6	409.6	410.3	0.7
AG	68,500	328	742	3.3	412.0	412.0	412.7	0.7
AH	69,199	242	737	3.4	415.2	415.2	416.0	0.8
AI	70,626	170	474	5.2	424.8	424.8	425.5	0.7
AJ	71,312	166	469	5.3	428.3	428.3	429.1	0.8
AK	72,137	190	616	4.0	432.4	432.4	433.3	0.9
AL	73,490	220	612	3.1	439.6	439.6	440.5	0.9
AM	74,631	215	518	3.7	448.3	448.3	449.0	0.7
AN	75,261	206	354	5.4	453.1	453.1	453.2	0.1
AO	75,752	160	489	3.9	457.2	457.2	458.2	1.0
AP	76,728	220	349	5.5	465.5	465.5	466.1	0.6
AQ	77,348	211	558	3.4	472.1	472.1	473.1	1.0
AR	81,862	160	430	5.8	515.2	515.2	516.0	0.8

¹Feet above confluence with Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

TABLE 5

FLOODWAY DATA

SAUCON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Schaefer Run	130 ¹	226	739	1.8	382.0	382.0	382.1	0.1
	750 ¹	36	769	1.7	383.0	383.0	383.3	0.3
	1,670 ¹	128	518	2.5	388.2	388.2	388.6	0.4
	2,970 ¹	142	781	1.7	390.3	390.3	390.9	0.6
	3,930 ¹	177	634	2.1	392.0	392.0	392.6	0.6
	4,060 ¹	178	677	1.9	392.7	392.7	393.4	0.7
	5,110 ¹	177	516	2.5	394.4	394.4	395.0	0.6
	6,760 ¹	70	382	3.0	398.2	398.2	398.9	0.7
	7,110 ¹	190	950	1.2	400.3	400.3	401.1	0.8
	7,780 ¹	144	570	2.0	400.8	400.8	401.5	0.7
	8,630 ¹	68	290	3.5	402.7	402.7	403.5	0.8
	9,080 ¹	114	372	2.7	404.1	404.1	404.9	0.8
Spring Creek No. 1	0.11 ²	240	2,581	1.6	378.3	375.4 ⁴	376.2	0.8
	0.22 ²	360	2,751	1.5	378.3	375.9 ⁴	376.8	0.9
	0.40 ²	490	3,352	1.2	378.3	376.1 ⁴	377.1	1.0
	0.60 ²	260	415	9.1	378.7	378.7	378.7	0.0
	0.80 ²	410	1,873 ³	2.1	380.2	380.2	381.1	0.9

¹Feet above confluence with Spring Creek No. 1

²Miles above confluence with Little Lehigh Creek

³Combined Iron Run/Spring Creek No. 1 floodway

⁴Elevation computed without consideration of backwater effects from Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

TABLE 5

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

SCHAEFER RUN – SPRING CREEK NO. 1

FLOODING SOURCE			FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
Swabia Creek									
A	960	90	478	4.9	351.2	346.2 ²	347.1	0.9	
B	1,742	160	474	5.1	351.2	348.6 ²	349.5	0.9	
C	2,429	89	411	5.6	351.2	350.2 ²	351.1	0.9	
D	2,904	130	672	3.6	351.9	351.9	352.9	1.0	
E	3,854	120	493	4.7	353.2	353.2	353.9	0.7	
F	5,544	130	597	3.7	356.4	356.4	356.8	0.4	
G	6,283	210	628	3.9	358.5	358.5	359.3	0.8	
H	7,286	220	438	6.5	361.1	361.1	362.1	1.0	
I	8,180	140	330	6.9	366.3	366.3	367.3	1.0	
J	9,180	150	410	5.5	370.2	370.2	371.2	1.0	
K	10,575	180	600	3.8	376.9	376.9	377.9	1.0	
L	11,505	40	155	9.3	378.2	378.2	378.8	0.6	
M	12,340	60	390	3.7	380.7	380.7	381.7	1.0	
N	13,110	220	171	7.9	384.9	384.9	385.7	0.8	
O	13,320	140	475	3.1	385.0	385.0	385.8	0.8	
P	16,530	230	419	3.4	398.4	398.4	399.3	0.9	
Q	16,920	220	770	1.9	398.4	398.4	399.3	0.9	
R	19,315	50	200	8.9	407.0	407.0	407.0	0.0	
S	19,395	25	180	7.8	409.8	409.8	409.8	0.0	
T	19,775	640	1,843	0.7	410.6	410.6	410.9	0.3	
U	21,085	160	587	2.9	411.9	411.9	412.9	1.0	
V	25,330	20	101	5.8	437.2	437.2	438.2	1.0	
W	27,535	20	81	8.2	451.6	451.6	452.6	1.0	

¹Feet above confluence with Little Lehigh Creek

²Elevation computed without consideration of backwater effects from Little Lehigh Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

SWABIA CREEK

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Swabia Creek Tributary								
A	1,190 ¹	80	103	5.8	443.5	443.5	444.5	1.0
B	3,370 ¹	40	83	8.2	483.9	483.9	484.4	0.5
C	4,440 ¹	40	118	3.7	529.5	529.5	529.6	0.1
Toad Creek								
A	460 ²	205	422	4.2	394.6	394.6	395.6	1.0
B	1,470 ²	85	381	4.9	394.9	394.9	395.7	0.8
C	2,190 ²	300	713	2.6	396.9	396.9	397.8	0.9
D	2,850 ²	170	1,344	1.4	398.0	398.0	398.9	0.9
E	2,960 ²	75	1,342	1.4	398.0	398.0	398.9	0.9
Tributary to Hosensack Creek								
A	2,310 ³	150	516	2.8	507.7	507.7	507.7	0.0
B	2,670 ³	135	363	4.1	508.1	508.1	508.5	0.4
C	3,210 ³	195	285	5.2	514.6	514.6	514.8	0.2
D	3,480 ³	80	178	8.3	519.6	519.6	519.8	0.2
E	3,930 ³	225	370	4.0	526.0	526.0	526.3	0.3
F	4,270 ³	325	401	3.7	531.0	531.0	531.1	0.1
G	4,510 ³	248	327	4.5	533.9	533.9	534.4	0.5
H	4,760 ³	75	207	7.1	538.1	538.1	538.3	0.2
I	5,030 ³	70	188	7.8	546.2	546.2	546.5	0.3
J	5,500 ³	310	1,762	0.8	562.3	562.3	562.9	0.6

¹Feet above confluence with Swabia Creek

²Feet above confluence with Little Lehigh Creek

³Feet above Scout Road

FEDERAL EMERGENCY MANAGEMENT AGENCY

TABLE 5

**LEHIGH COUNTY, PA
(ALL JURISDICTIONS)**

FLOODWAY DATA

SWABIA CREEK TRIBUTARY - TOAD CREEK - TRIBUTARY TO HOSENSACK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary to Lehigh River	175 ¹	41	153	10.6	263.5	251.9 ³	251.9	0.0
	765 ¹	106	515	3.2	263.5	261.3 ³	261.5	0.2
	1,550 ¹	80	240	6.8	266.6	266.6	266.6	0.0
	2,250 ¹	72	287	5.7	272.2	272.2	272.2	0.0
	2,800 ¹	118	323	5.0	281.7	281.7	282.3	0.6
	3,700 ¹	77	266	6.1	292.5	292.5	292.5	0.0
Tributary to Little Lehigh Creek	5,140 ²	35	106	5.2	392.0	392.0	392.8	0.8
	6,390 ²	243	177	3.1	415.9	415.9	415.9	0.0
	6,860 ²	55	89	6.2	421.2	421.2	421.2	0.0
	7,400 ²	170	143	3.9	433.8	433.8	433.9	0.1
	7,910 ²	23	59	9.3	446.5	446.5	447.0	0.5

¹Feet above confluence with the Lehigh River

²Feet above confluence with Little Lehigh Creek

³Elevation computed without consideration of backwater effects from Lehigh River

FEDERAL EMERGENCY MANAGEMENT AGENCY

TABLE 5

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY TO LEHIGH RIVER - TRIBUTARY TO LITTLE LEHIGH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Trout Creek No. 1								
A	216	95	377	6.4	252.0	245.4 ²	245.4	0.0
B	299	130	665	3.6	252.0	247.1 ²	247.1	0.0
C	1,055	88	366	6.6	252.0	249.9 ²	249.9	0.0
D	2,065	70	370	6.5	255.1	255.1	255.2	0.1
E	2,950	109	542	4.4	260.4	260.4	261.0	0.6
F	5,338	115	344	6.4	273.7	273.7	274.5	0.8
G	6,664	217	586	3.8	280.0	280.0	280.9	0.9
H	7,650	100	387	5.2	287.5	287.5	288.1	0.6
I	8,330	100	270	7.5	293.5	293.5	293.5	0.0
J	8,908	100	511	4.0	304.3	304.3	304.4	0.1
K	9,711	200	917	1.9	306.4	306.4	307.2	0.8
L	10,853	106	260	6.7	314.6	314.6	314.6	0.0
M	11,385	150	705	2.5	322.2	322.2	322.3	0.1
N	12,580	155	1,126	1.5	335.5	335.5	335.5	0.0
O-R*								

¹Feet above confluence with Little Lehigh Creek

²Elevation computed without consideration of backwater effects from Little Lehigh Creek

*No floodway data available

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

TROUT CREEK NO. 1

TABLE 5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Trout Creek No. 2	200 ¹	86	866	6.9	363.2	360.0 ³	360.8	0.8
	350 ¹	89	744	8.1	363.2	360.5 ³	361.5	1.0
	840 ¹	134	596	10.1	363.2	363.1 ³	363.1	0.0
	1,470 ¹	75	492	12.2	370.6	370.6	370.6	0.0
	2,000 ¹	100	1,035	5.8	375.9	375.9	376.5	0.6
	2,330 ¹	98	986	6.1	376.5	376.5	377.3	0.8
	2,730 ¹	100	779	7.7	377.8	377.8	377.9	0.1
West Branch Trout Creek No. 1	300 ²	31	115	9.4	304.2	303.4 ⁴	303.4	0.0
	2,100 ²	66	173	5.6	320.0	320.0	320.7	0.7
	2,750 ²	105	204	4.8	337.8	337.8	338.1	0.3
	4,250 ²	80	166	5.3	362.6	362.6	362.7	0.1
	4,940 ²	97	188	4.7	375.6	375.6	375.6	0.0
	6,670 ²	94	139	4.9	413.2	413.2	413.9	0.7

¹Feet above confluence with Lehigh River

²Feet above confluence with Trout Creek No. 1

³Elevation computed without consideration of backwater effects from the Lehigh River

⁴Elevation computed without consideration of backwater effects from Trout Creek No. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TABLE 5

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOODWAY DATA

TROUT CREEK NO. 2 - WEST BRANCH TROUT CREEK NO. 1

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by 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 2.

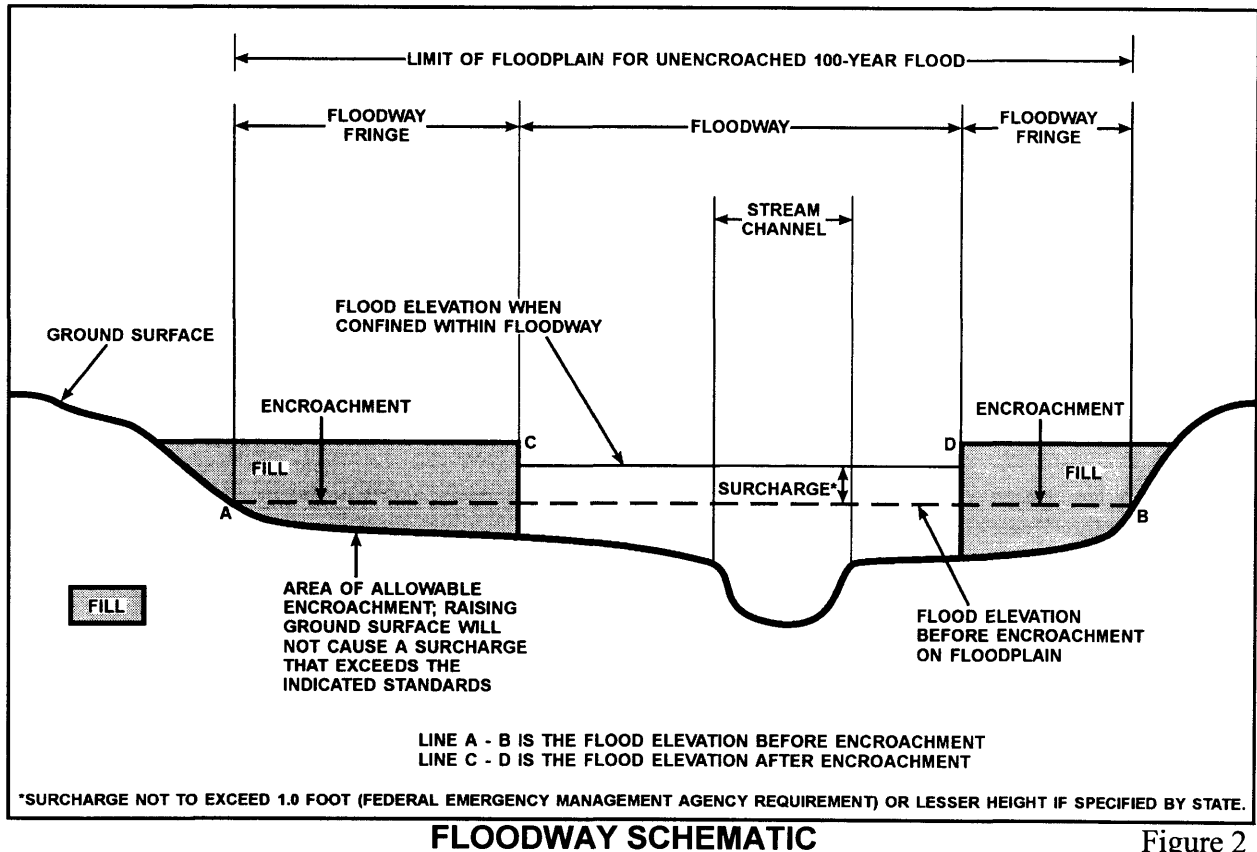


Figure 2

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 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 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 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 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. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The countywide FIRM presents flooding information for the entire geographic area of Lehigh County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community within the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each floodprone community, up to and including the November 7, 2001, countywide FIS, are presented in Table 6, "Community Map History."

7.0 OTHER STUDIES

FISs have been prepared for Berks County (All Jurisdictions), Bucks County (All Jurisdictions), Carbon County (All Jurisdictions), Montgomery County (All Jurisdictions), and Northampton County (All Jurisdictions), and the Township of West Penn, Schuylkill County (References 53, 54, 55, 56, 57, and 58).

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Alburtis, Borough of	January 16, 1974	July 26, 1974	December 15, 1978	November 7, 2001 July 16, 2004
Allentown, City of	July 26, 1974	None	June 1, 1982	January 6, 1995 November 7, 2001 July 2, 2003 July 16, 2004
Catasauqua, Borough of	November 30, 1973	August 13, 1976 January 23, 1976	November 1, 1979	November 7, 2001 July 16, 2004
Coopersburg, Borough of	November 19, 1976	None	July 30, 1982	November 7, 2001 July 16, 2004
Coplay, Borough of	November 22, 1974	None	June 25, 1976	November 7, 2001 July 16, 2004
Emmaus, Borough of	December 28, 1973	None	September 1, 1977	November 7, 2001 July 16, 2004
Fountain Hill, Borough of	November 22, 1974	None	May 15, 1986	November 7, 2001 July 16, 2004
Hanover, Township of	December 20, 1974	None	June 25, 1976	November 7, 2001 July 16, 2004
Heidelberg, Township of	December 27, 1974	October 17, 1975 August 22, 1980	December 4, 1985	November 7, 2001 July 16, 2004

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

TABLE 6

COMMUNITY NAME	INITIAL IDENTIFICATION DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Lower Macungie, Township of	June 28, 1974	None	February 2, 1977	November 7, 2001 July 16, 2004
Lower Milford, Township of	October 18, 1974	None	April 17, 1978	November 2, 1979 November 7, 2001 July 16, 2004
Lowhill, Township of	December 20, 1974	None	October 15, 1985	November 7, 2001 July 16, 2004
Lynn, Township of	November 29, 1974	None	September 30, 1987	November 7, 2001 July 16, 2004
Macungie, Borough of	January 9, 1974	August 20, 1976	April 15, 1980	November 7, 2001 July 16, 2004
North Whitehall, Township of	October 18, 1974	May 28, 1976	September 30, 1981	November 7, 2001 July 16, 2004
Salisbury, Township of	December 28, 1973	May 21, 1976	January 3, 1979	February 1, 1984 November 7, 2001 July 2, 2003 July 16, 2004
Slatington, Borough of	April 12, 1974	May 7, 1976	March 16, 1981	November 7, 2001 July 16, 2004

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

TABLE 6

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
South Whitehall, Township of	January 16, 1974 June 18, 1976	None	February 1, 1978	November 7, 2001 July 16, 2004
Upper Macungie, Township of	November 26, 1976	March 11, 1977	April 2, 1979	November 7, 2001 July 16, 2004
Upper Milford, Township of	November 1, 1974	November 14, 1975	May 19, 1981	November 7, 2001 July 16, 2004
Upper Saucon, Township of	July 26, 1974	July 16, 1976	July 15, 1977	November 7, 2001 July 16, 2004
Washington, Township of	November 15, 1974	None	April 15, 1981	November 7, 2001 July 16, 2004
Weisenburg, Township of	January 10, 1975	None	October 15, 1985	November 7, 2001 July 16, 2004
Whitehall, Township of	January 9, 1974	January 23, 1976	March 1, 1978	February 15, 1984 November 7, 2001 July 16, 2004

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

TABLE 6

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

This is a multi-volume FIS. Each volume may be revised separately, in which case it supersedes the previously printed volume. Users should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, One Independence Mall, Sixth Floor, 615 Chestnut Street, Philadelphia, Pennsylvania 19106-4404.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Housing and Urban Development, Flood Insurance Administration, Flood Insurance Study, Borough of Walnutport, Northampton County, Pennsylvania, Washington, D.C., June 1, 1978.
2. U.S. House of Representatives, 87th Congress, 2nd Session, House Document 522, Volume III, Appendix D, prepared by the Delaware River Basin Commission, 1962.
3. Lehigh-Northampton Counties, Joint Planning Commission, A comprehensive Plan, Upper Milford Township, Terminal Building, Allentown-Bethlehem-Easton Airport, Lehigh Valley, Pennsylvania, 1968.
4. Pennsylvania State University, Flood Peak Frequency Design Manual - PSU III for Pennsylvania, B.M. Reich, V.P. King, and E.L. White, September 1971.
5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Users Manual, Davis, California, January 1973.
6. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Information Report, City of Allentown, Lehigh County, Pennsylvania (Little Lehigh Creek, Cedar Creek, Little Cedar Creek), Philadelphia, Pennsylvania, October 1972.
7. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Information Report, City of Allentown, Lehigh County, Pennsylvania (Lehigh River, Jordan River, Trout Creek), Philadelphia, Pennsylvania, September 1971.

8. U.S. Army Corps of Engineers, Regional Frequency Study, Upper Delaware and Hudson River Basins, Hydrologic Engineering Center, New York District, November 1974.
9. Water Resources Council, "Technique For Determining Flood Flow Frequencies," Bulletin No. 15, December 1967.
10. U.S. Department of the Interior, Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: East Greenville, Pennsylvania, 1956, Photorevised 1973; Kunkletown, Pennsylvania, 1960; Leighton, Pennsylvania, 1960; Milford Square, Pennsylvania, 1968, Photorevised 1973; Palmerton, Pennsylvania, 1960, Photorevised 1970; Topton, Pennsylvania, 1972; Contour Interval 10 Feet: Allentown, Pennsylvania, 1964, Photorevised 1972; Allentown East, Pennsylvania, 1964, Photorevised 1972; Allentown West, Pennsylvania, 1964, Photorevised 1972; Catasauqua, Pennsylvania, 1964, Photorevised 1972; Cementon, Pennsylvania, *, Photorevised 1965; Hellerton, Pennsylvania, 1965, Photorevised 1972; Nazareth, Pennsylvania, 1964, Photorevised 1972; Slatedale, Pennsylvania, 1965, Photorevised 1972.
11. Commonwealth of Pennsylvania, Department of Environmental Resources, Water Resources Bulletin No. 6, Pennsylvania Gazetteer of Streams, Part I, by L.C. Shaw and W.F. Busch, Harrisburg, Pennsylvania, 1971.
12. U.S. Geological Survey, Part I, Water Resources Data for Pennsylvania, Surface Water Records.
13. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 82-21, Evaluation of the Streamflow-Data Program in Pennsylvania, by H.N. Flippo, Jr., Harrisburg, Pennsylvania, 1982.
14. Leo R. Beard, Statistical Methods in Hydrology, Sacramento, California, U.S. Army Corps of Engineers, January 1962.
15. Commonwealth of Pennsylvania, Department of Environmental Resources, in cooperation with the U.S. Geological Surveys, Water Resources Bulletin No. 13, Floods in Pennsylvania, A Manual for Estimation of their Magnitude and Frequency, by Herbert J. Fillipo, Jr., Harrisburg, Pennsylvania, October 1977.
16. U.S. Department of the Interior, Geological Survey, Open-File Report 76-391, Flood in Pennsylvania: A Manual for Estimation for Magnitude and Frequency, Washington, D.C., May 1976.
17. U.S. Army Corps of Engineers, Philadelphia District, "Modification of the Francis E. Walter Dam and Reservoir, General Design Memorandum, Appendix J - Hydrology and Hydraulics," August 1985.

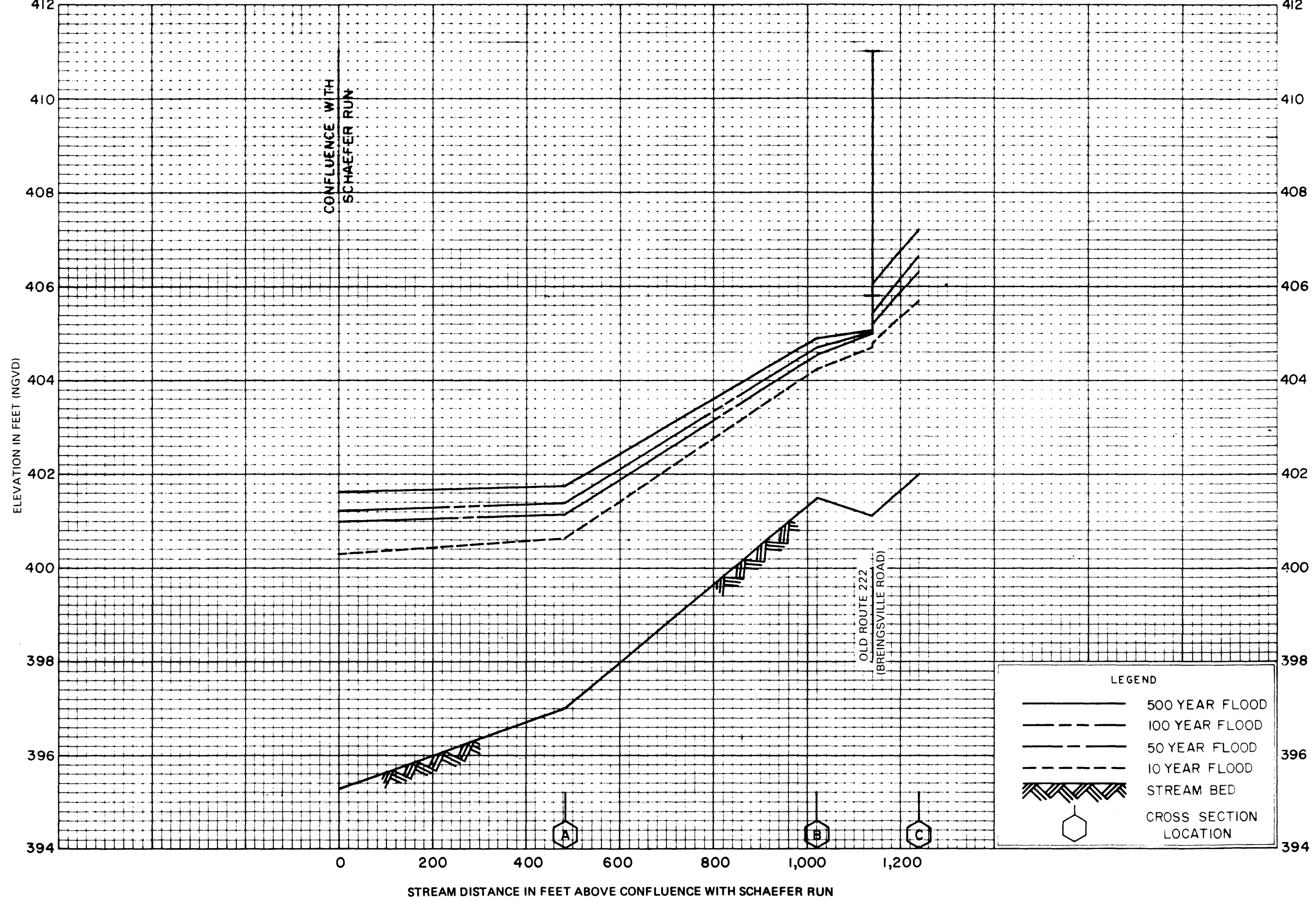
18. U.S. Army Corps of Engineers, Philadelphia District, "F.E. Walter Reservoir, Lehigh River, Pennsylvania, Water Control Manual (Revised)," October 1994.
19. U.S. Army Corps of Engineers, Philadelphia District, Field Surveys, 1980, 1992.
20. Quinn and Associates, Inc., of Horsham, Pennsylvania, Maps compiled from aerial photos, Scale 1"=1,000', Lehigh River, Jordan Creek, Coplay Creek, Township of North Whitehall, Lehigh County, Pennsylvania, April 1974 and April 1976.
21. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Information, Little Lehigh Creek - Cedar Creek, Little Lehigh Creek, Allentown, Pennsylvania, October 1972.
22. U.S. Army Corps of Engineers, Philadelphia District, Flood Insurance Study (Preliminary), City of Allentown, Lehigh County, Pennsylvania, October 1973.
23. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, May 1991.
24. National Technical Information Service, Bridge Waterway Analysis Model/Research Report by J.O. Shearman, W.H. Kirby, and V.R. Schneider, Springfield, Virginia, 1985.
25. National Technical Information Service, Bridge Waterway Analysis Model/User's Instructions by J.O. Shearman, W.H. Kirby, and V.R. Schneider, Springfield, Virginia, 1985.
26. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 86-4195, Open-File Report, Technique for Estimating Depths of 100-Year Floods in Pennsylvania by H.N. Flippo, Jr., Harrisburg, Pennsylvania, 1986.
27. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Township of Lower Macungie, Lehigh County, Pennsylvania, Washington, D.C., August 1976 (FIS); February 2, 1977 (FIRM).
28. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Information Report, City of Allentown, Lehigh County, Pennsylvania (Little Lehigh Creek, Cedar Creek and Little Cedar Creek), Philadelphia, Pennsylvania, October 1972.
29. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Information Report, City of Allentown, Lehigh County, Pennsylvania (Lehigh River, Jordan Creek, Trout Creek), Philadelphia, Pennsylvania, September 1971.
30. Ernest F. Brater and Horace Williams King, Handbook of Hydraulics, McGraw-Hill Book Co., New York, 1976.

31. Daniel S. Hoggan, Computer-assisted Floodplain Hydrology & Hydraulics, McGraw-Hill Publishing Co., New York, 1989.
32. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 86-4195, Open-File Report, Technique for Estimating Depths of 100-Year Floods in Pennsylvania by H.N. Flippo, Jr., Harrisburg, Pennsylvania, 1986.
33. U.S. Department of the Interior, Geological Survey, Techniques of Water Resources Investigations, Measurement of Peak Discharge and culverts by Indirect Method by G.L. Bodhaine, Washington, D.C., 1968.
34. Justin & Coutney, Inc., "Nordep," Philadelphia, Pennsylvania, September 1974.
35. U.S. Department of Housing and Urban Development, Flood Insurance Administration, Flood Hazard Boundary Map, Township of North Whitehall, Lehigh County, Pennsylvania, July 26, 1974.
36. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Upper Milford, Lehigh County, Pennsylvania, Washington, D.C., October 10, 1974.
37. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Washington, Lehigh County, Pennsylvania, Washington, D.C., August 21, 1974.
38. U. S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, Digital Terrain Model (DTM), Lehigh River Basin: Northampton and Lehigh Counties, 4 foot contour accuracy, digital layers include: triangulated irregular network, transportation, hydrography, spot elevations, corporate limits, and orthophotography, developed by Greenhorne and O'Mara., Greenbelt, Maryland, 1996.
39. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, Aerial Photography, Lehigh River Basin: Northampton and Lehigh Counties, Scale 1"=1,200', developed by Greenhorne and O'Mara, Inc., Greenbelt, Maryland, April 1996.
40. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, CROSS, Arc/Info software application, developed by Flood Plain Management Services Branch, Philadelphia District, 1993.
41. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, CHANNEL, Arc/Info software application, developed by the Philadelphia District and Greenhorne and O'Mara, Inc., Greenbelt, Maryland, 1993.

42. Tetra Tech, Inc., "Digital Terrain Model: Fells Creek, Lehigh County, Pennsylvania." 1997-98.
43. U.S. Army Corps of Engineers, Philadelphia District, "Cross Cut" (Draft Version), Arc/Info AML, Philadelphia, Pennsylvania, July 1993.
44. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Davis, California, April 1997, updated September 1998.
45. City of Allentown, Digital Geographic Information System Mapping, City of Allentown, 2-foot topography, compiled by Aerial Reduction Associates, Inc. via aerial photography, 1987.
46. Quinn and Associates of Horsham, Pennsylvania, Topographic Maps compiled from aerial photographs, Scale 1"=200', Contour Interval 5 Feet: Lehigh River, Jordan Creek, Coplay Creek, Township of North Whitehall, Lehigh County, Pennsylvania, April 1979.
47. Quinn and Associates, Inc., of Horsham, Pennsylvania, Topographic Maps compiled from aerial photographs, Scale 1"=200', Contour Interval 5 Feet, Lehigh River and Trout Creek, Borough of Slatington, Lehigh County, Pennsylvania, April 1979.
48. Quinn and Associates, Inc., of Horsham, Pennsylvania, Topographic Maps obtained from aerial photographs, Scale 1"=200', Contour Interval 5 feet, Tributary to Hosensack Creek and Tributary to Little Lehigh Creek, Township of Upper Milford, Lehigh County, Pennsylvania, April 1979.
49. U.S. Army Corps of Engineers, Philadelphia District, Flood Plain Management Services Branch, DFMAP, Arc/Info software application, developed by the Philadelphia District and Greenhorne and O'Mara, Inc., Greenbelt, Maryland, 1993.
50. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Township of Hanover, Lehigh County, Pennsylvania, Washington, D.C., June 25, 1976.
51. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Lynn, Lehigh County, Pennsylvania, Washington, D.C., November 29, 1974.
52. The Joint Planning Commission, Lehigh-Worthington Counties, Zoning Ordinance No. 1982-1, Lynn Township, Lehigh County, Pennsylvania, Official Zoning Map, Pennsylvania, May 1980.
53. Federal Emergency Management Agency, Flood Insurance Study, Berks County, Pennsylvania (All Jurisdictions), Washington, D.C., May 21, 2001.

54. Federal Emergency Management Agency, Flood Insurance Study, Bucks County, Pennsylvania (All Jurisdictions), Washington, D.C., April 2, 2002.
55. Federal Emergency Management Agency, Flood Insurance Study, Carbon County, Pennsylvania (All Jurisdictions), Washington, D.C., June 3, 2002
56. Federal Emergency Management Agency, Flood Insurance Study, Montgomery County, Pennsylvania (All Jurisdictions), Washington, D.C., October 19, 2001.
57. Federal Emergency Management Agency, Flood Insurance Study, Northampton County, Pennsylvania (All Jurisdictions), Washington, D.C., April 6, 2001.
58. Federal Emergency Management Agency, Flood Insurance Study, Township of West Penn, Schuylkill County, Pennsylvania, Washington, D.C., February 2, 1990.
59. Federal Emergency Management Agency, Flood Insurance Study, Lehigh County, Pennsylvania (All Jurisdictions), Washington, D.C., November 7, 2001.
60. U.S. Army Corps of Engineers, Philadelphia District, Type 19 Flood Insurance Study—Lehigh River Basin FIS, Topographic Map, Scale 1"=400', Contour Interval 4 Feet, November 19, 1997.
61. Cowan Associates, Haaf-Tercha Industrial Park, Topographic Maps, Scale 1"=200', Contour Interval 2 Feet, April 21, 1998.
62. McTish, Kunkel & Associates, Cedar Creek Flood Study, Topographic Maps, Scale 1"=40', Contour Interval 1 Foot, December 27, 2002.

U.S. Department of the Interior, Geological Survey, Water Resources Data for Pennsylvania, Harrisburg, Pennsylvania, 1977.



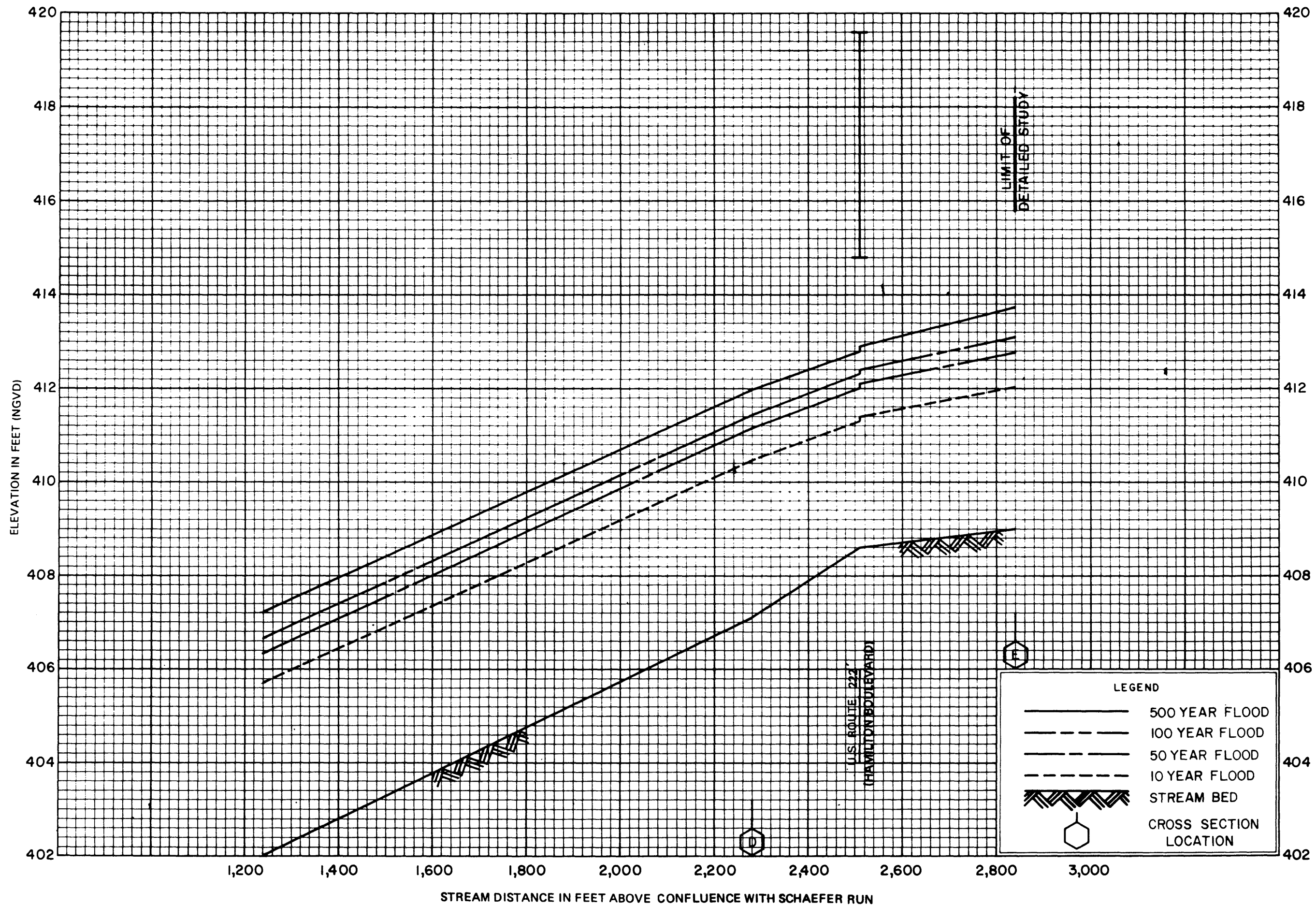
FLOOD PROFILES

BREINIG RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

01P



FLOOD PROFILES

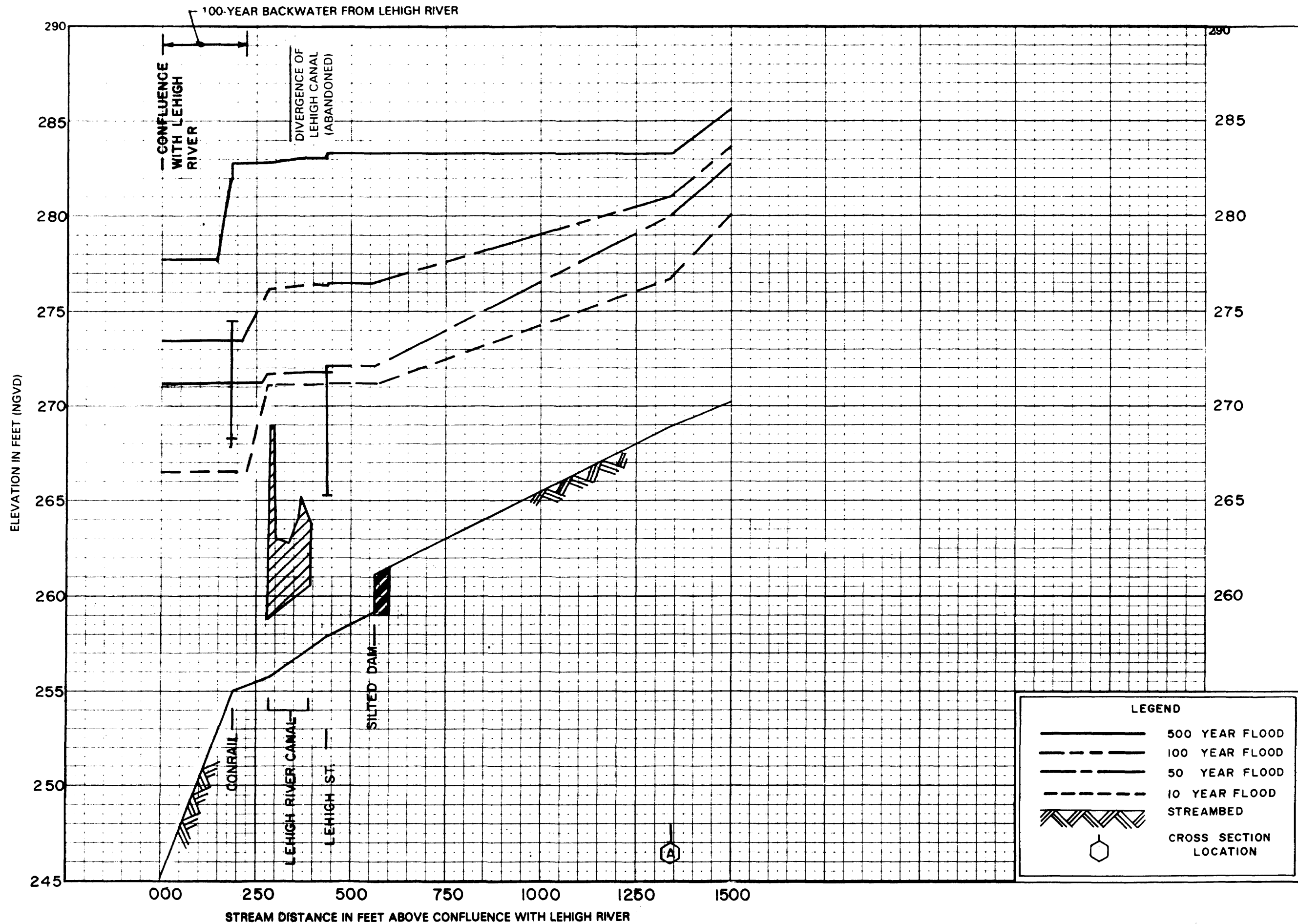
BRENIG RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

02P



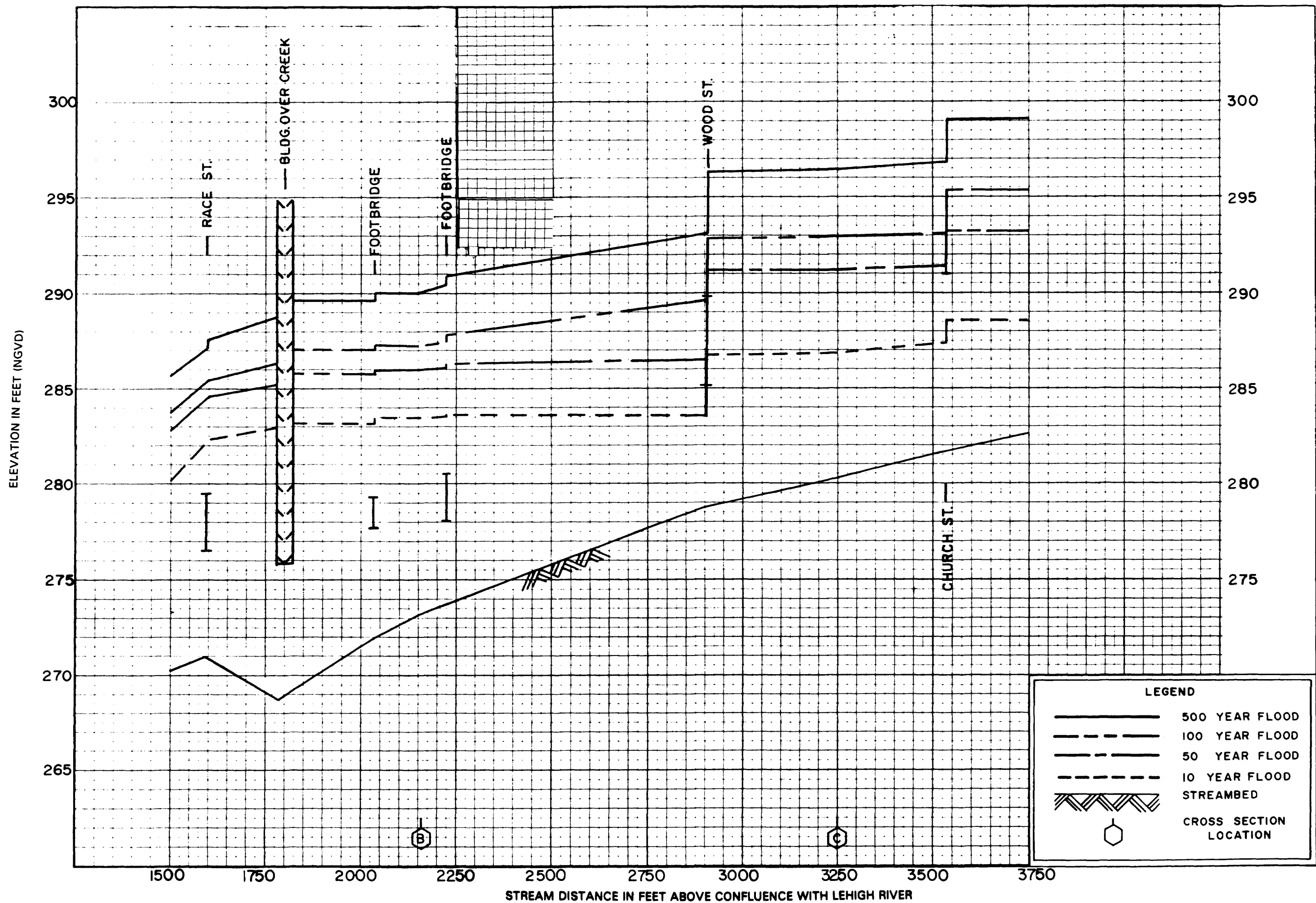
FLOOD PROFILES

CATASAUQUA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

03P



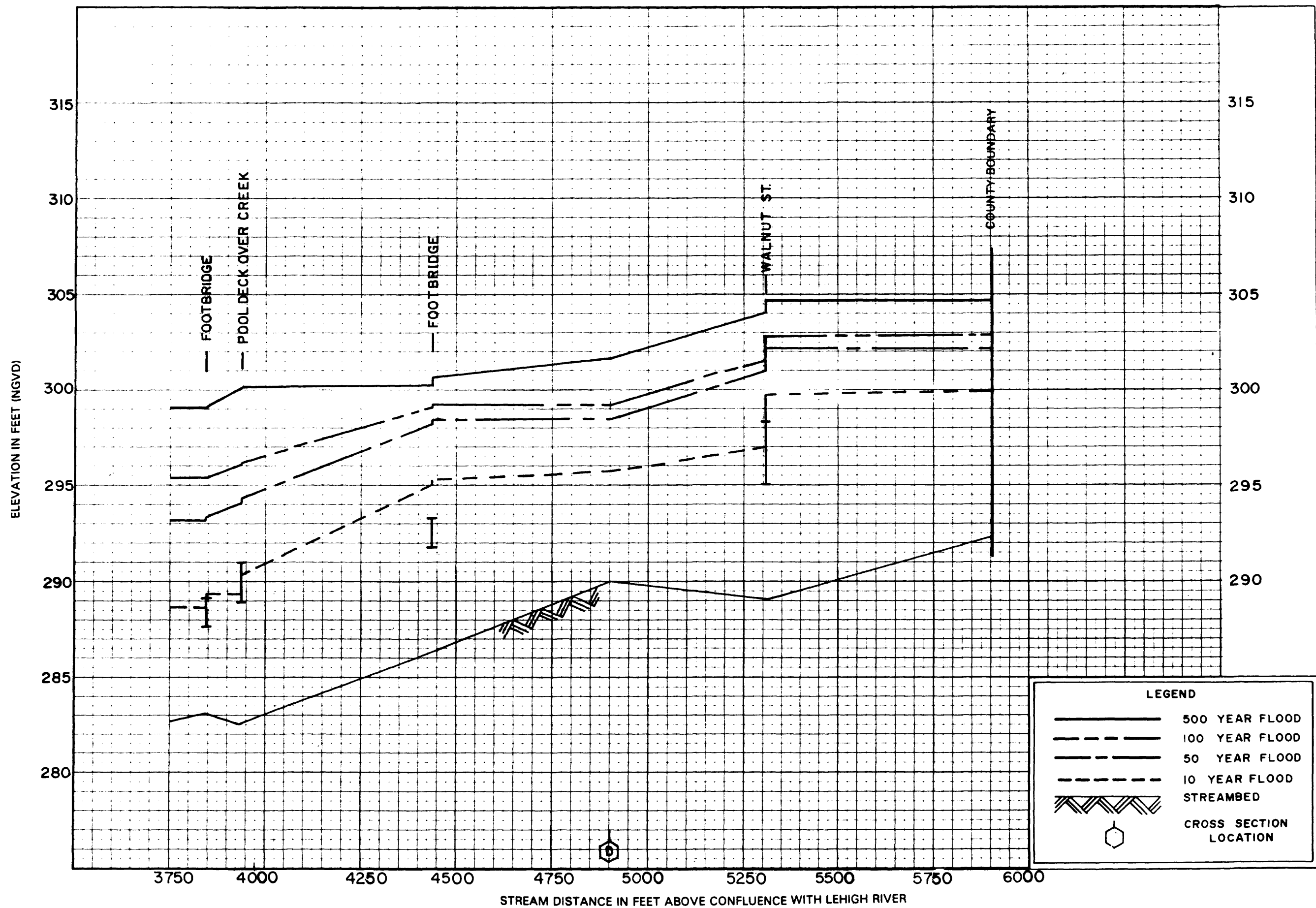
FLOOD PROFILES

CATASAUQUA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

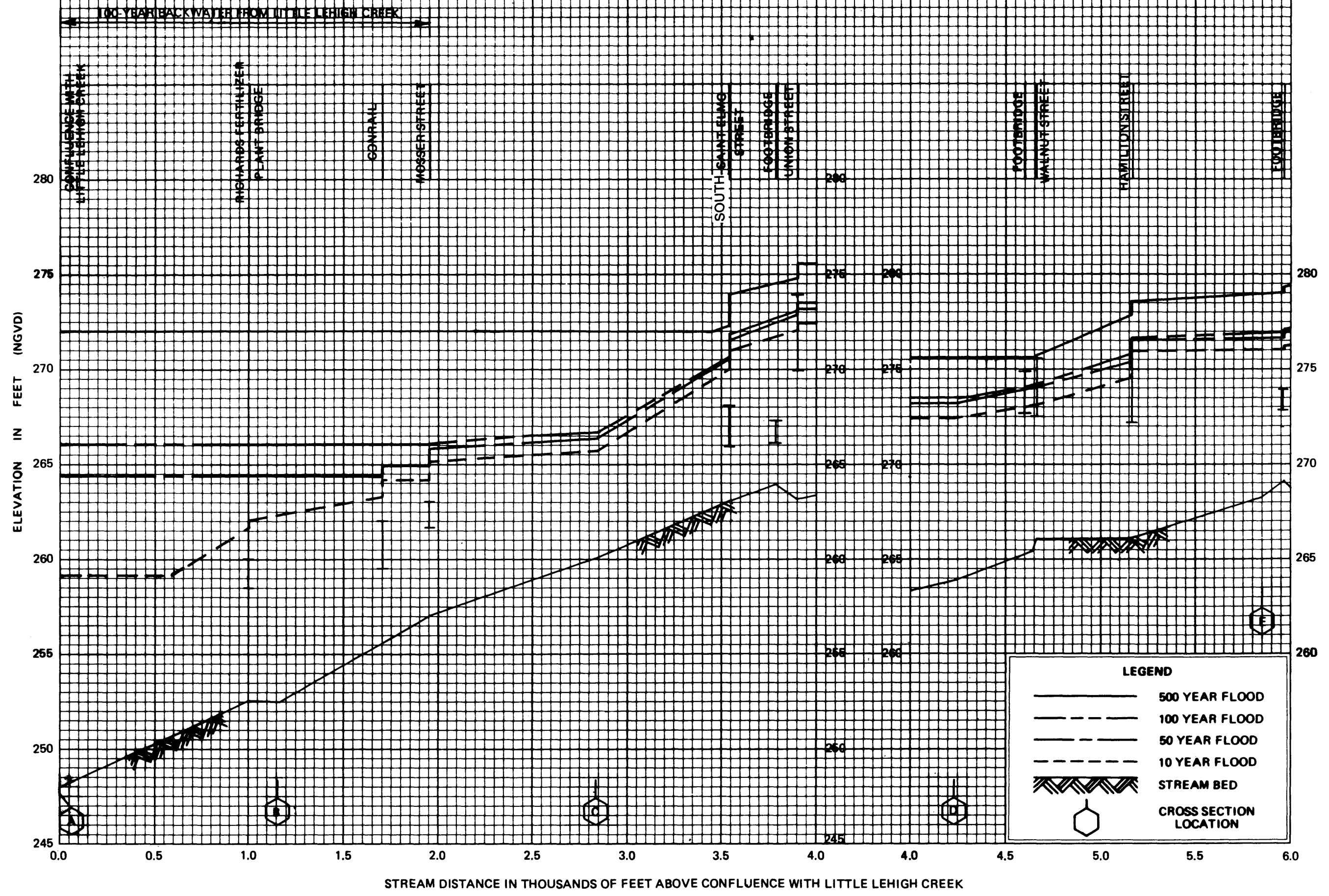
LEHIGH COUNTY, PA

(ALL JURISDICTIONS)



FLOOD PROFILES
CATASAUQUA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

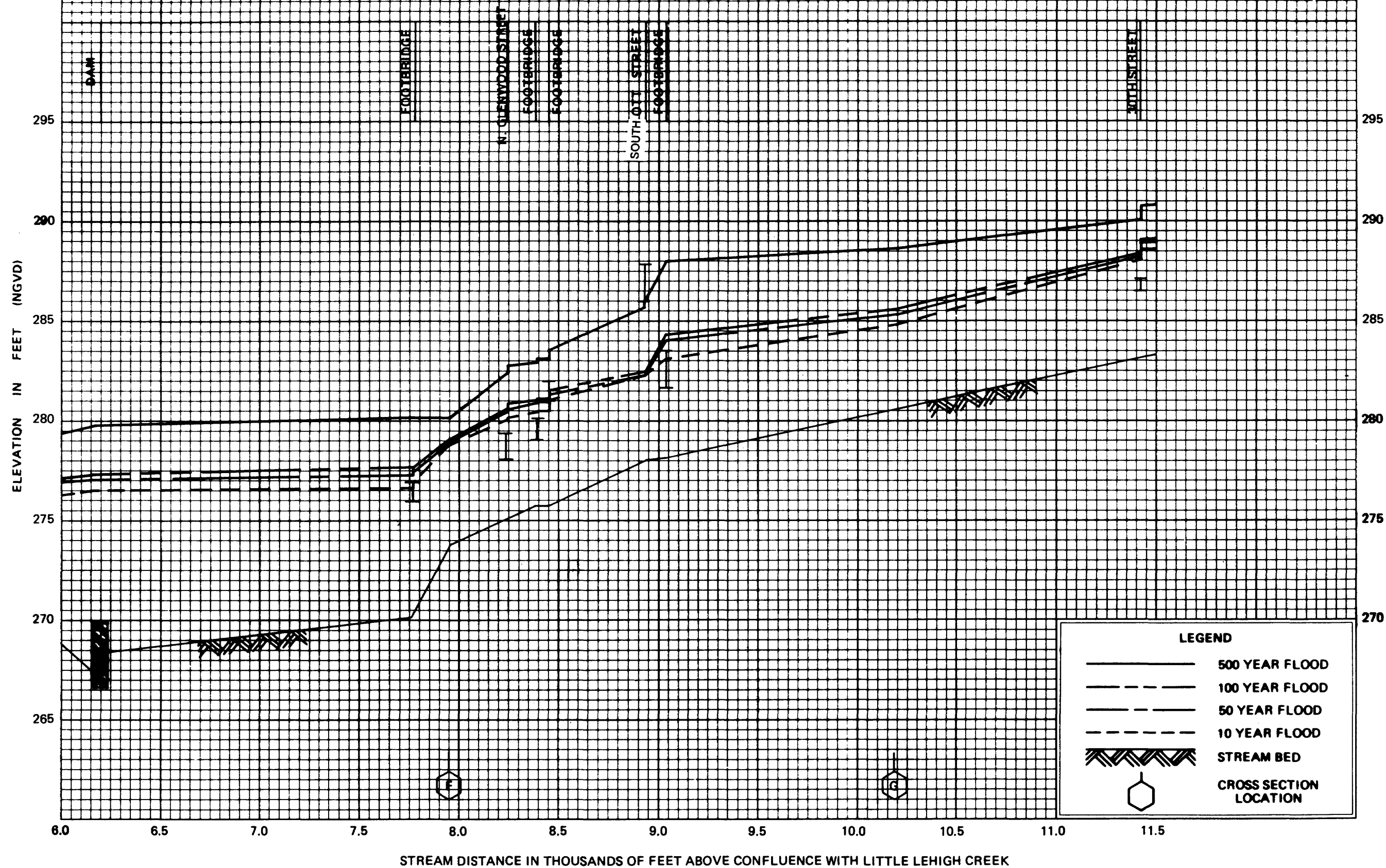


FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)



FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

07P

ELEVATION IN FEET (NGVD)

300

295

290

285

280

11.5

12.0

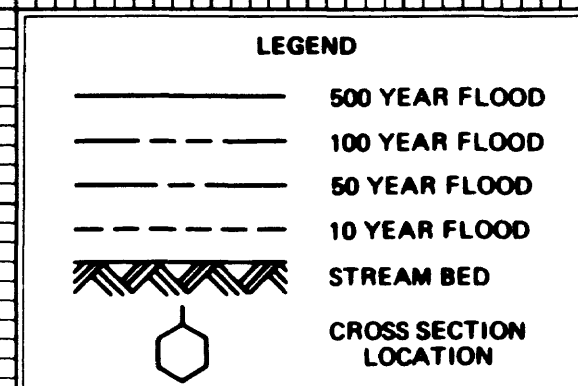
12.5

13.0

13.5

CONFLUENCE OF
LITTLE CEDAR CREEK
CEDAR CREEK
BOULEVARD

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK



FEDERAL EMERGENCY MANAGEMENT AGENCY

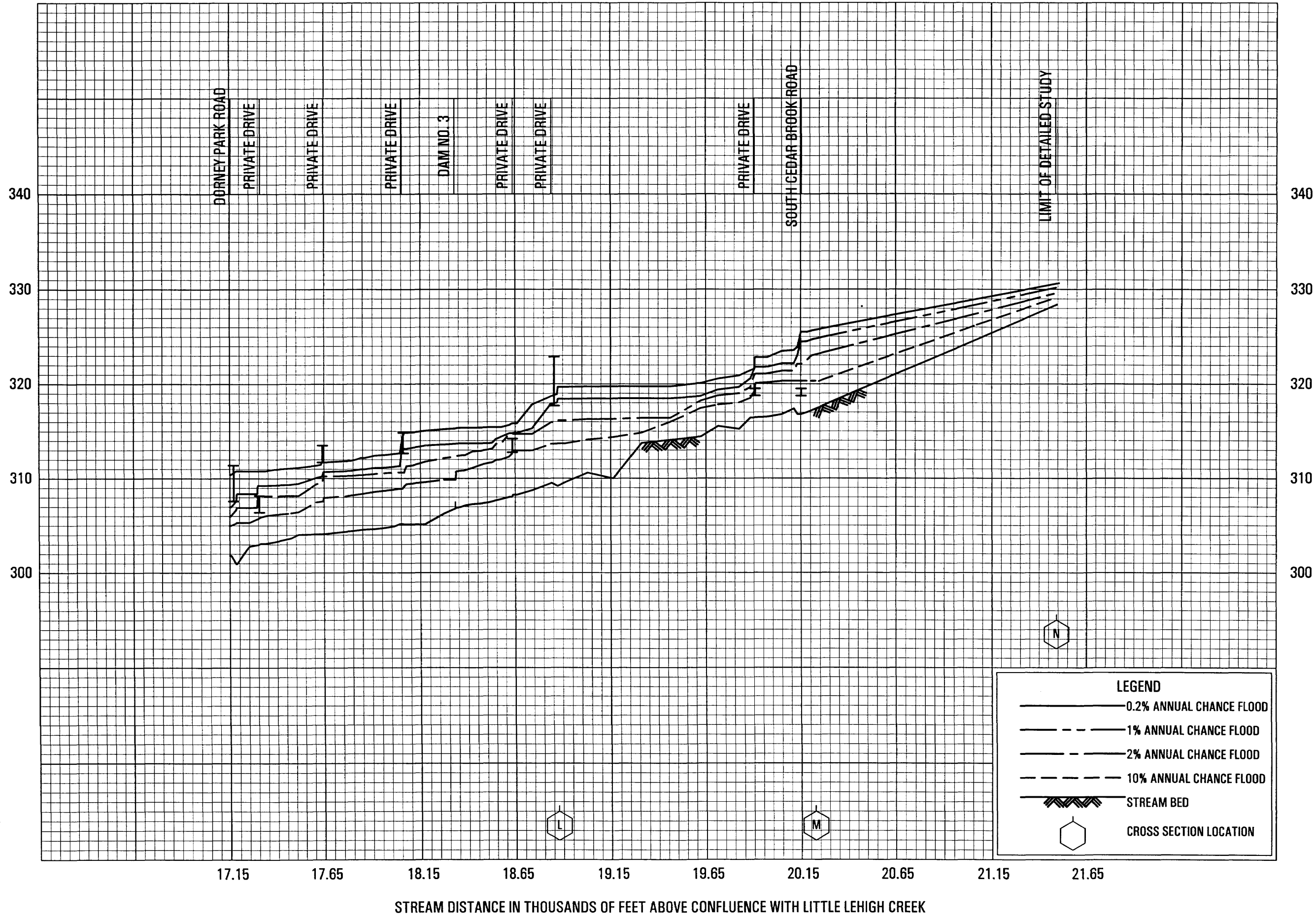
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOOD PROFILES

CEDAR CREEK

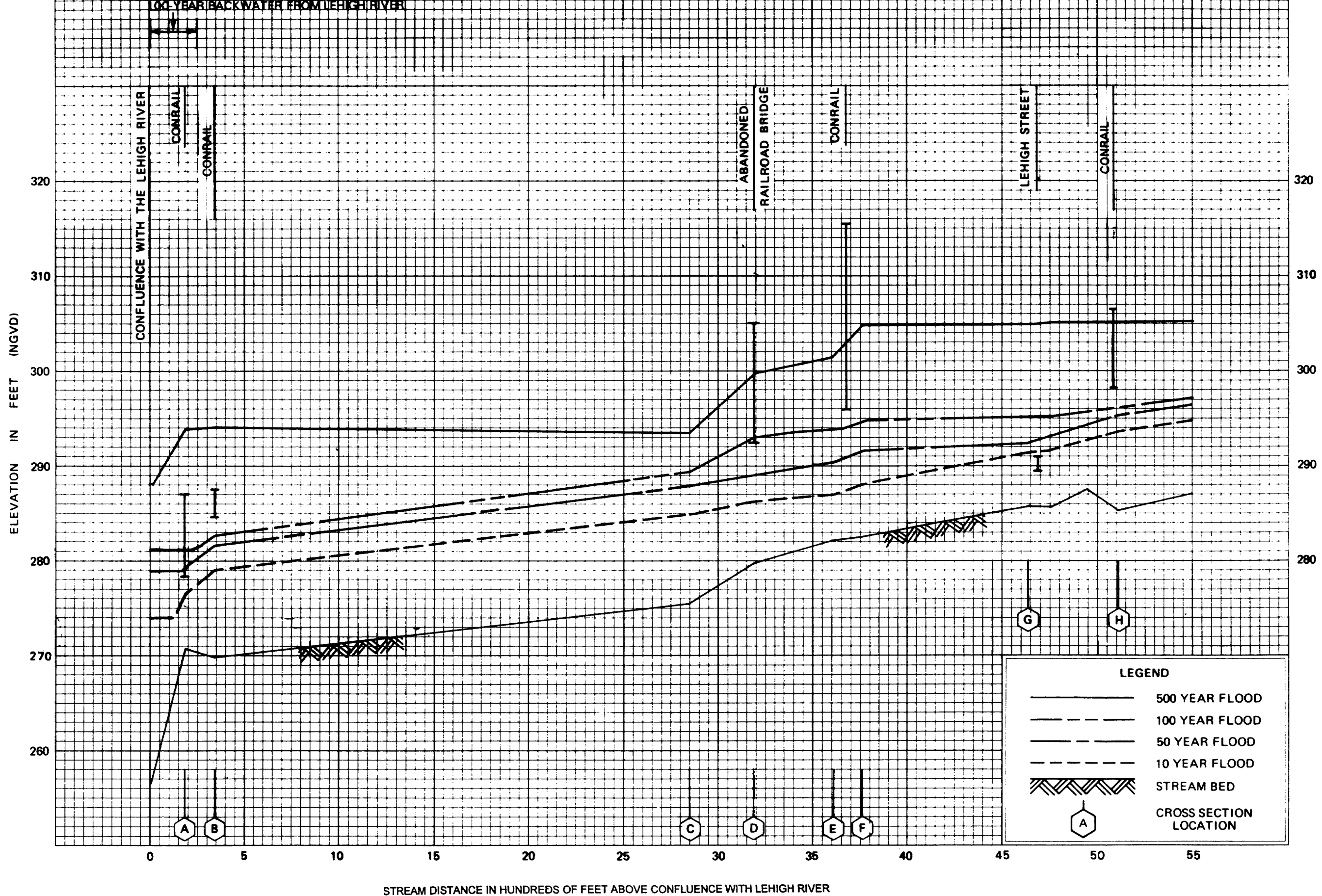
08P

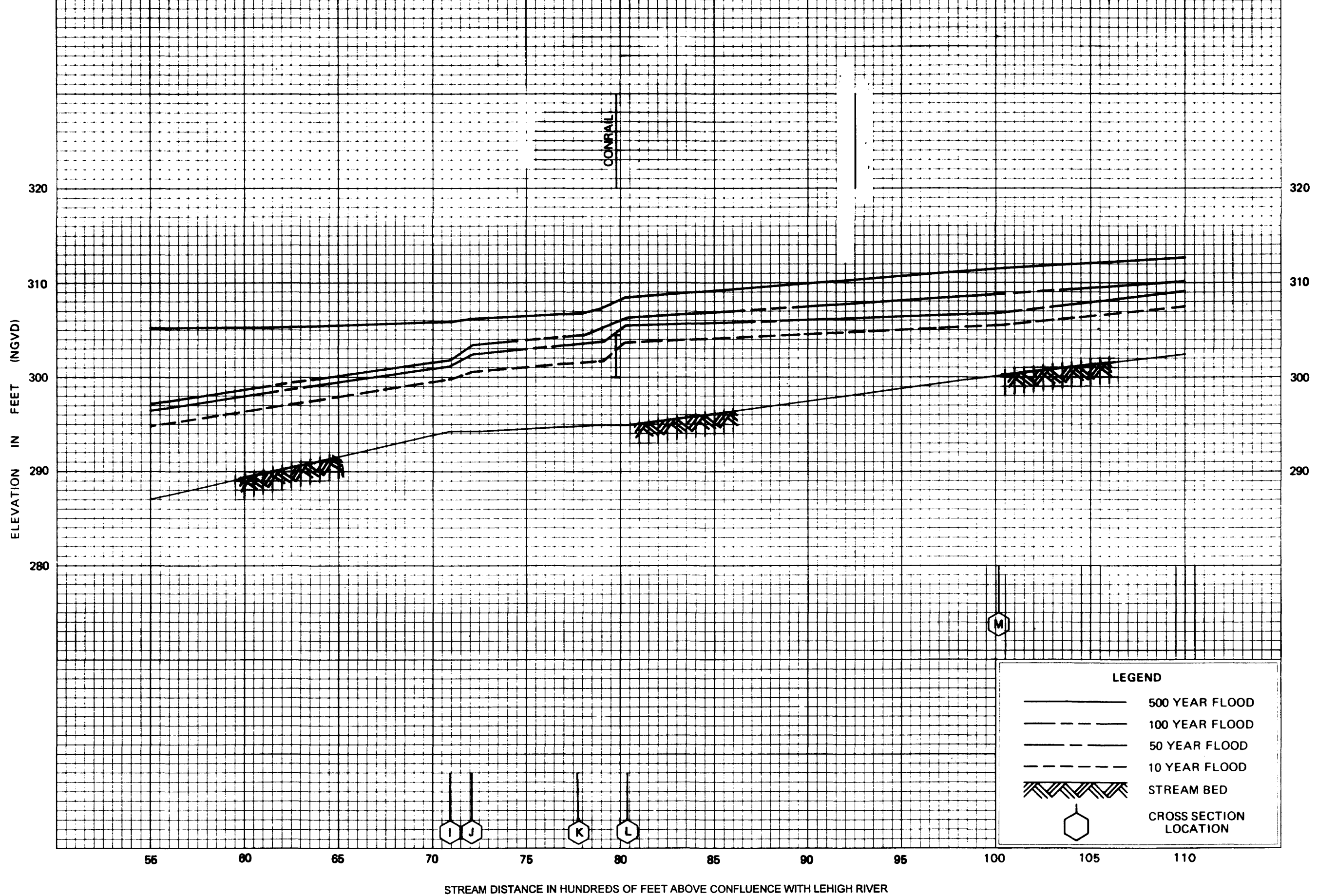
ELEVATION IN FEET (NGVD 29)



FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOOD PROFILES
CEDAR CREEK

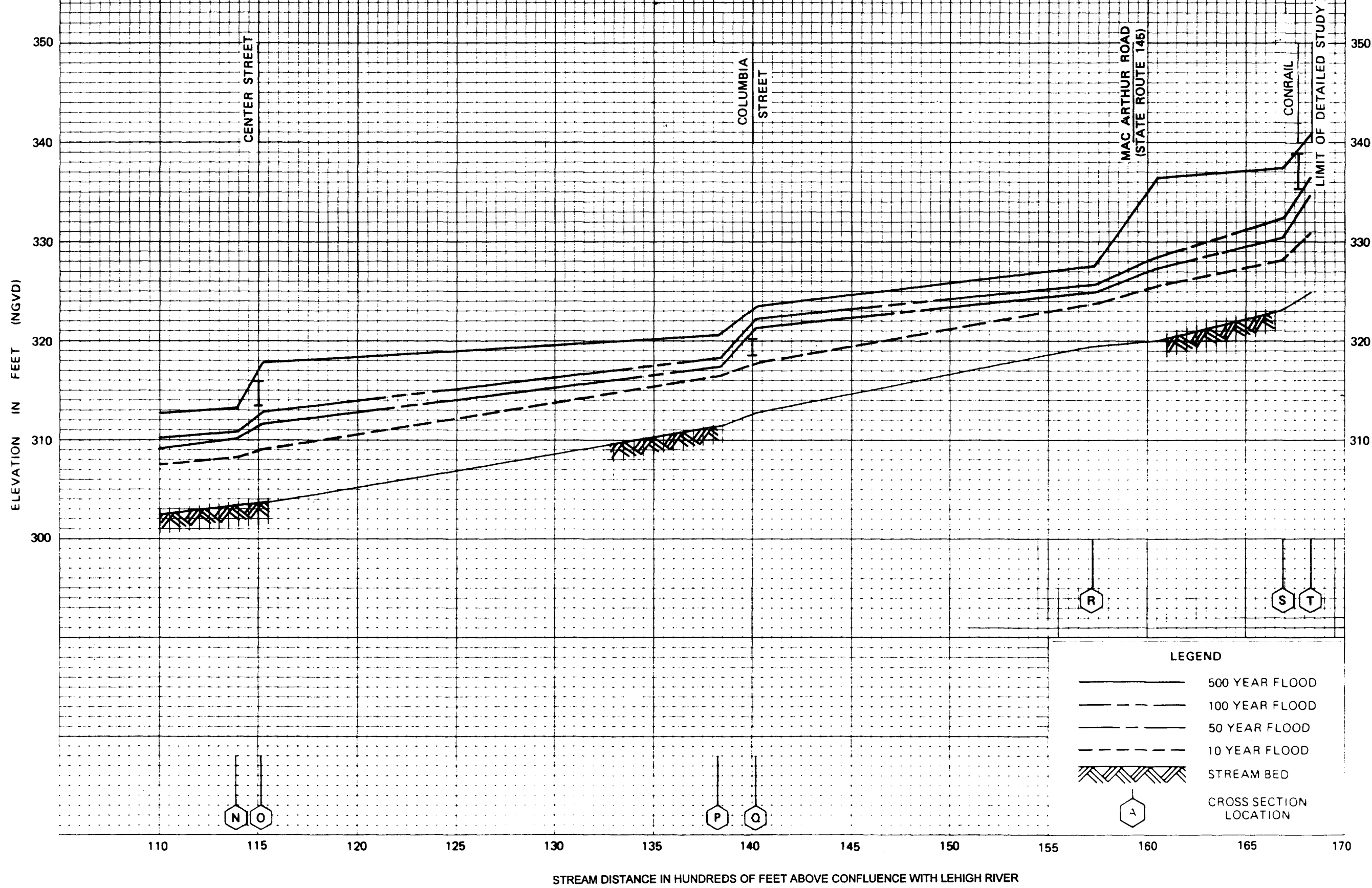




FLOOD PROFILES

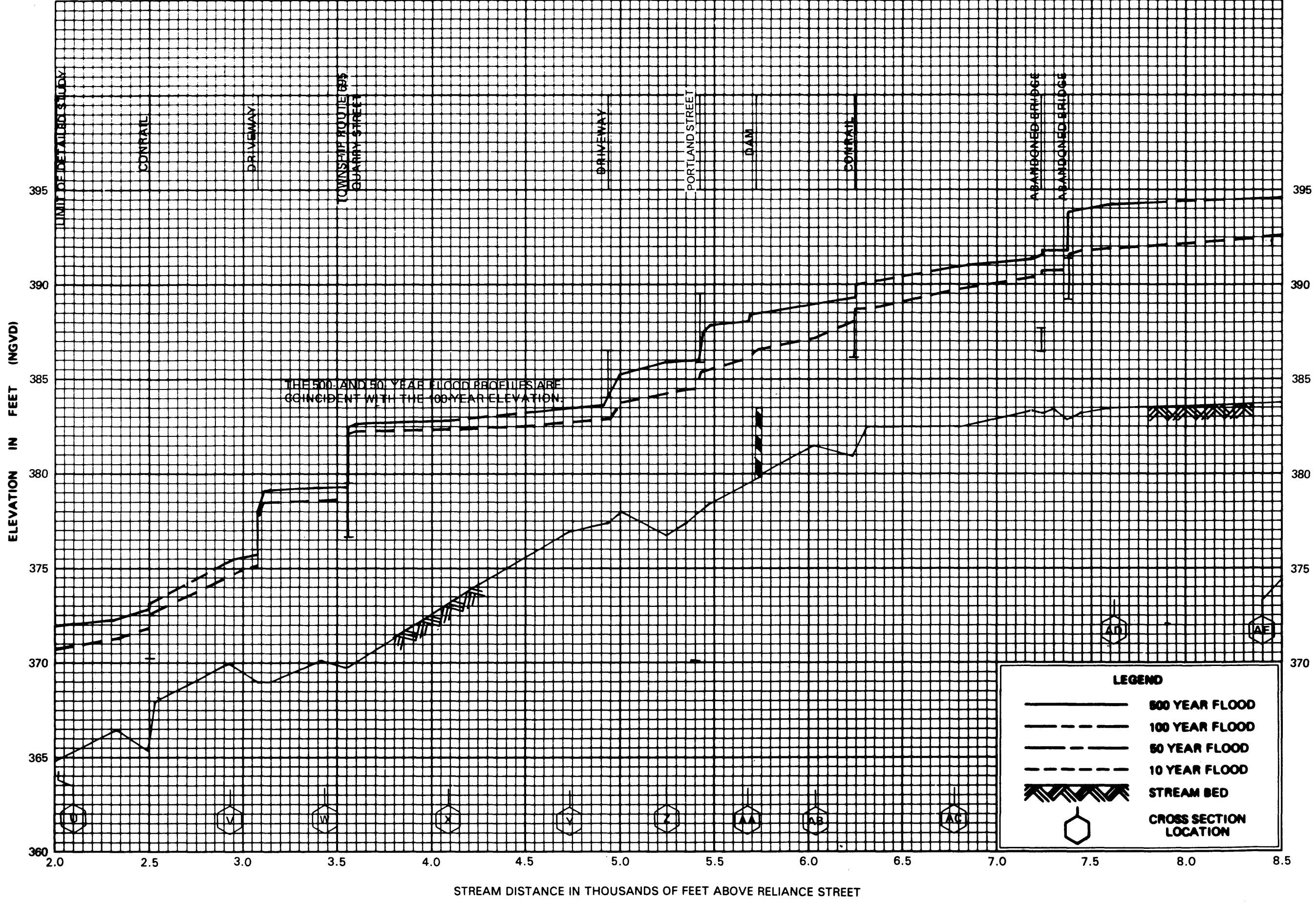
COPLAY CREEK

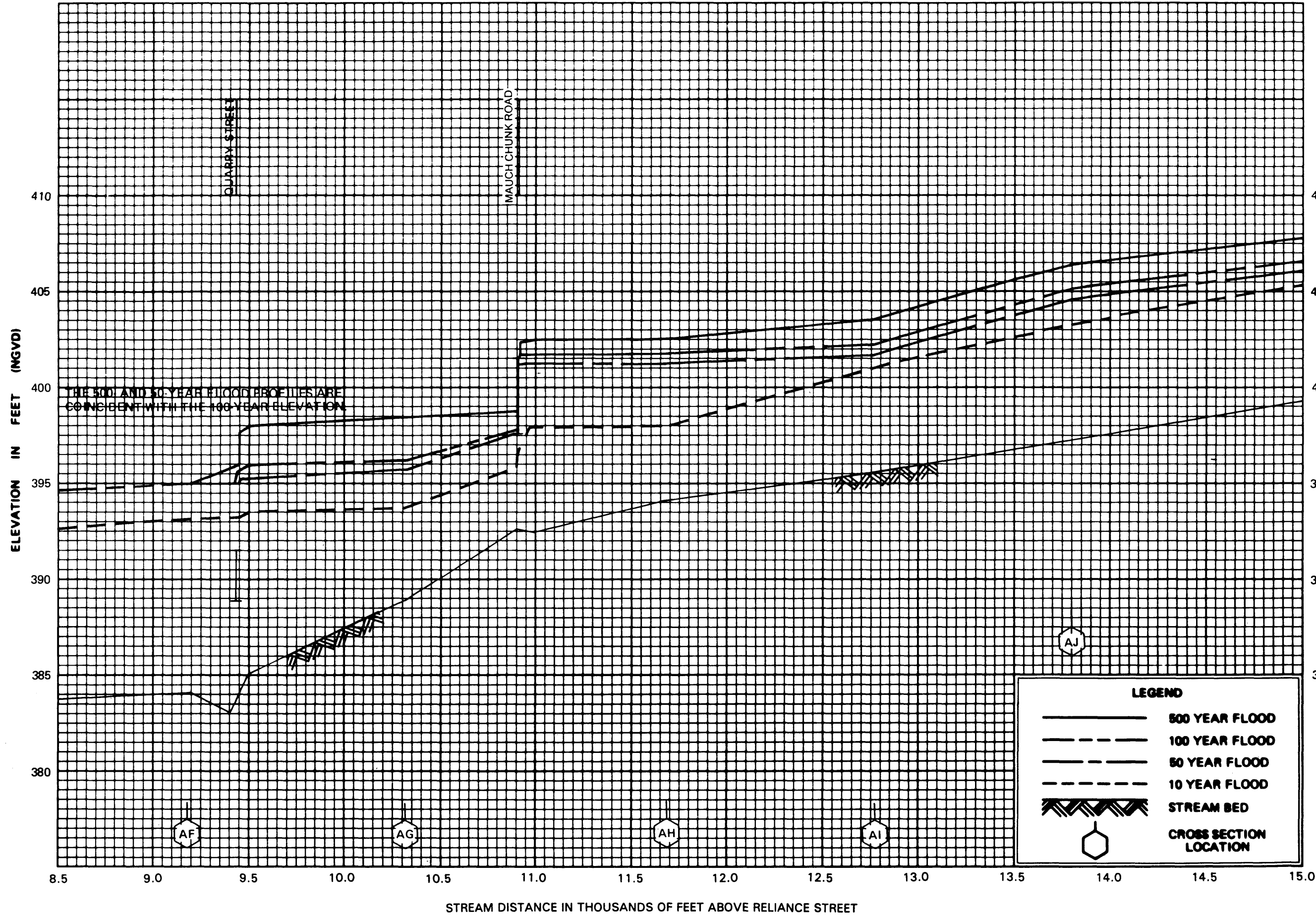
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
 (ALL JURISDICTIONS)

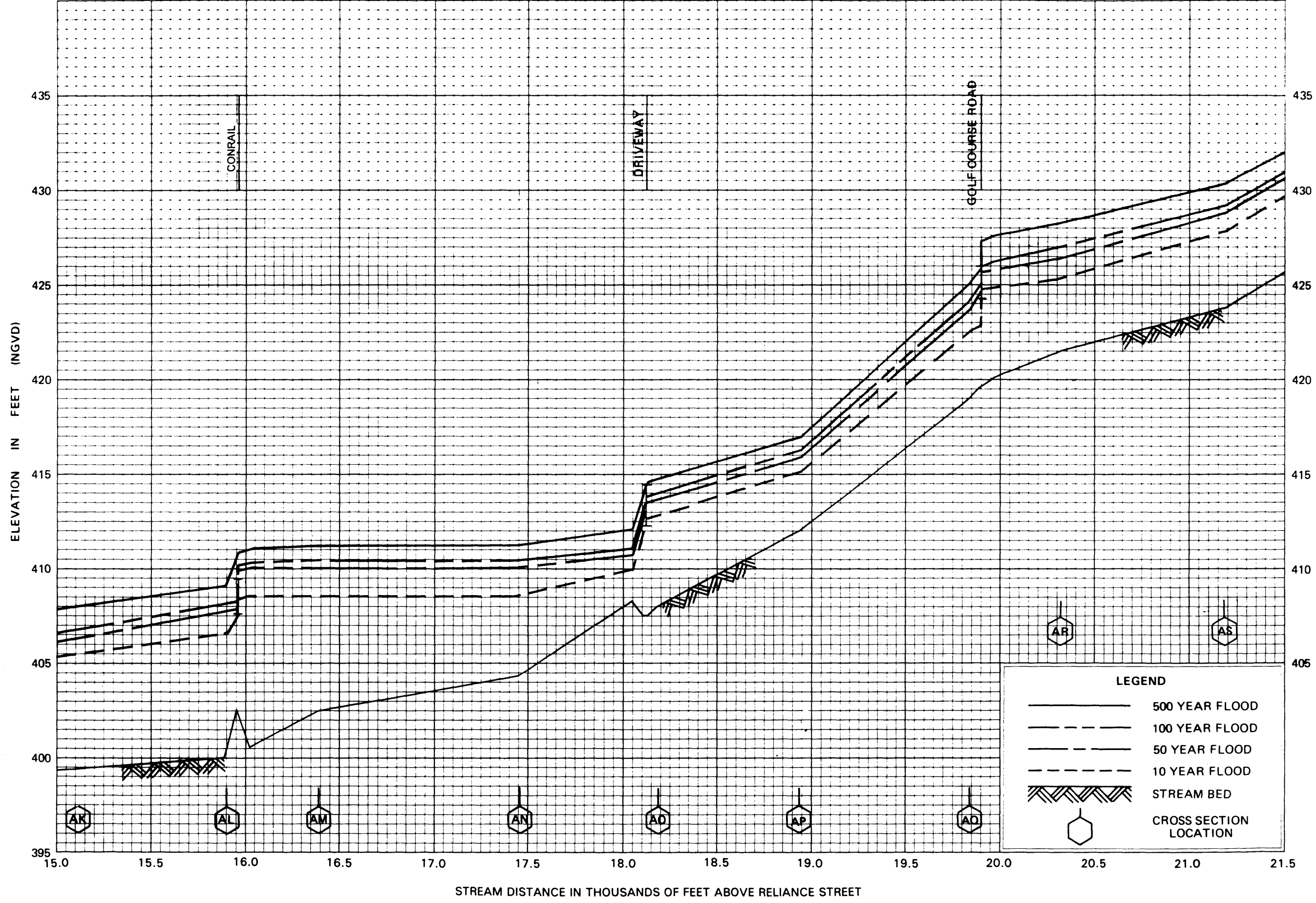


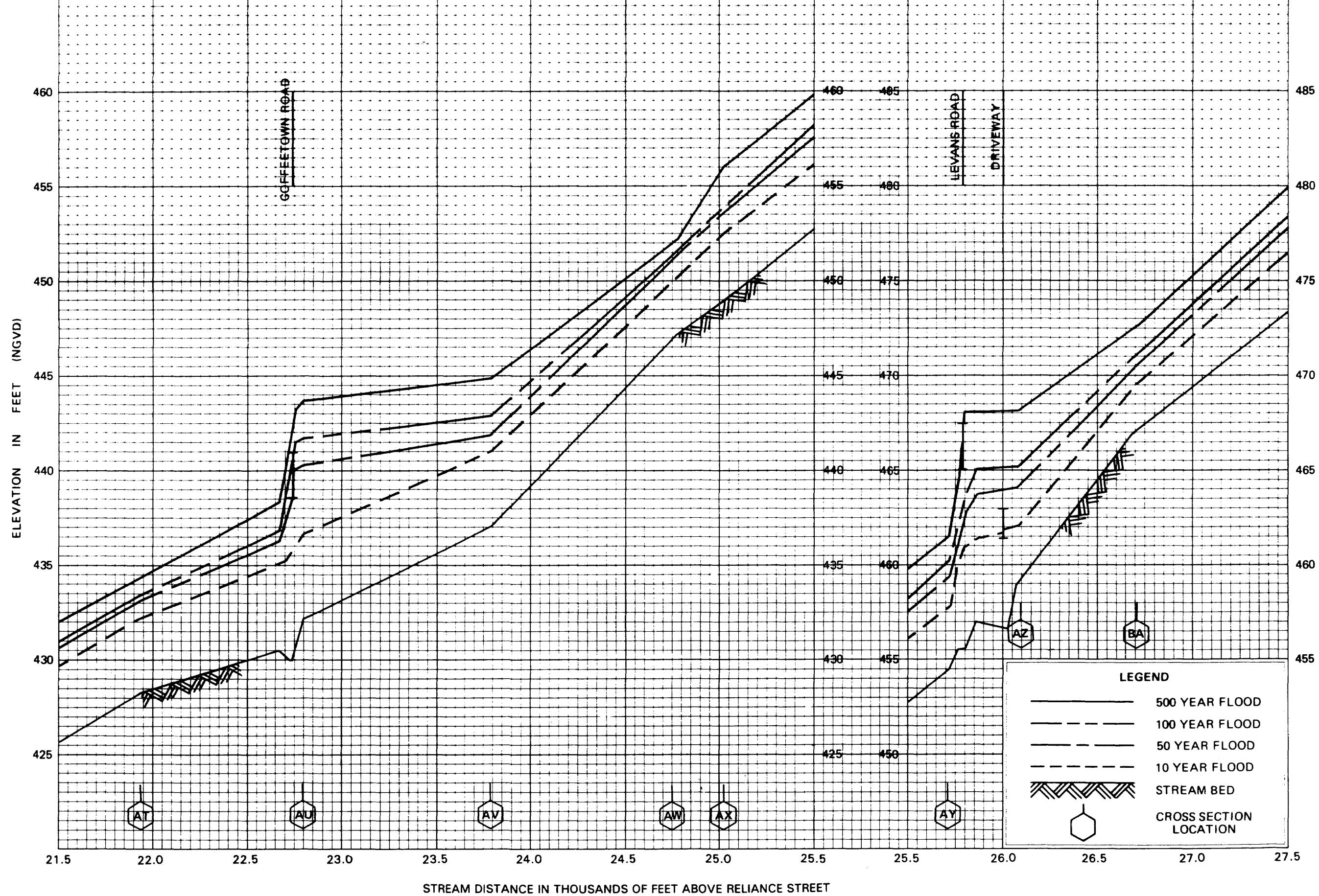
FLOOD PROFILES
COPLAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)









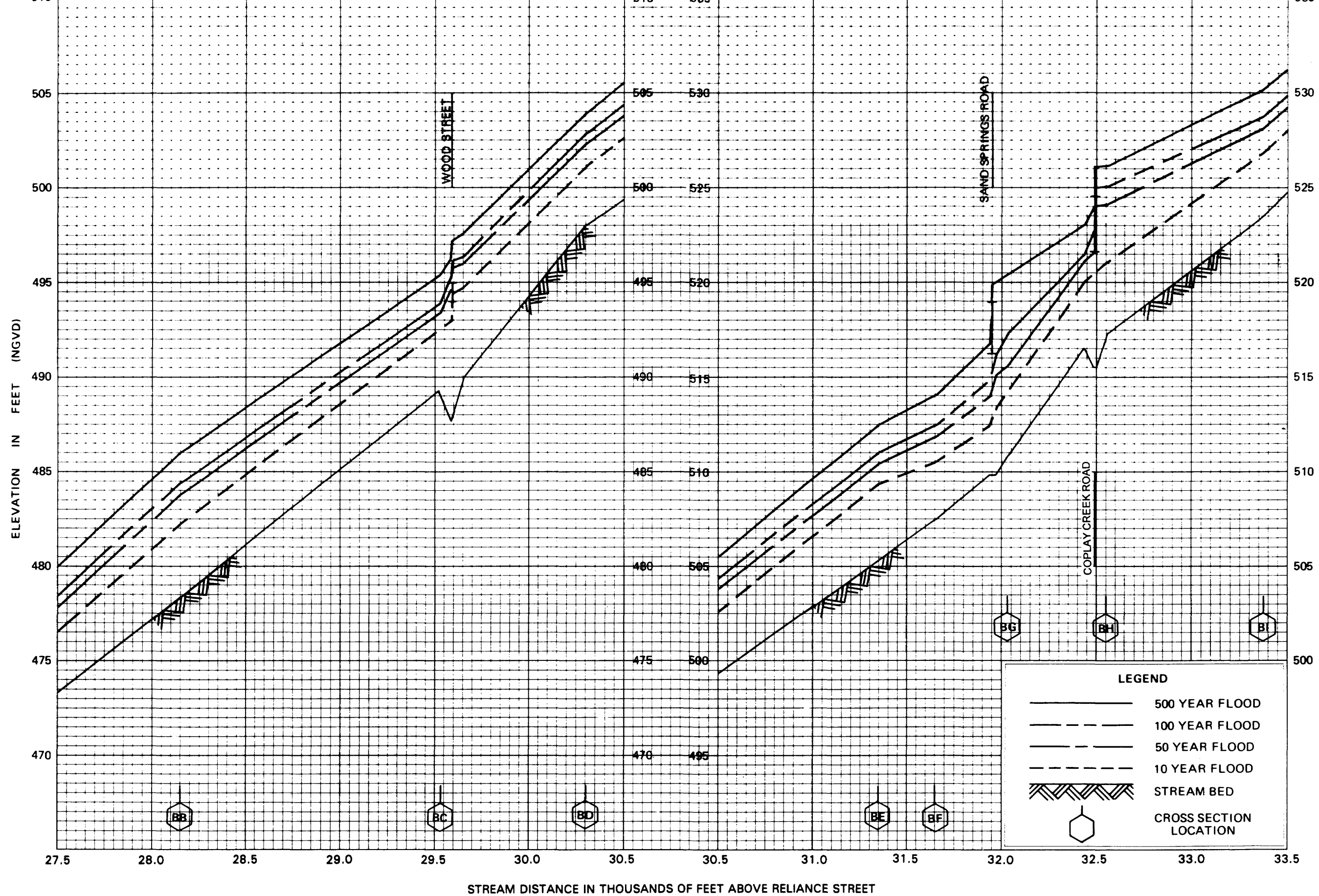
FLOOD PROFILES

COPLAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

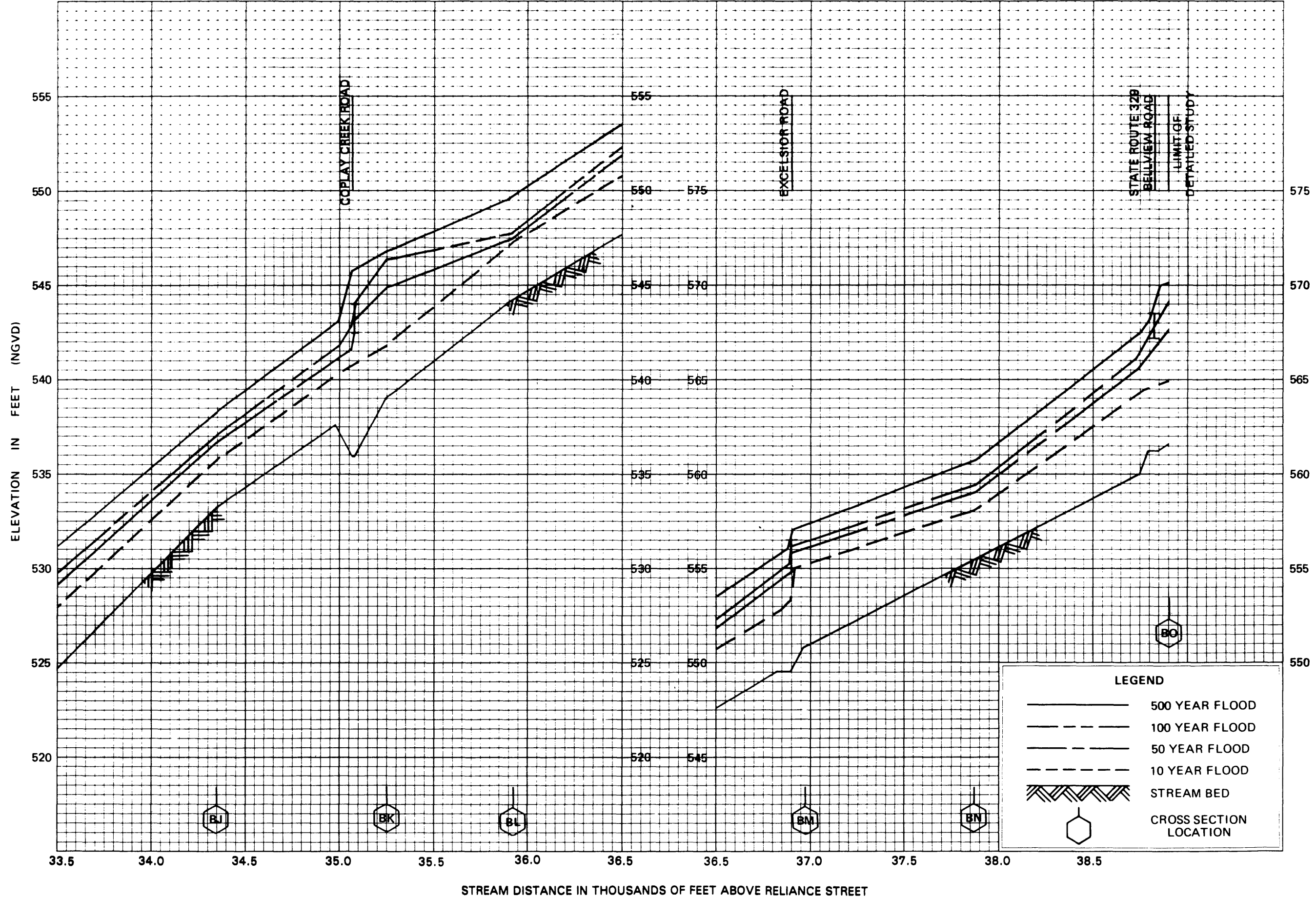
LEHIGH COUNTY, PA

(ALL JURISDICTIONS)



FLOOD PROFILES
COPLAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

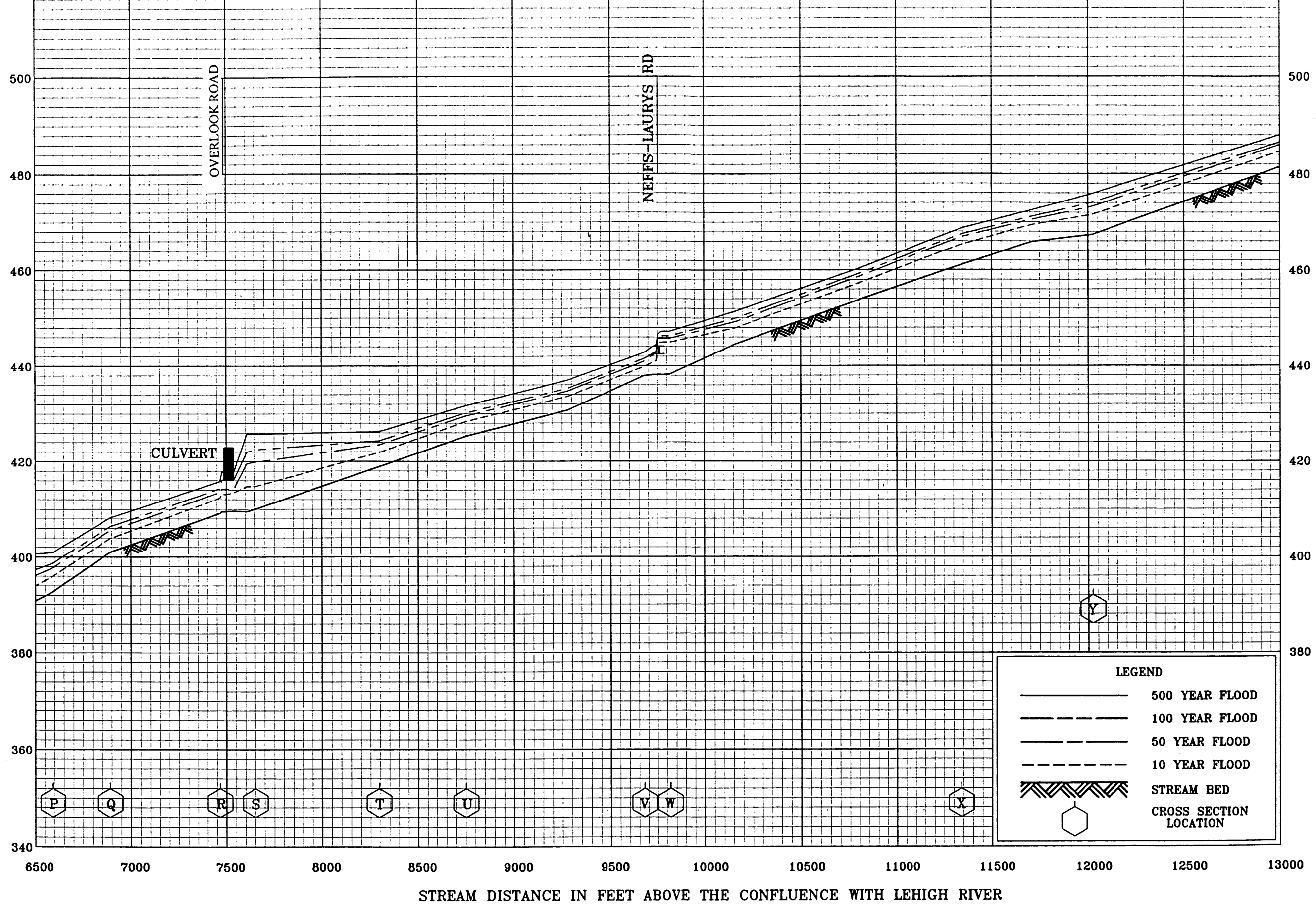


FLOOD PROFILES

COPLAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

ELEVATION IN FEET (NGVD)



FLOOD PROFILES

FELLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

19(b)P

ELEVATION IN FEET (NGVD)

600
580
560
540
520
500
480
460
440

13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000

STREAM DISTANCE IN FEET ABOVE THE CONFLUENCE WITH LEHIGH RIVER

RIVERVIEW ROAD

PRIVATE DRIVE

NEFFS-LAURYS RD

LIMIT OF DETAILED STUDY

THE 50-YEAR FLOOD PROFILE
IS TOO CLOSE TO THE 100-YEAR
ELEVATION TO BE SHOWN SEPARATELY

CULVERT

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

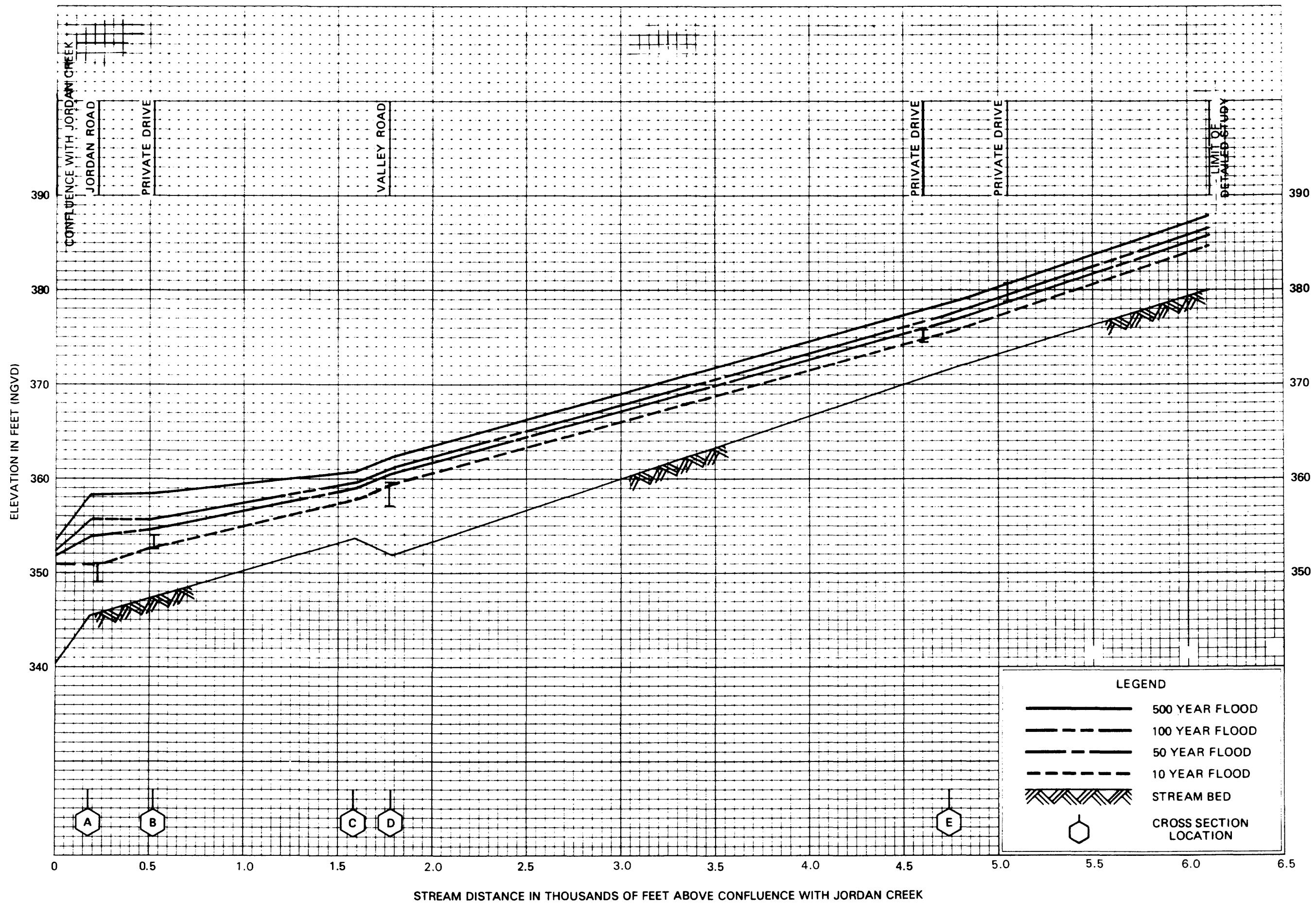
FELLS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

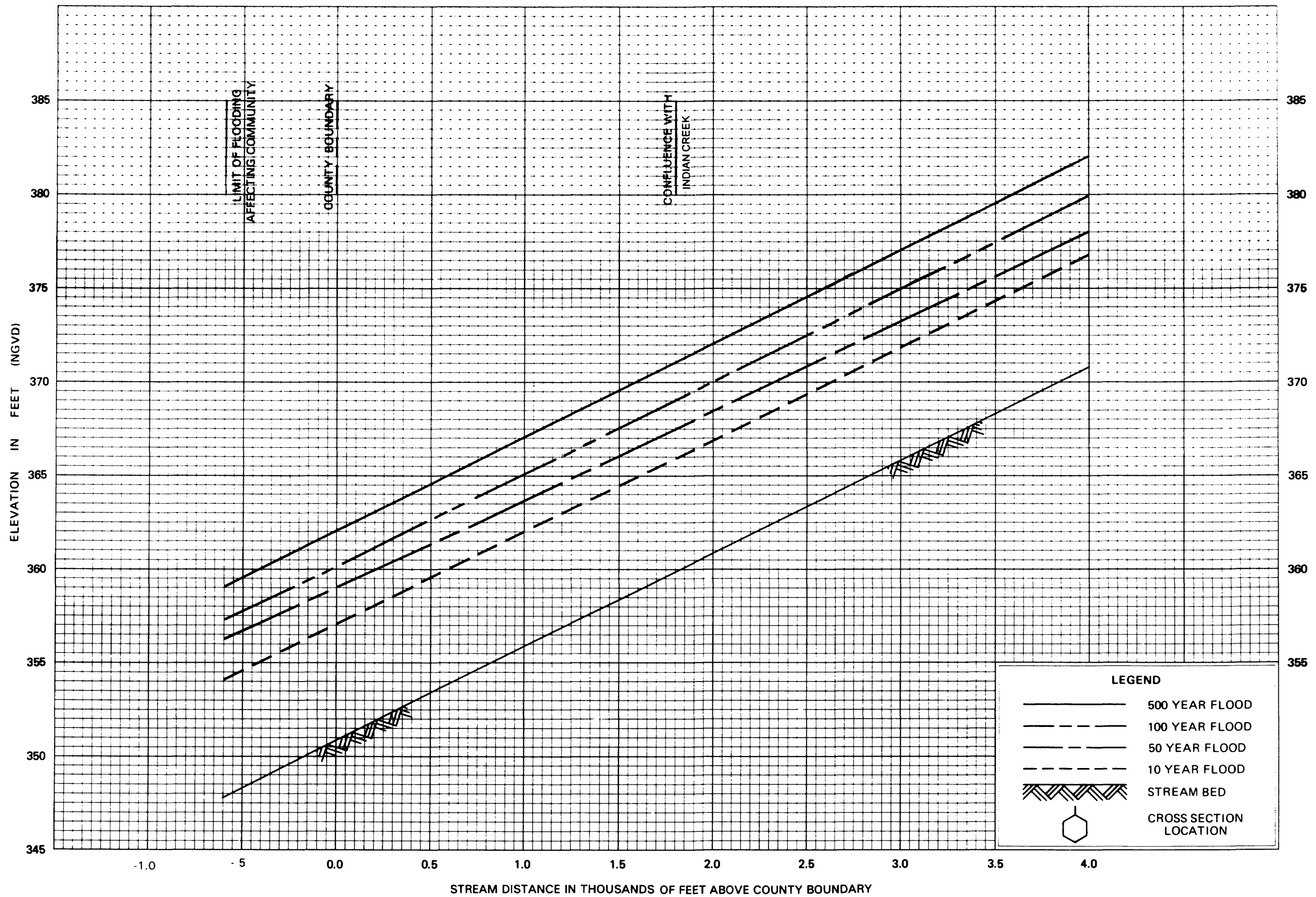
(ALL JURISDICTIONS)

19(c)P



FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

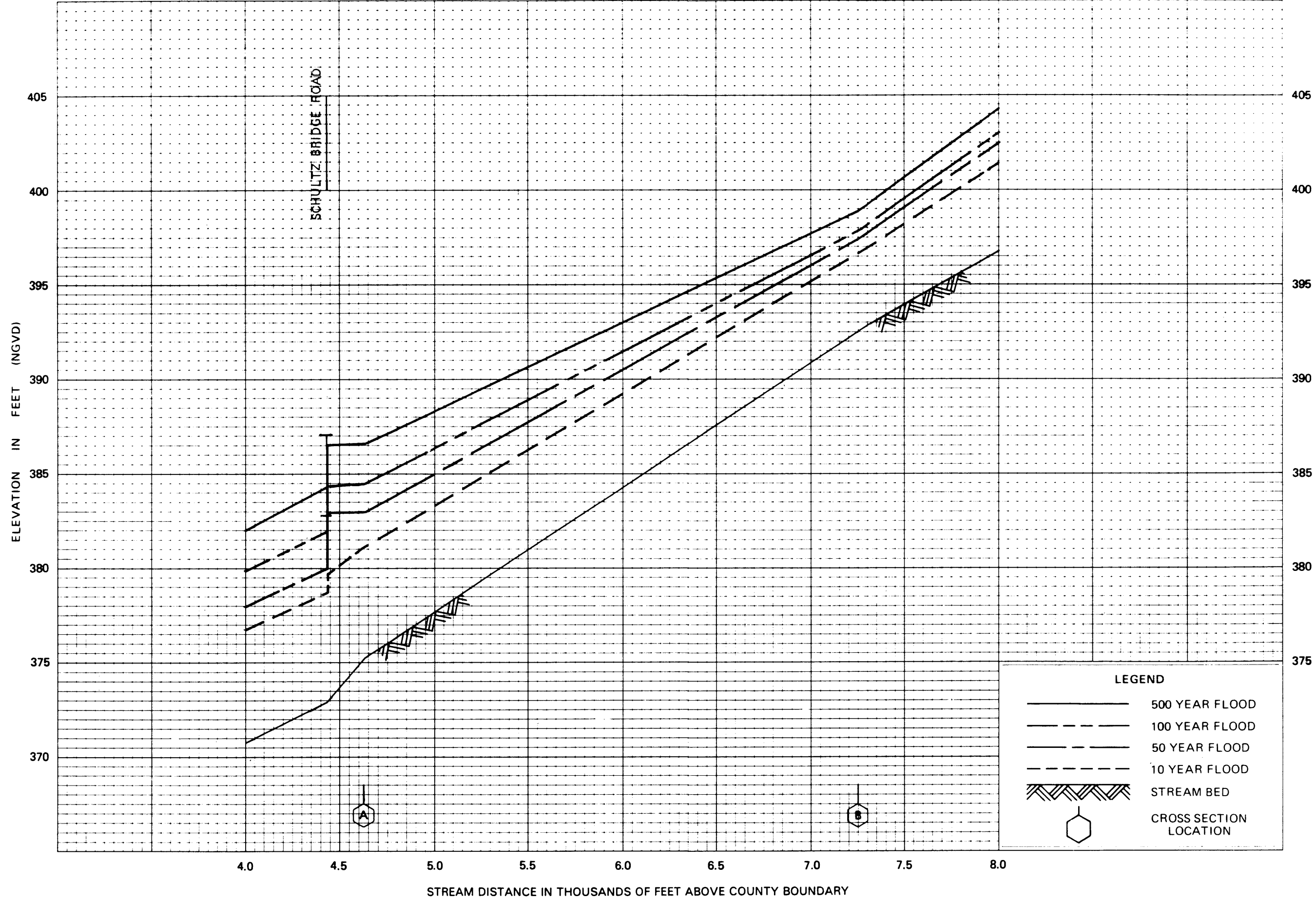


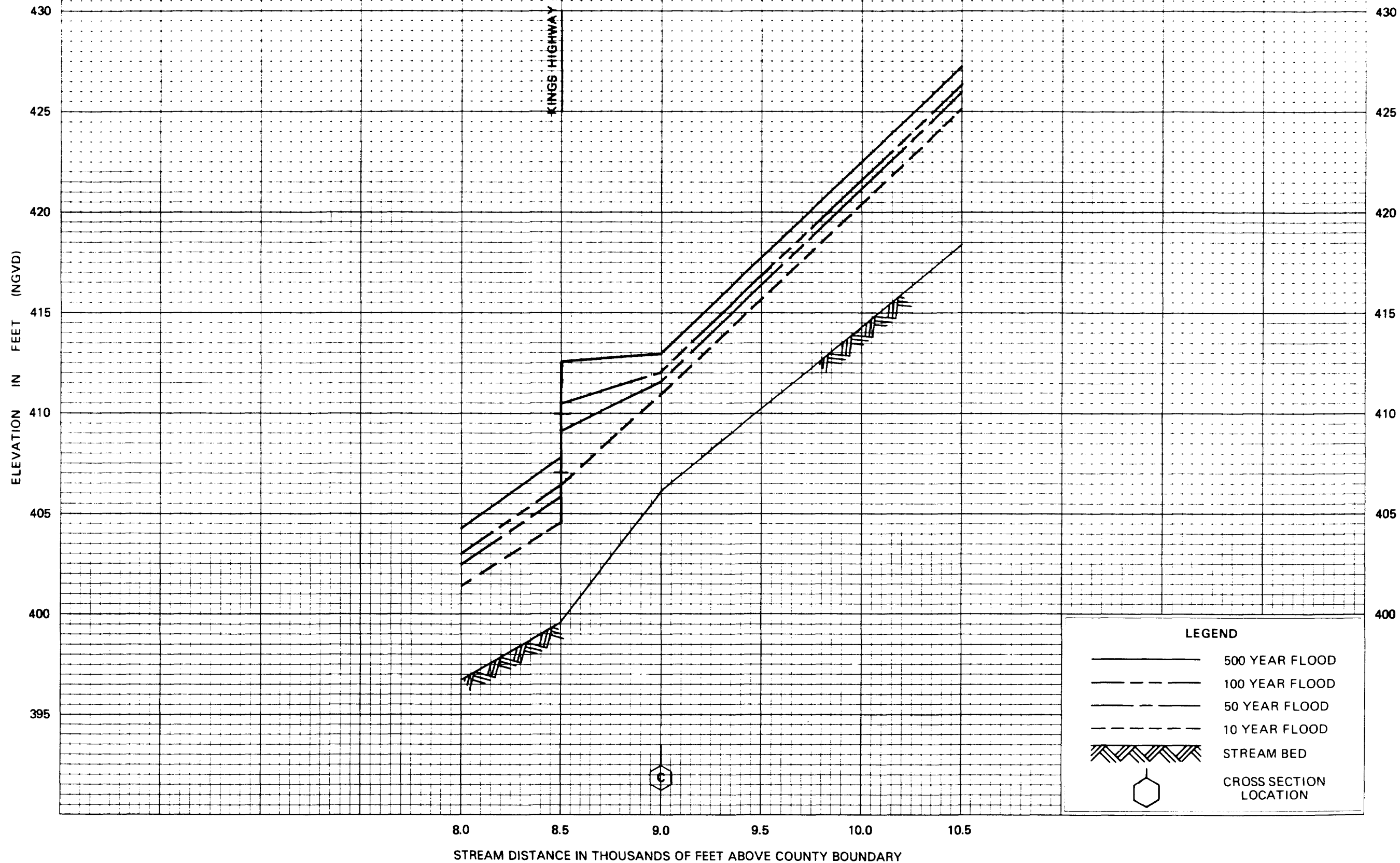
FLOOD PROFILES

HOSENSACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

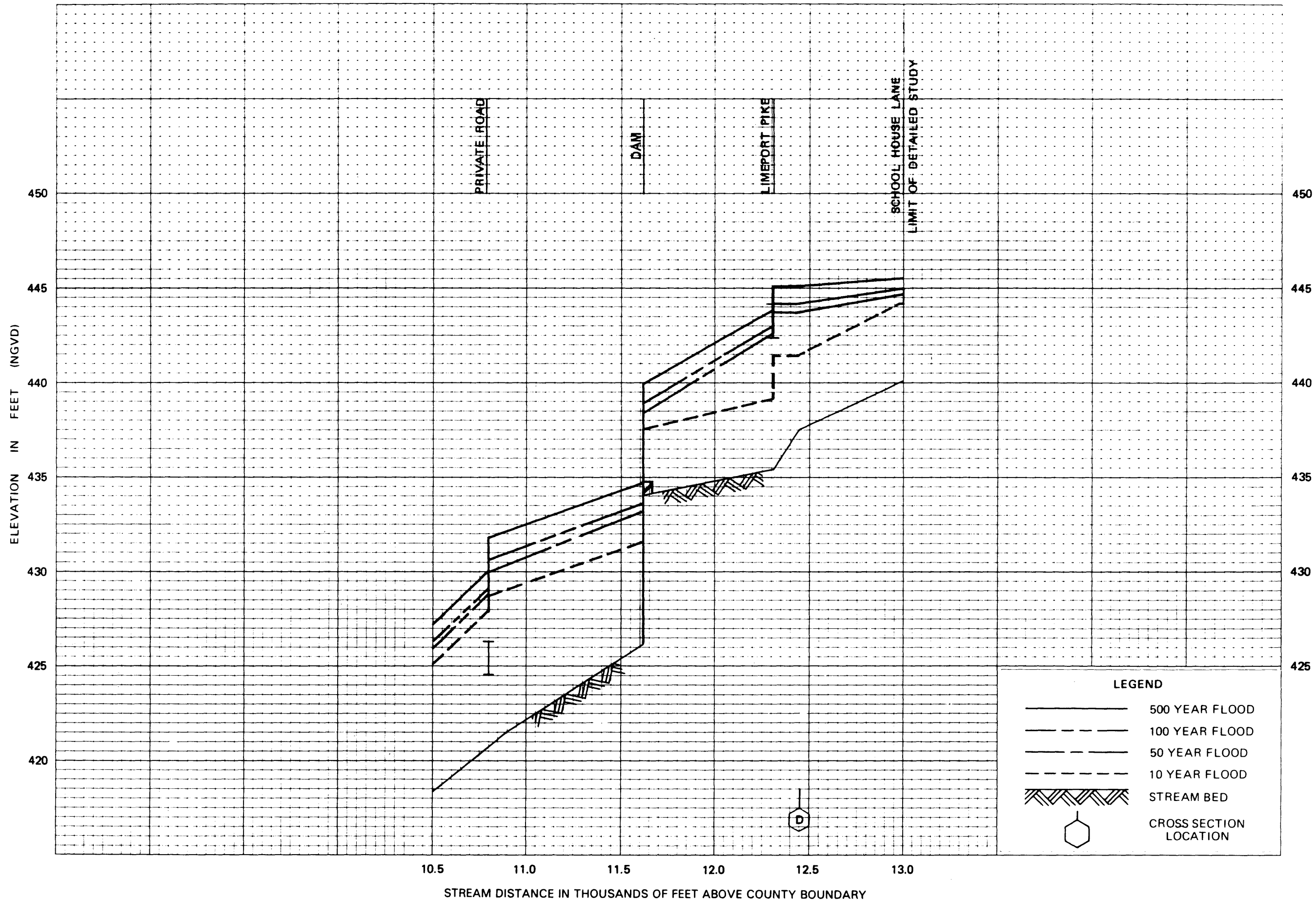
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)





FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

FLOOD PROFILES
HOSENSACK CREEK



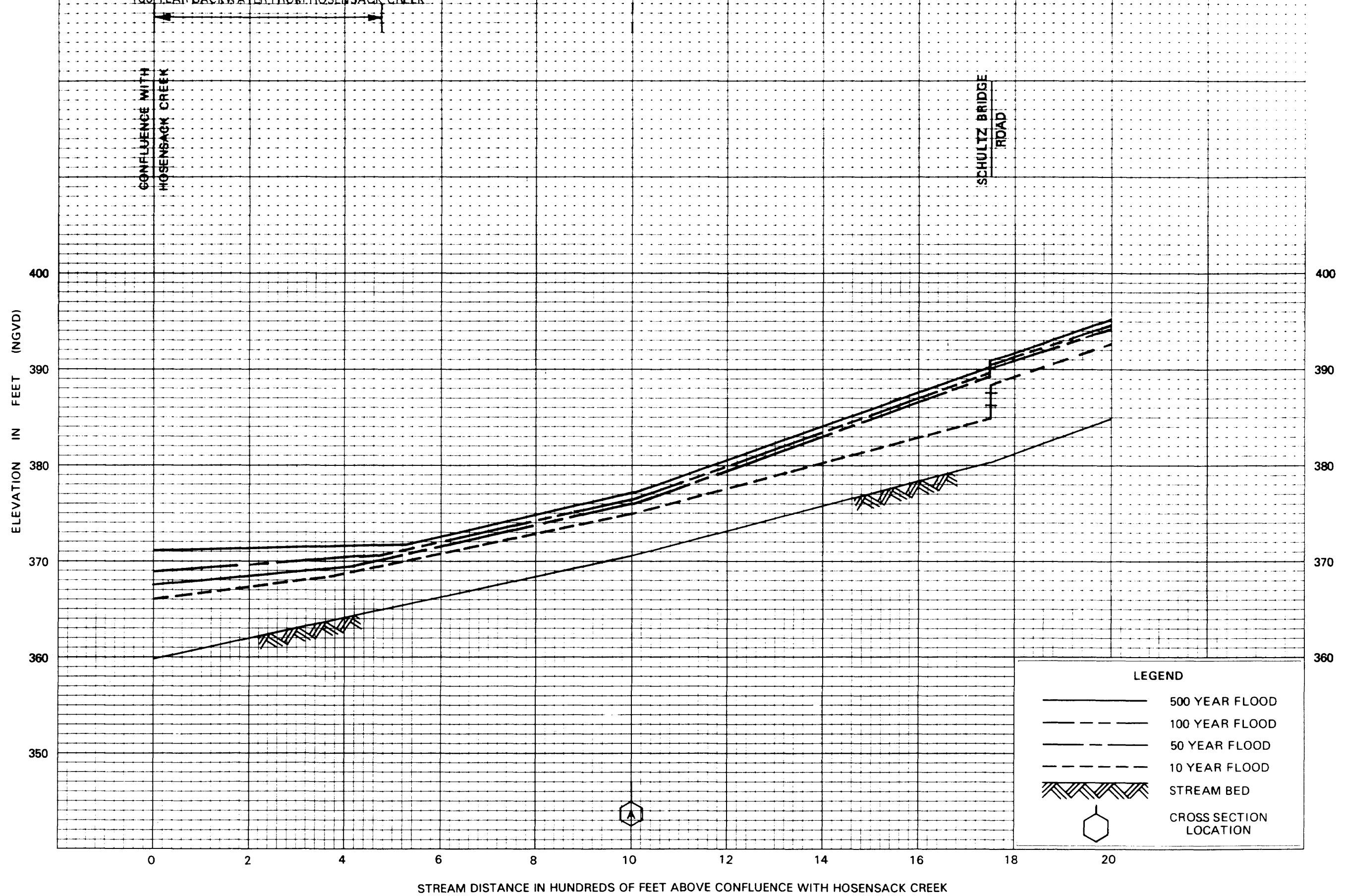
FLOOD PROFILES

HOSENSACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

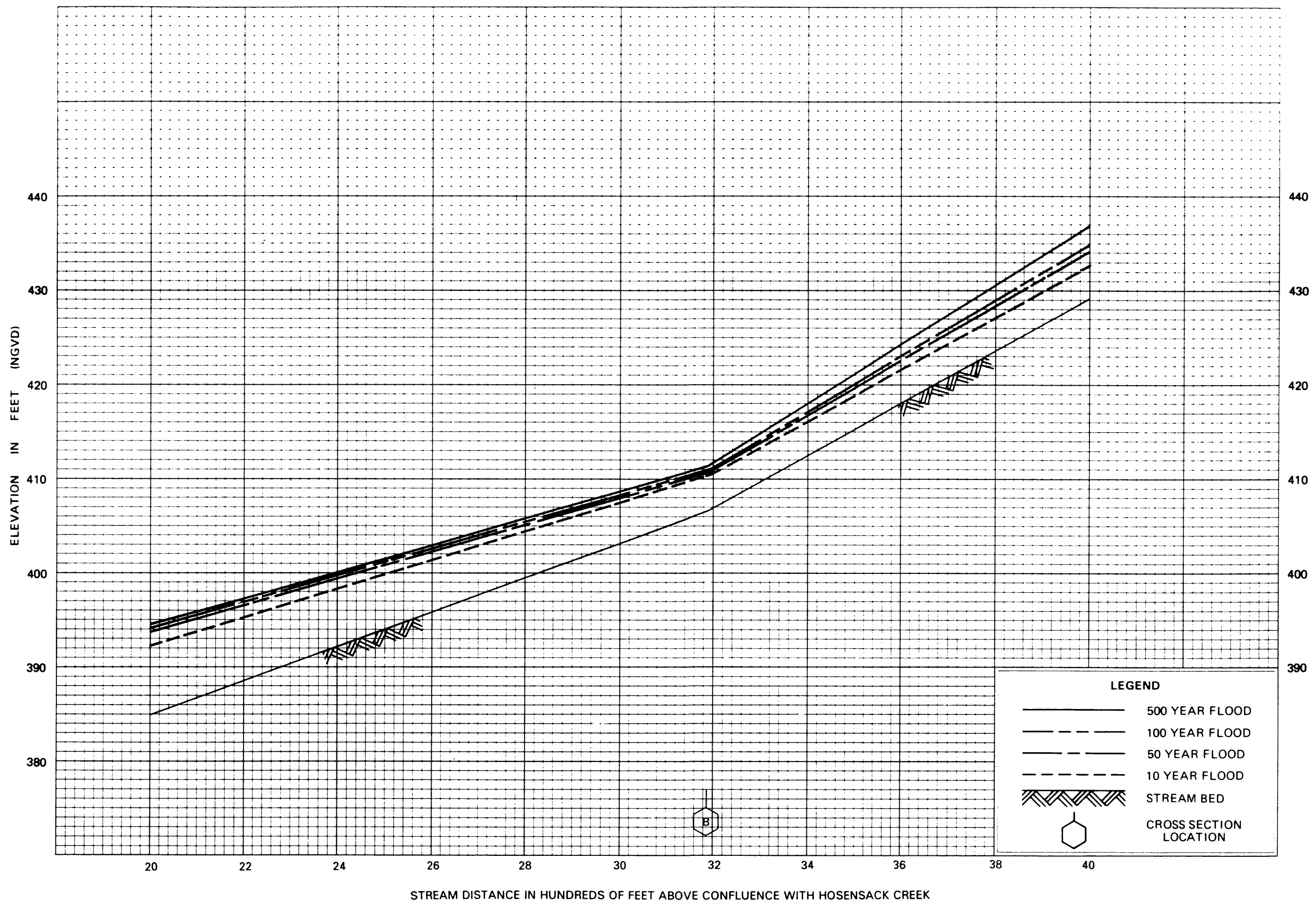
(ALL JURISDICTIONS)



FLOOD PROFILES

INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)



FLOOD PROFILES

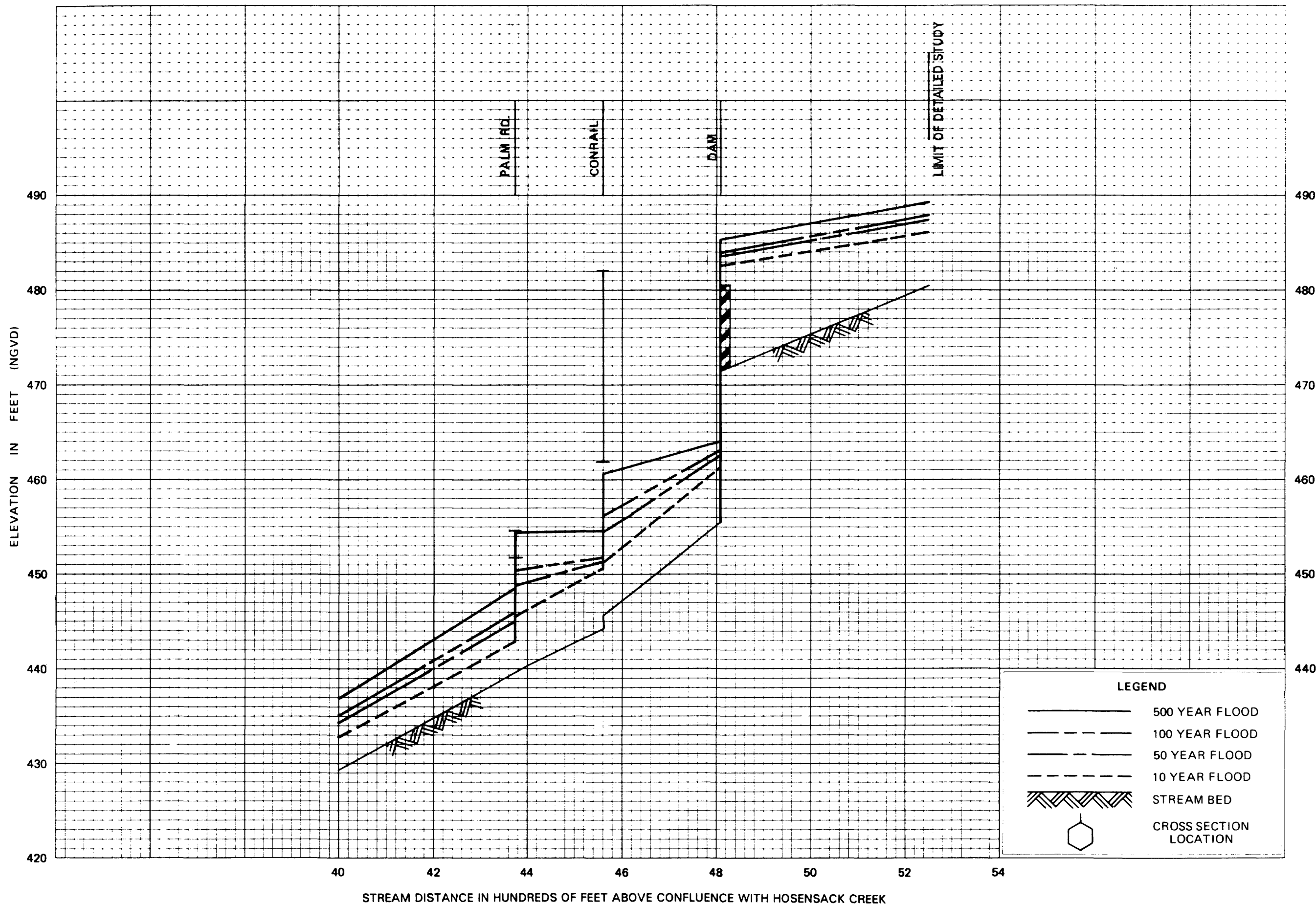
INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

26P

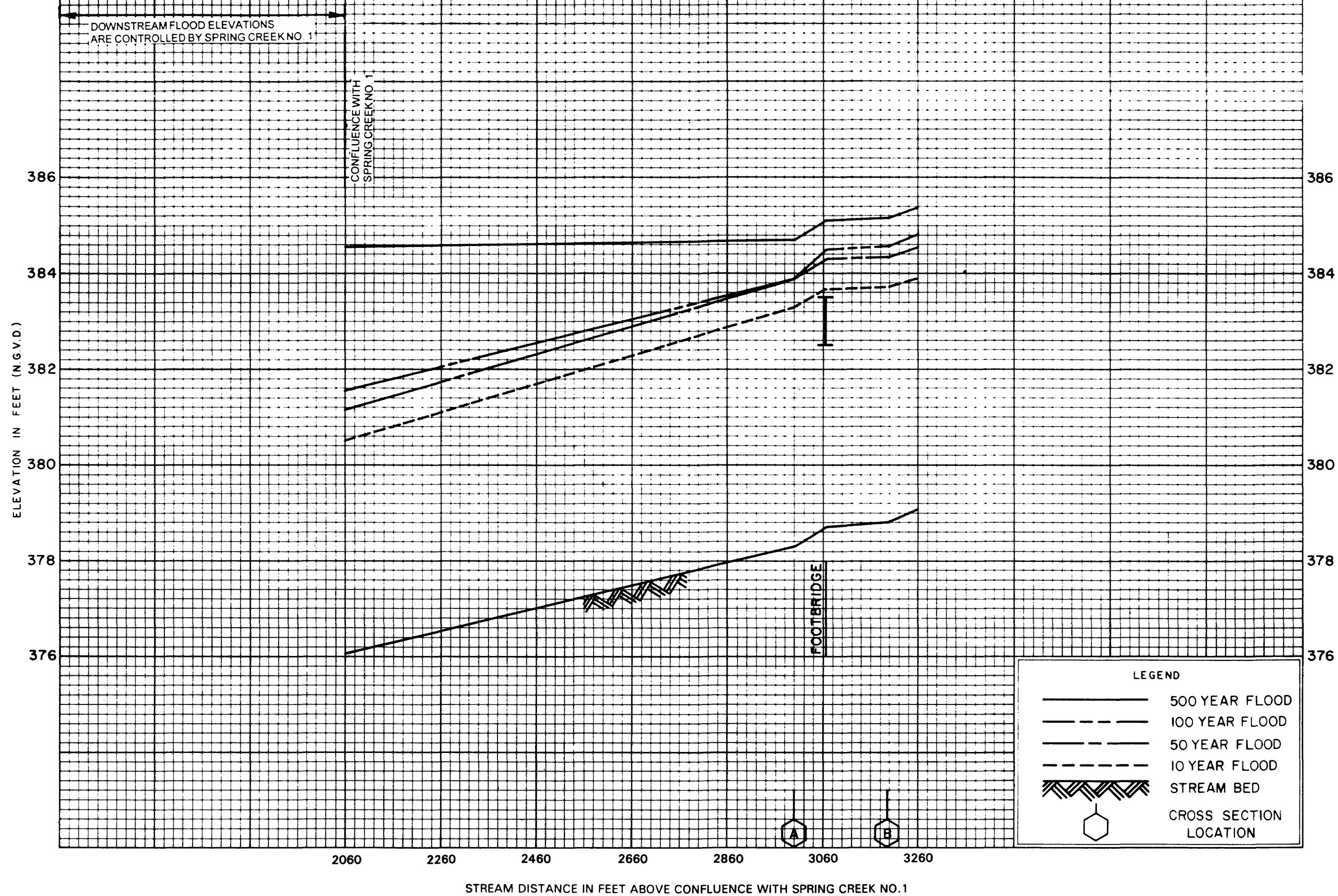


FLOOD PROFILES

INDIAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)



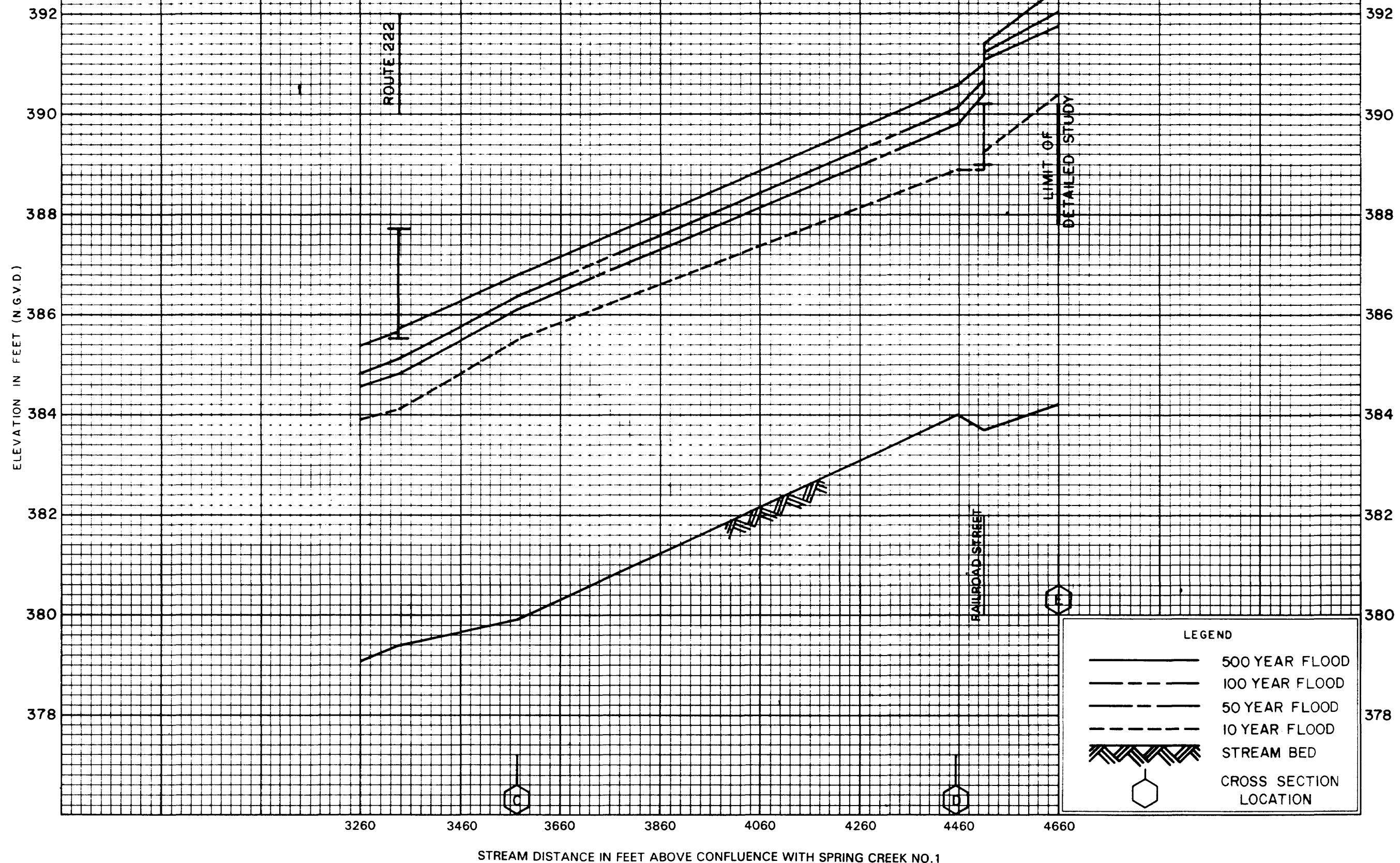
FLOOD PROFILES

IRON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

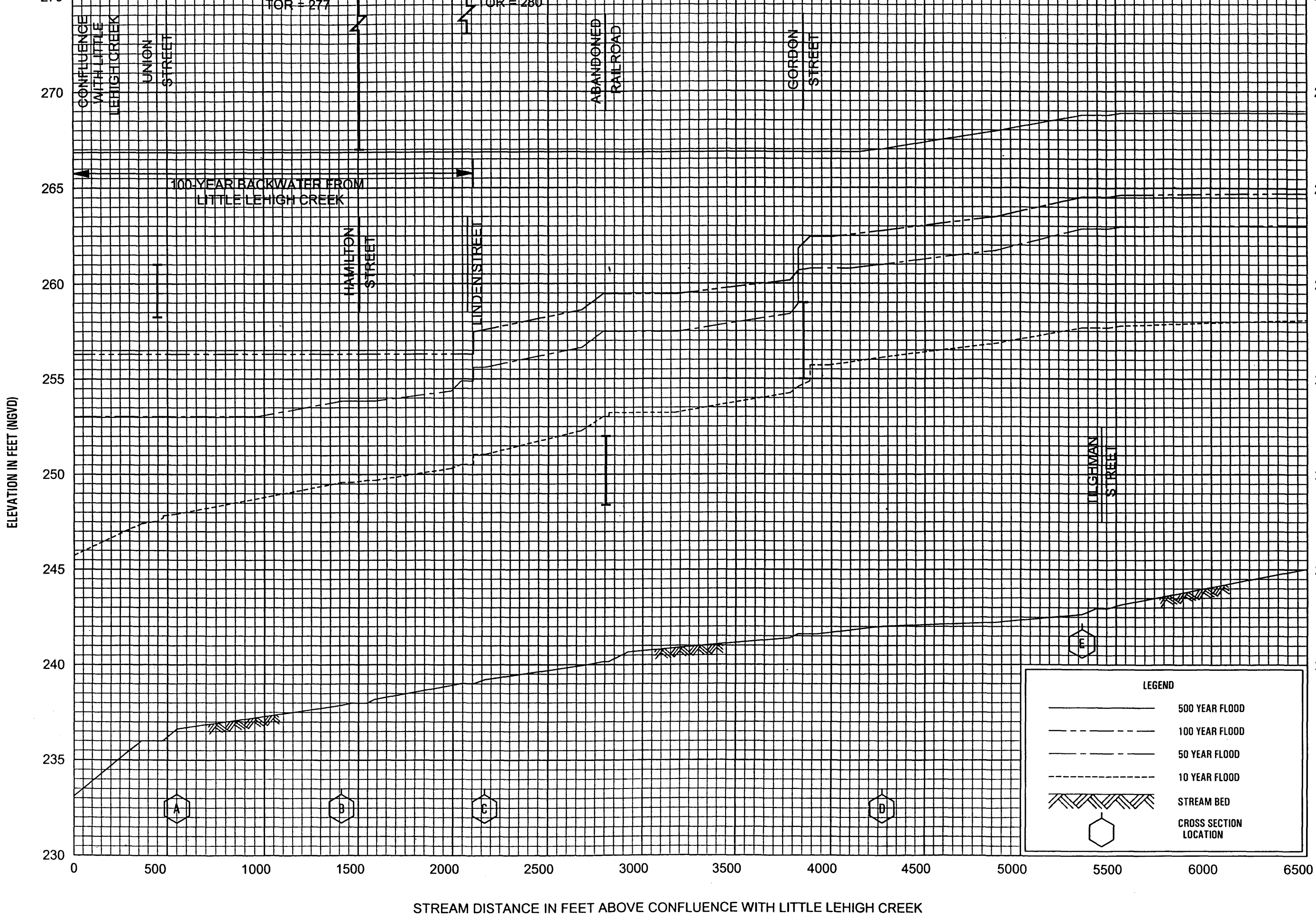
28P



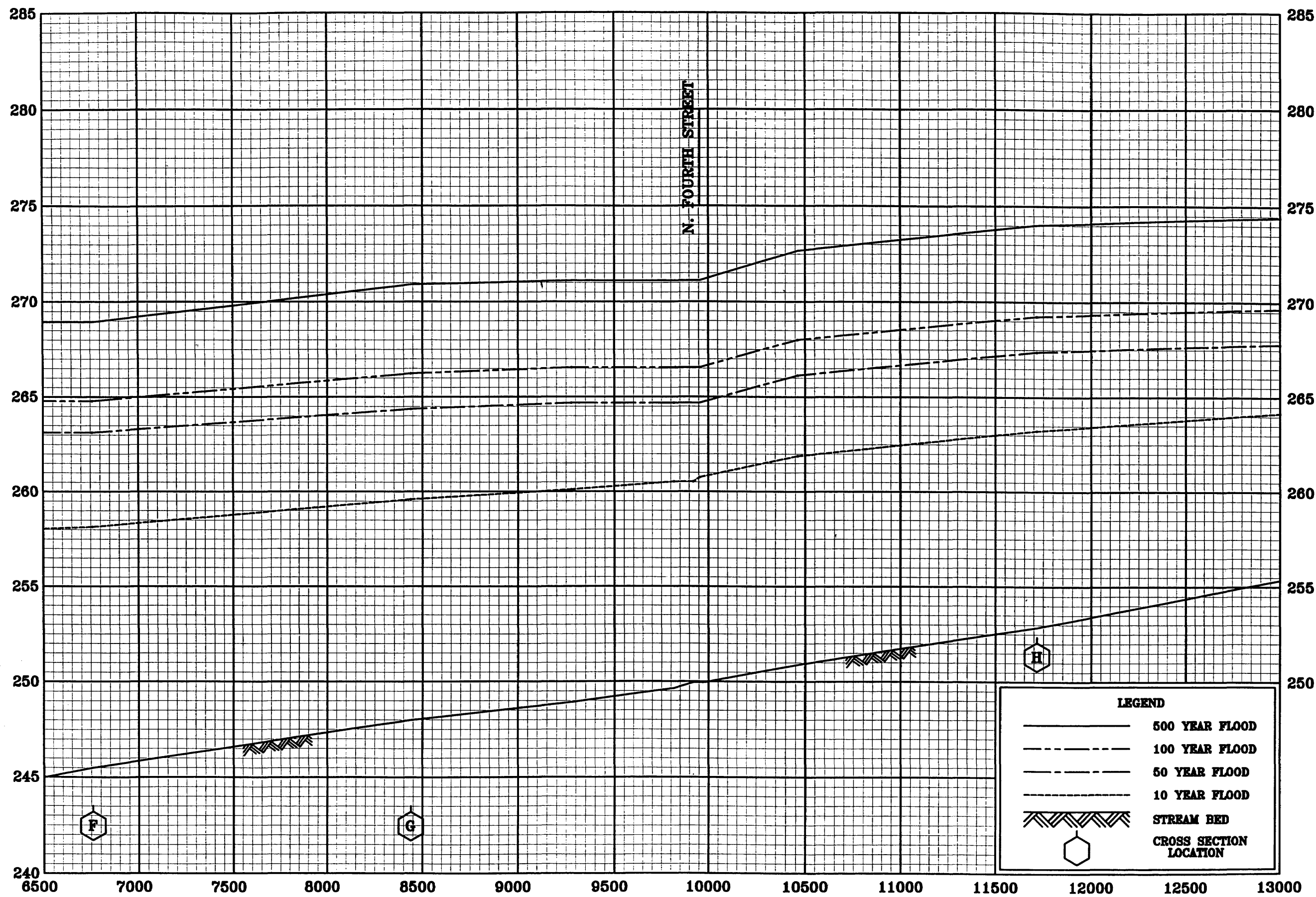
FLOOD PROFILES

IRON RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)



ELEVATION IN FEET (NGVD)



STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK

FLOOD PROFILES

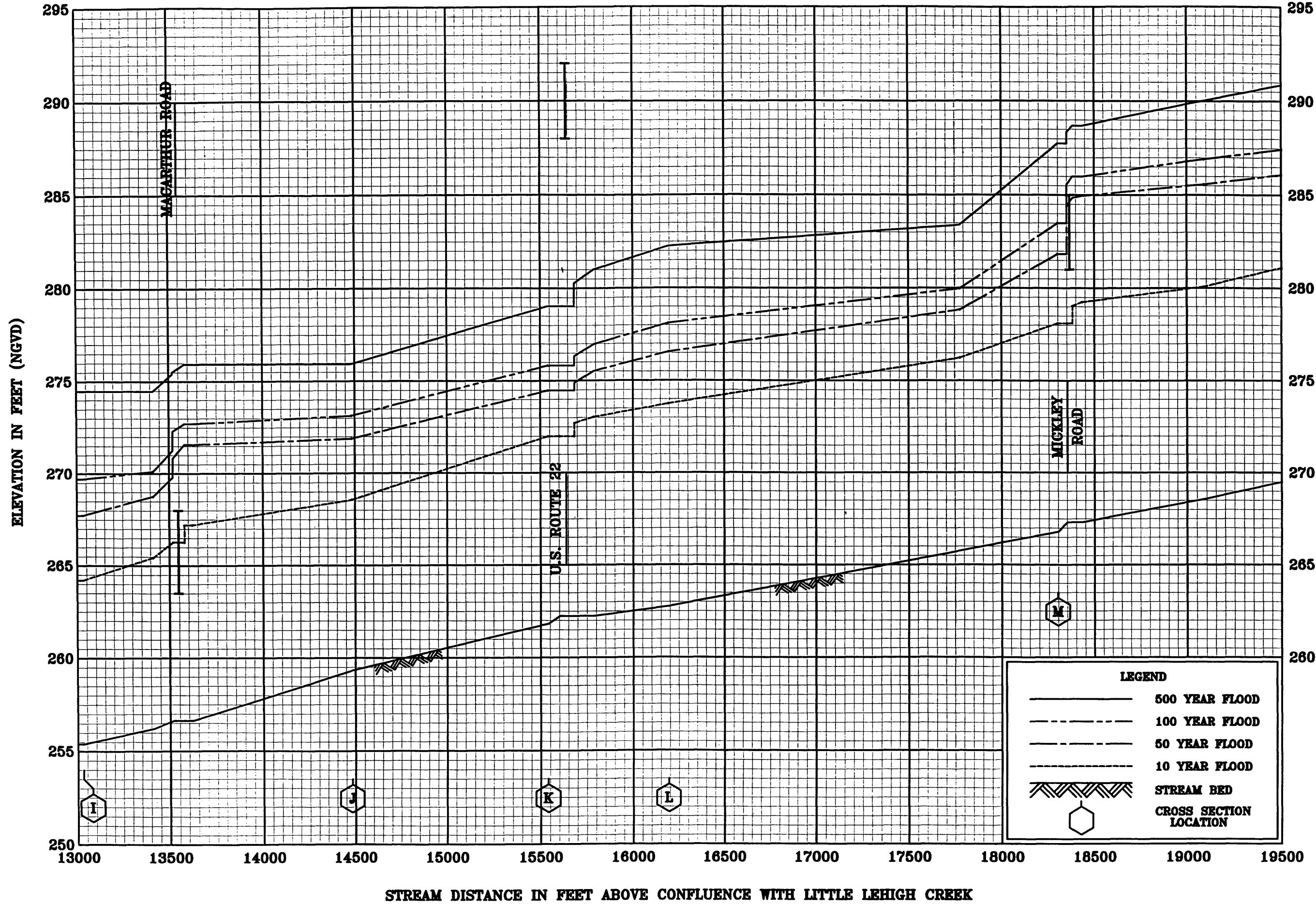
JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

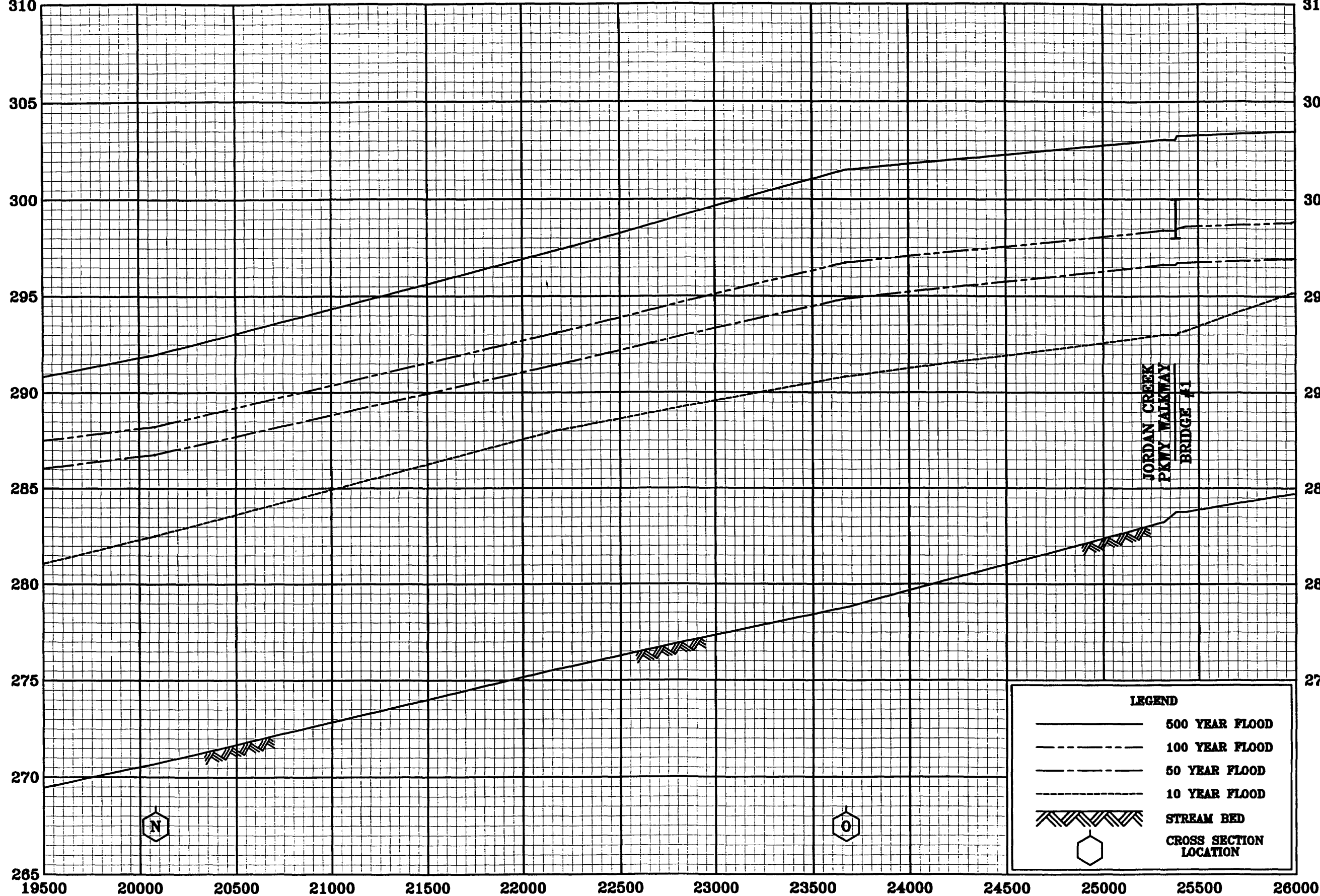
LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

31P



ELEVATION IN FEET (NGVD)

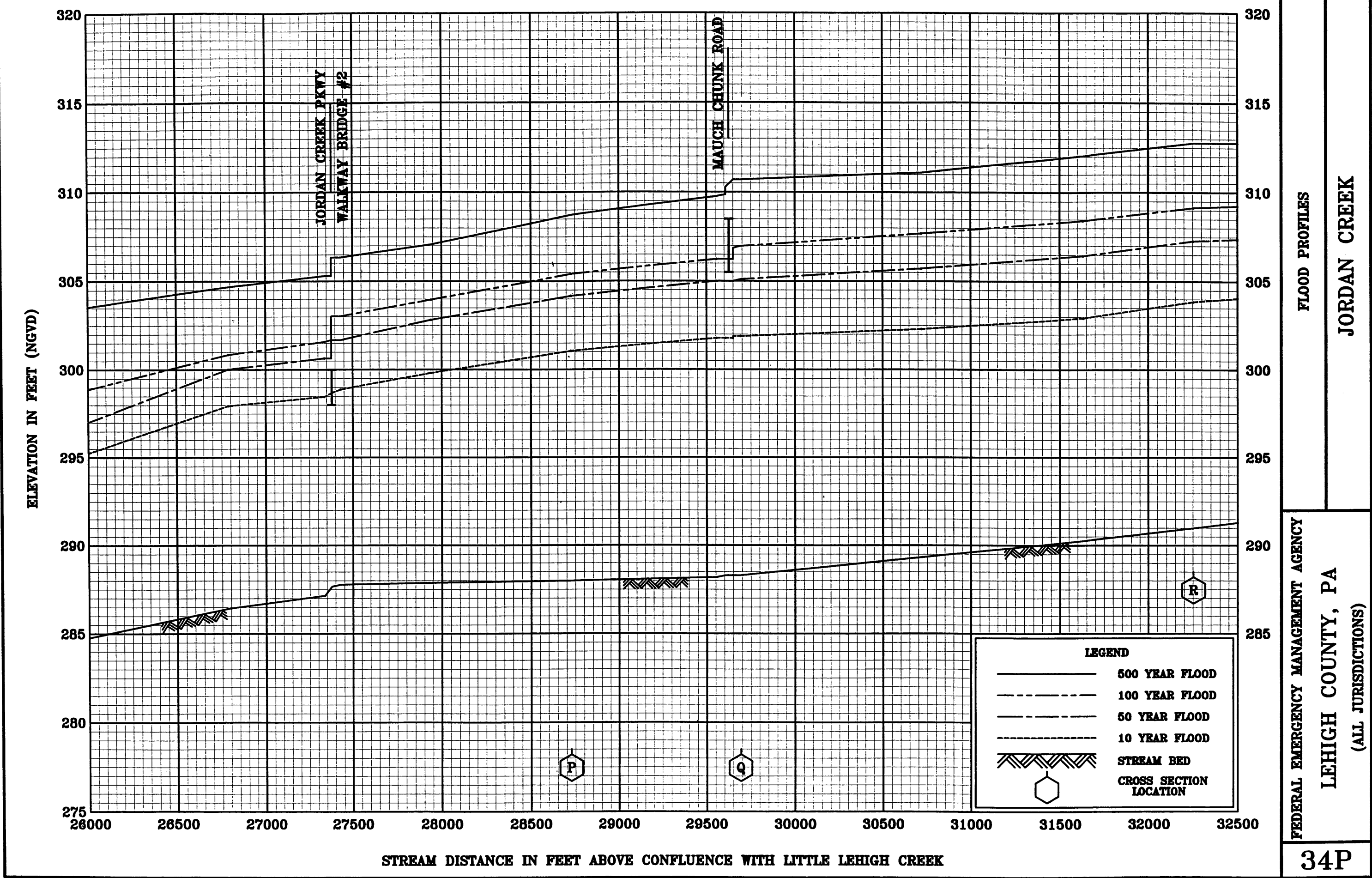


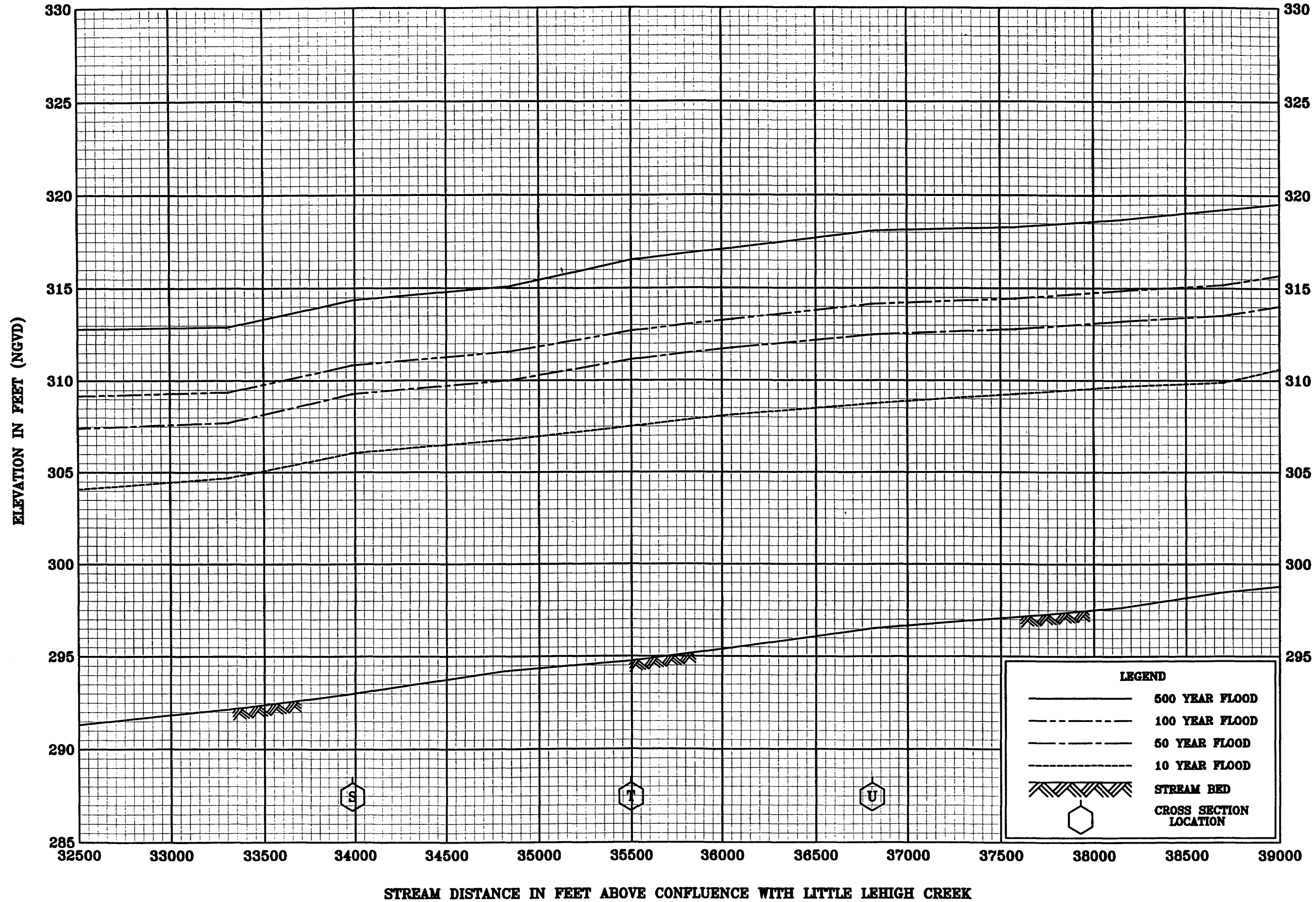
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK

FLOOD PROFILES
JORDAN CREEK

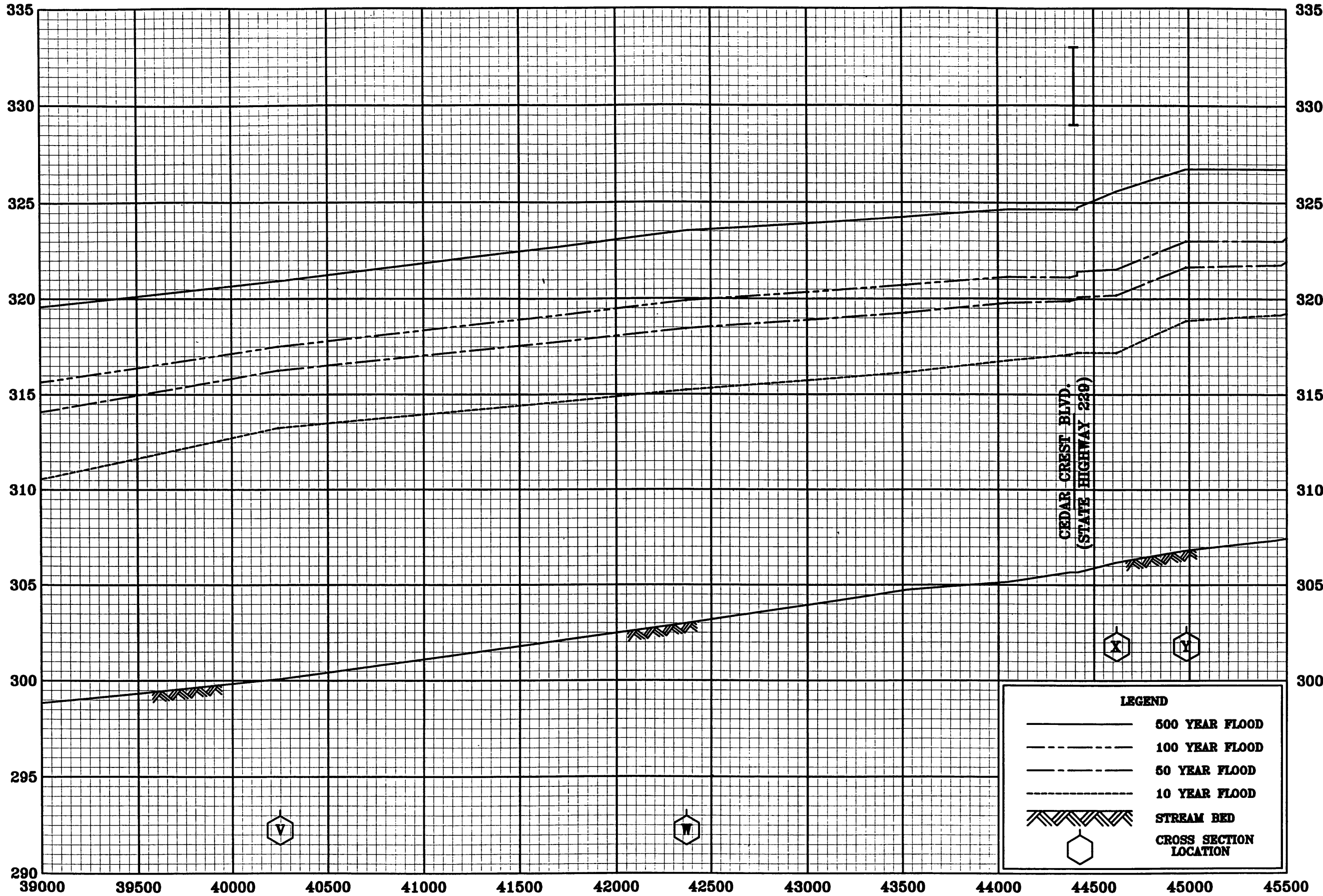
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

33P





ELEVATION IN FEET (NGVD)

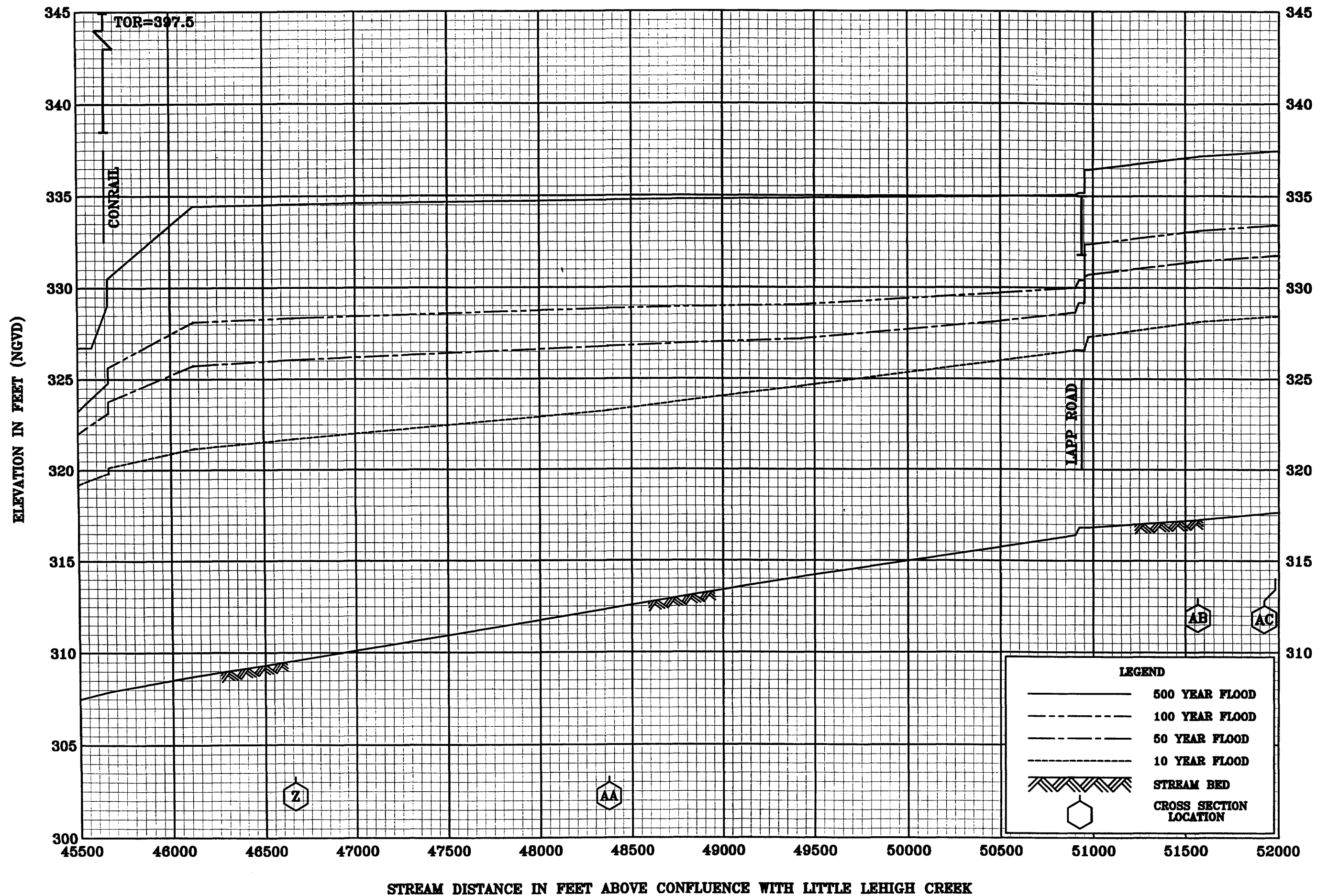


STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK

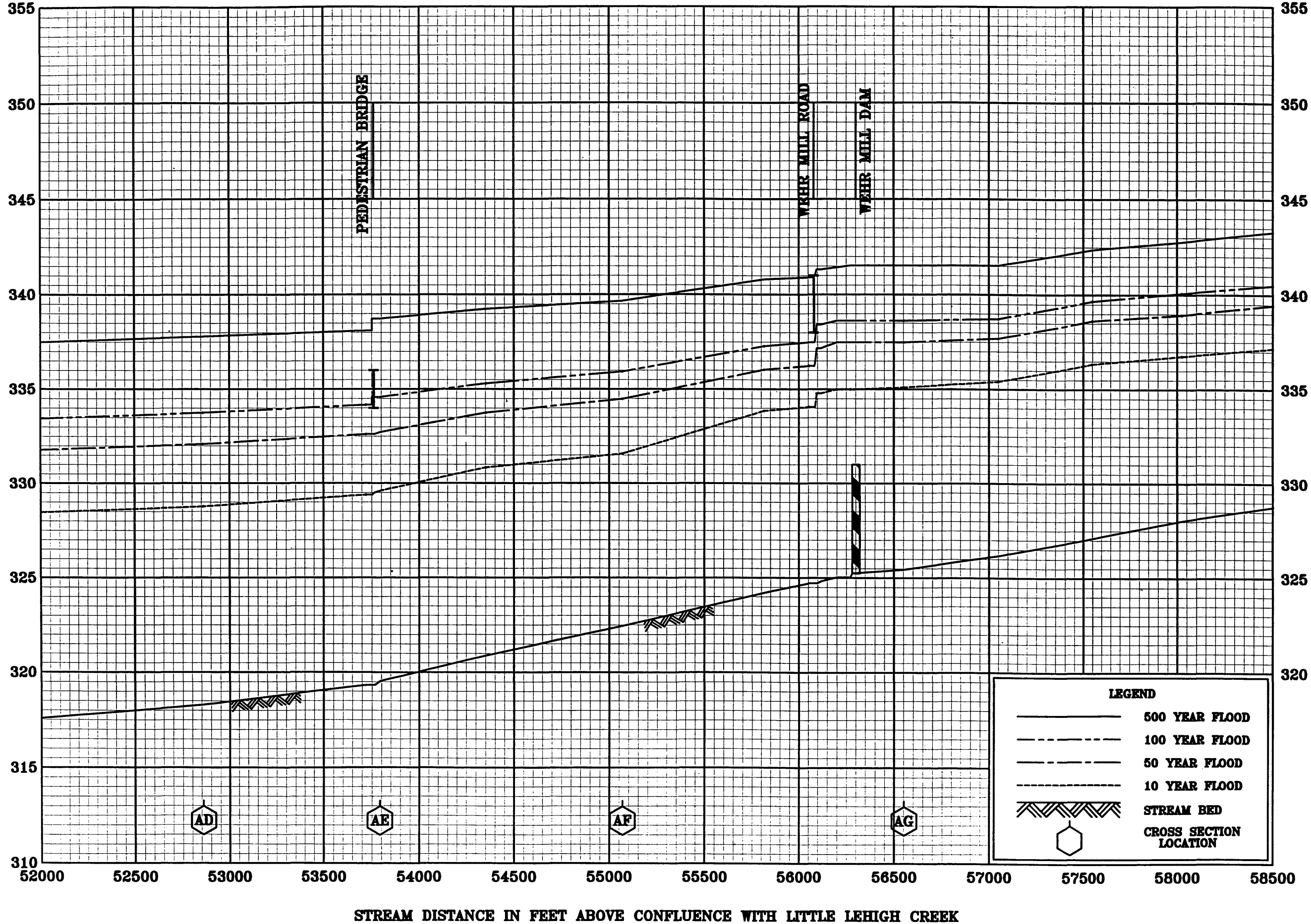
FLOOD PROFILES
JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

36P



ELEVATION IN FEET (NGVD)



FLOOD PROFILES

JORDAN CREEK

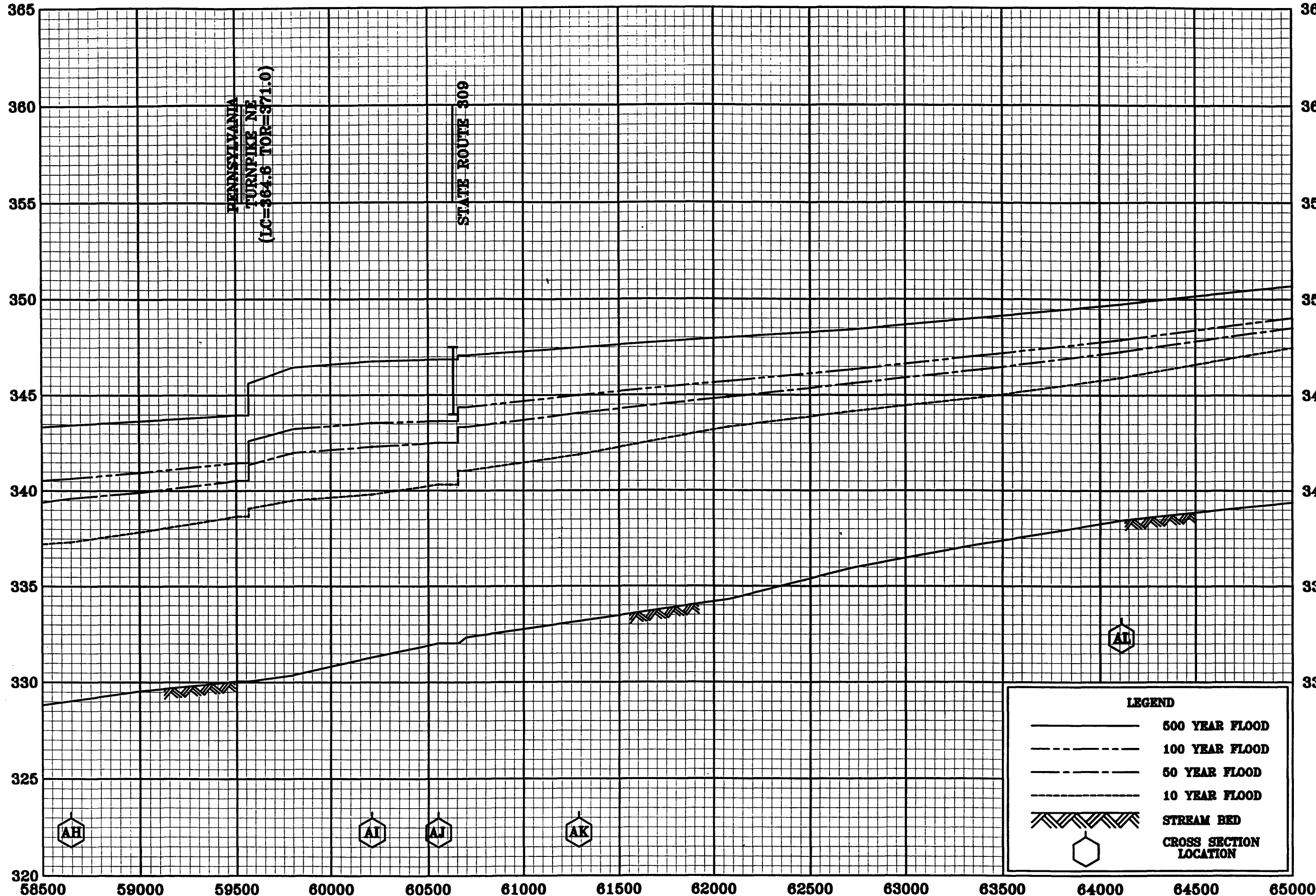
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

38P

ELEVATION IN FEET (NGVD)



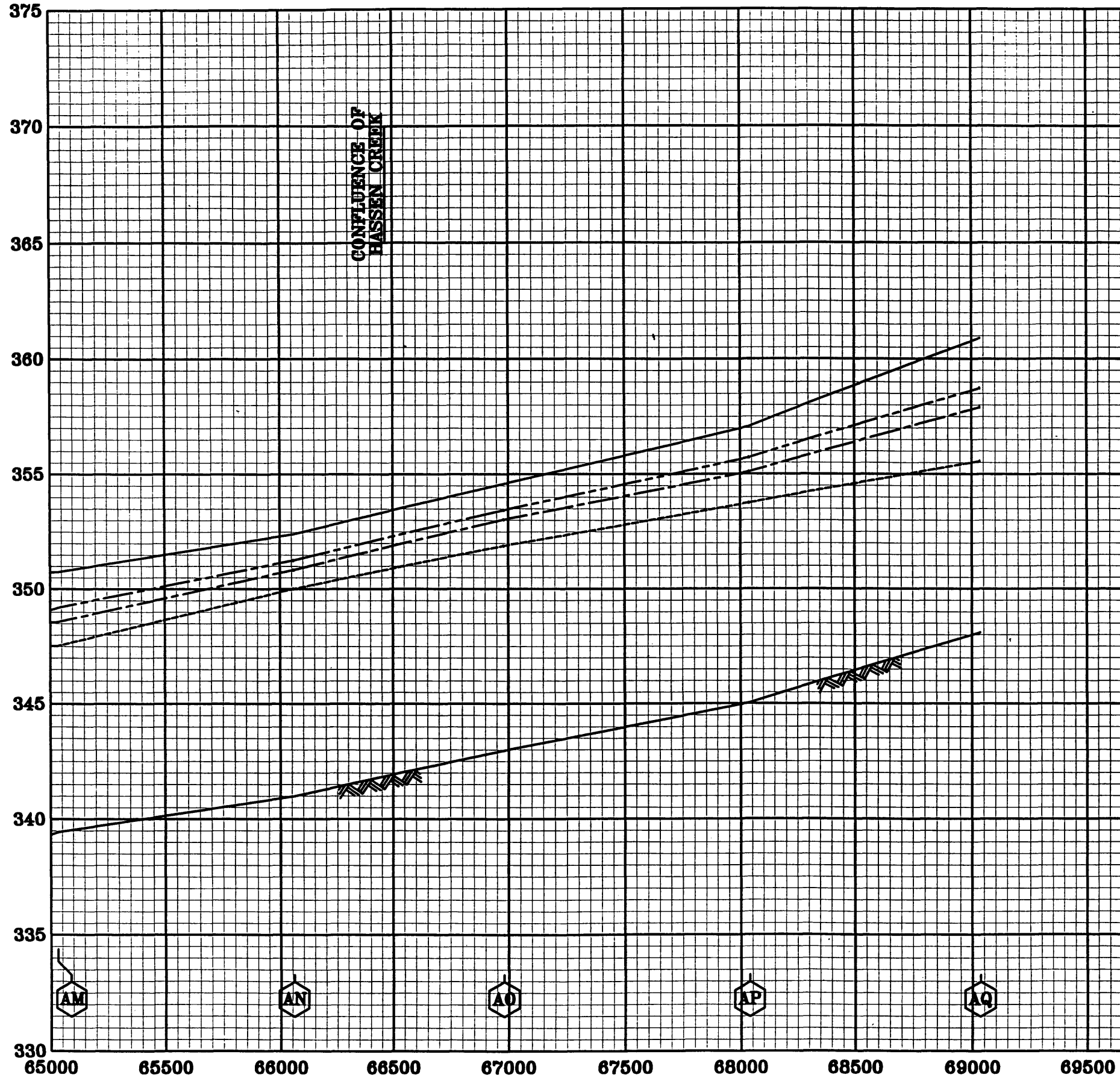
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK

FLOOD PROFILES
JORDAN CREEK

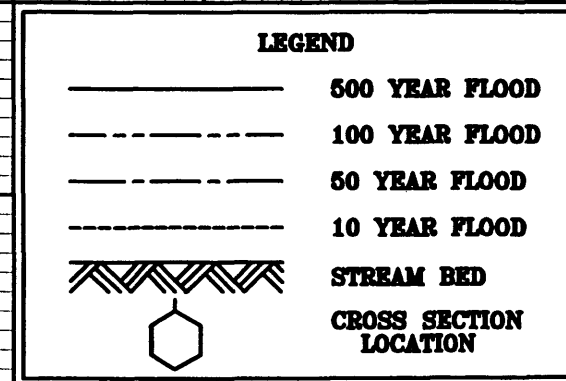
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

39P

ELEVATION IN FEET (NGVD)



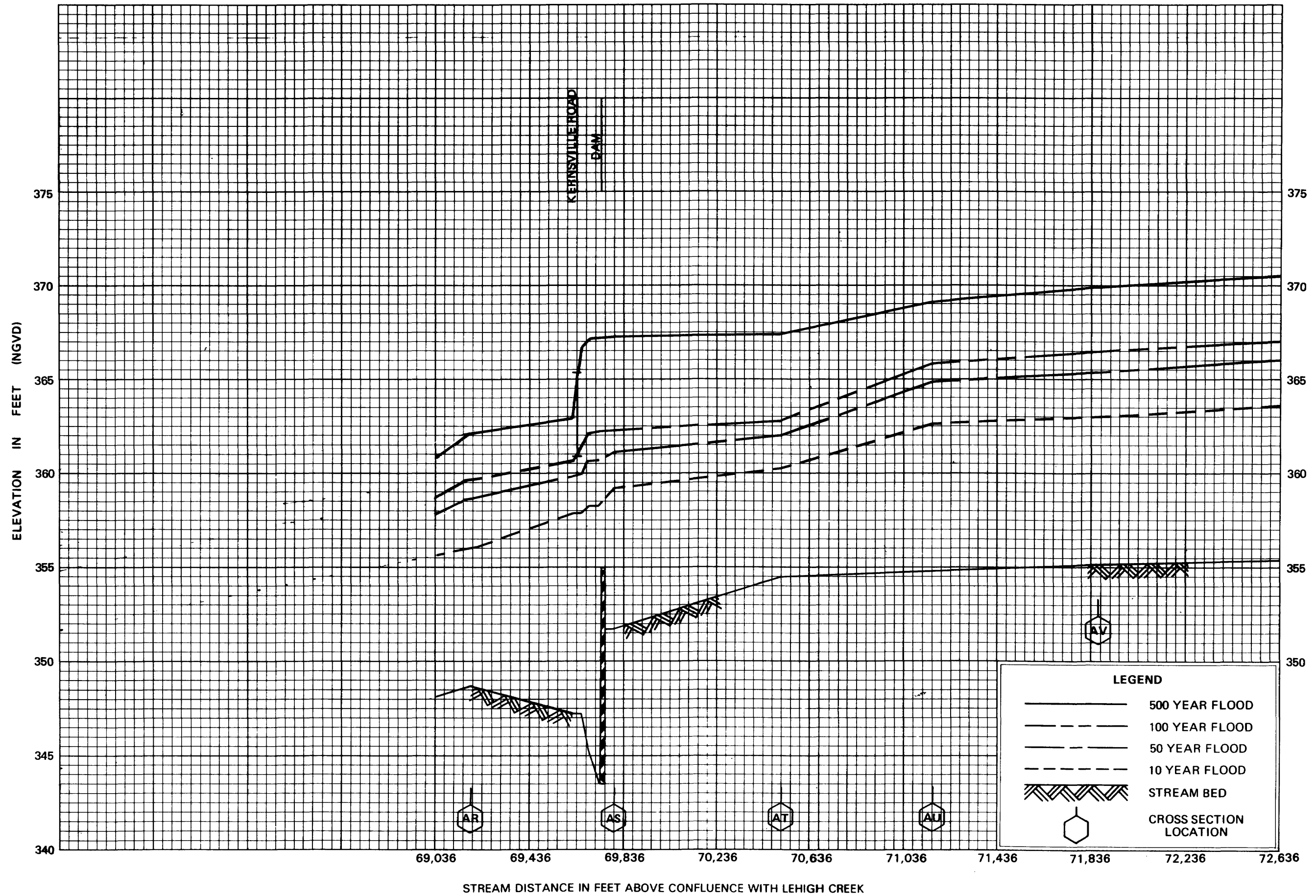
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE LEHIGH CREEK



FLOOD PROFILES
JORDAN CREEK

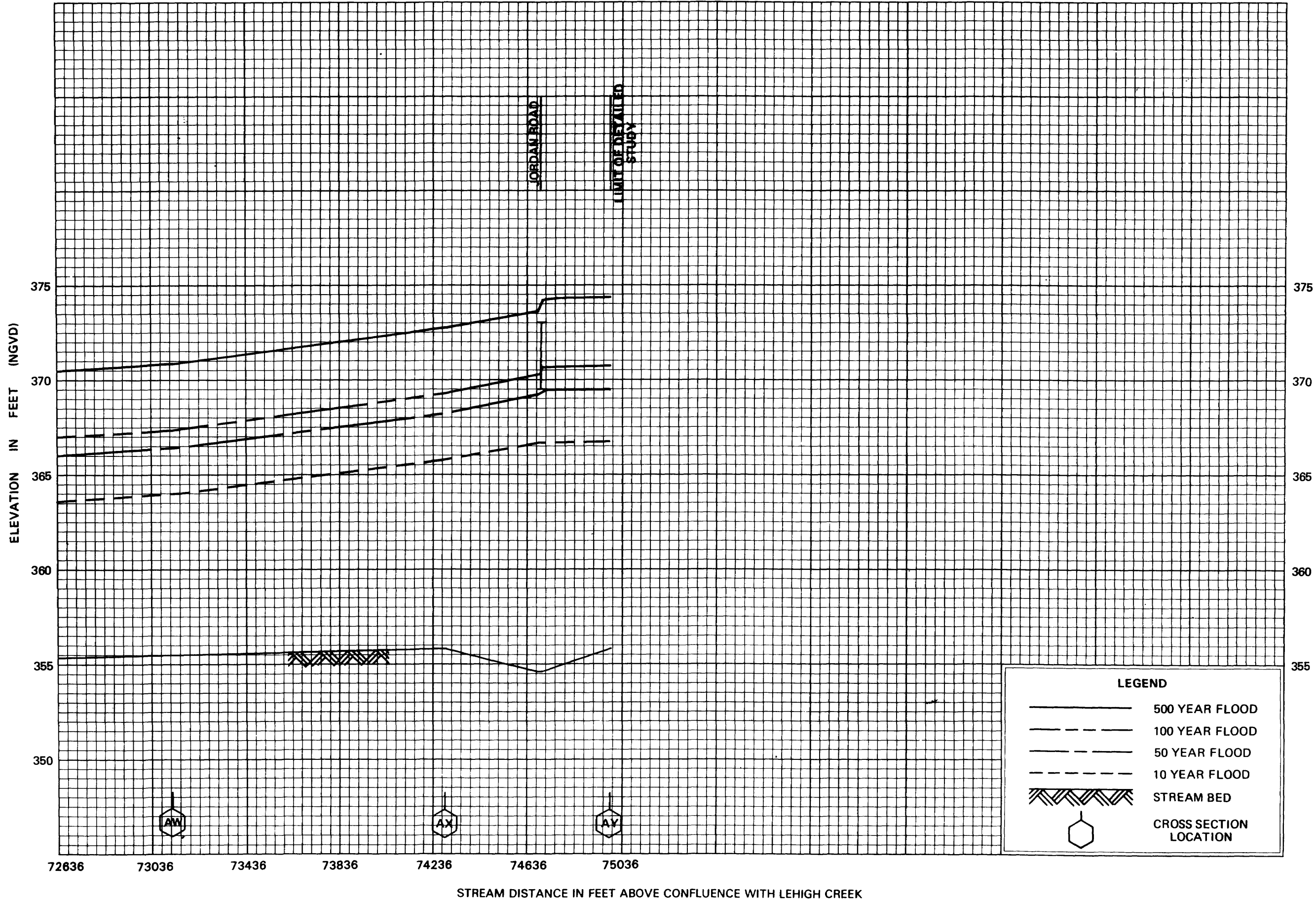
FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

40P



FLOOD PROFILES
JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)



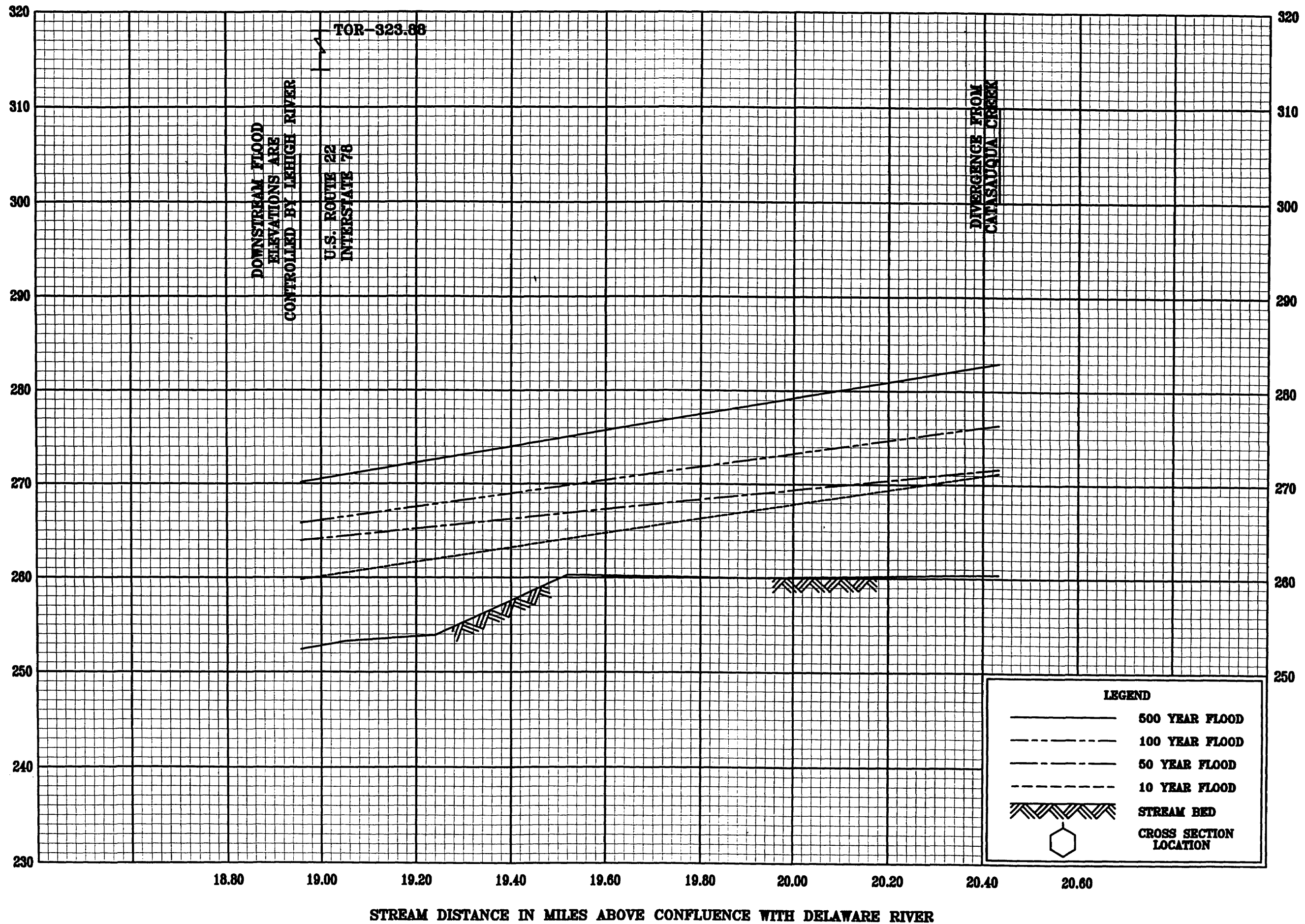
FLOOD PROFILES

JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

ELEVATION IN FEET (NGVD)



FLOOD PROFILES

LEHIGH CANAL (ABANDONED)

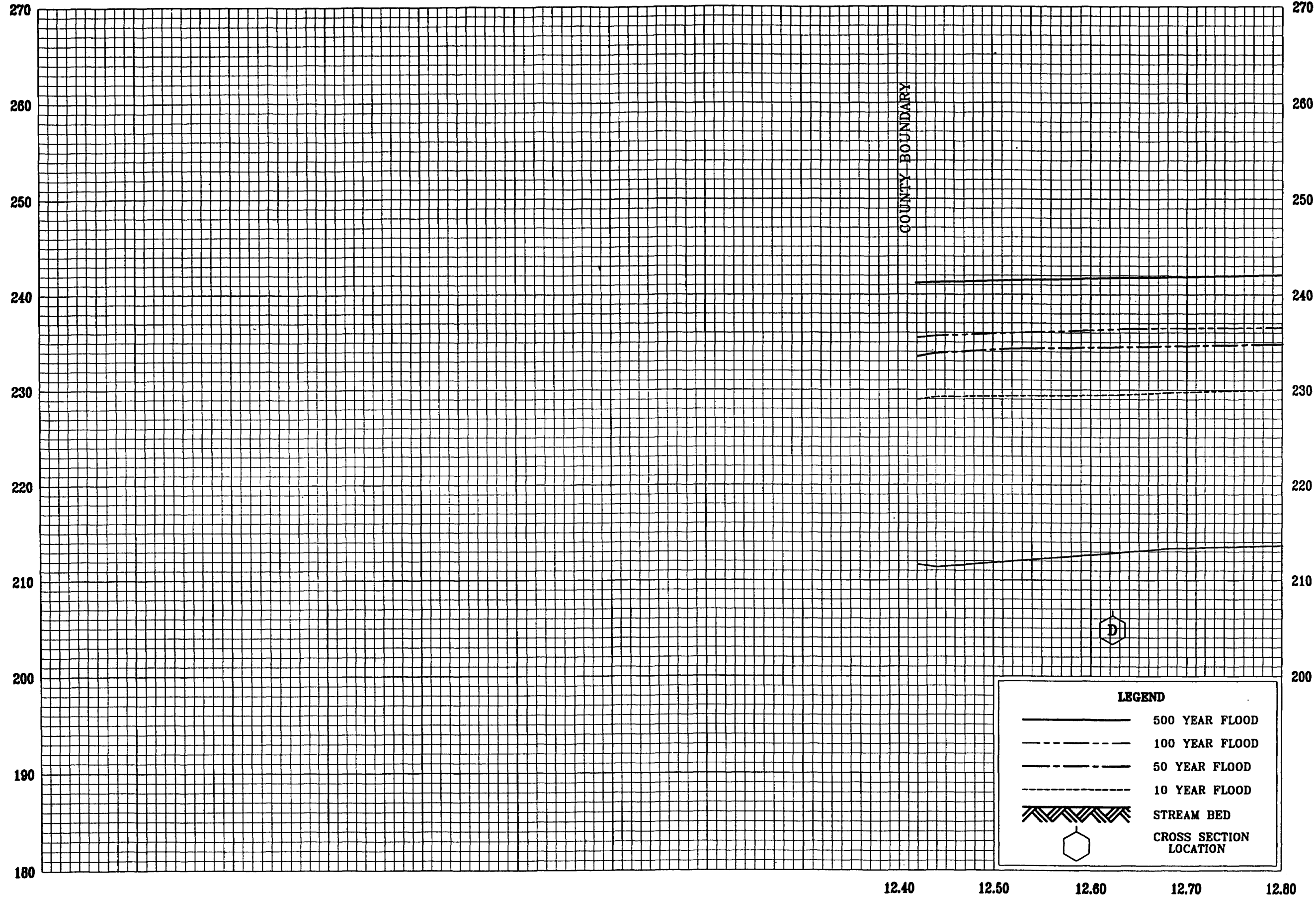
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

43P

ELEVATION IN FEET (NGVD)

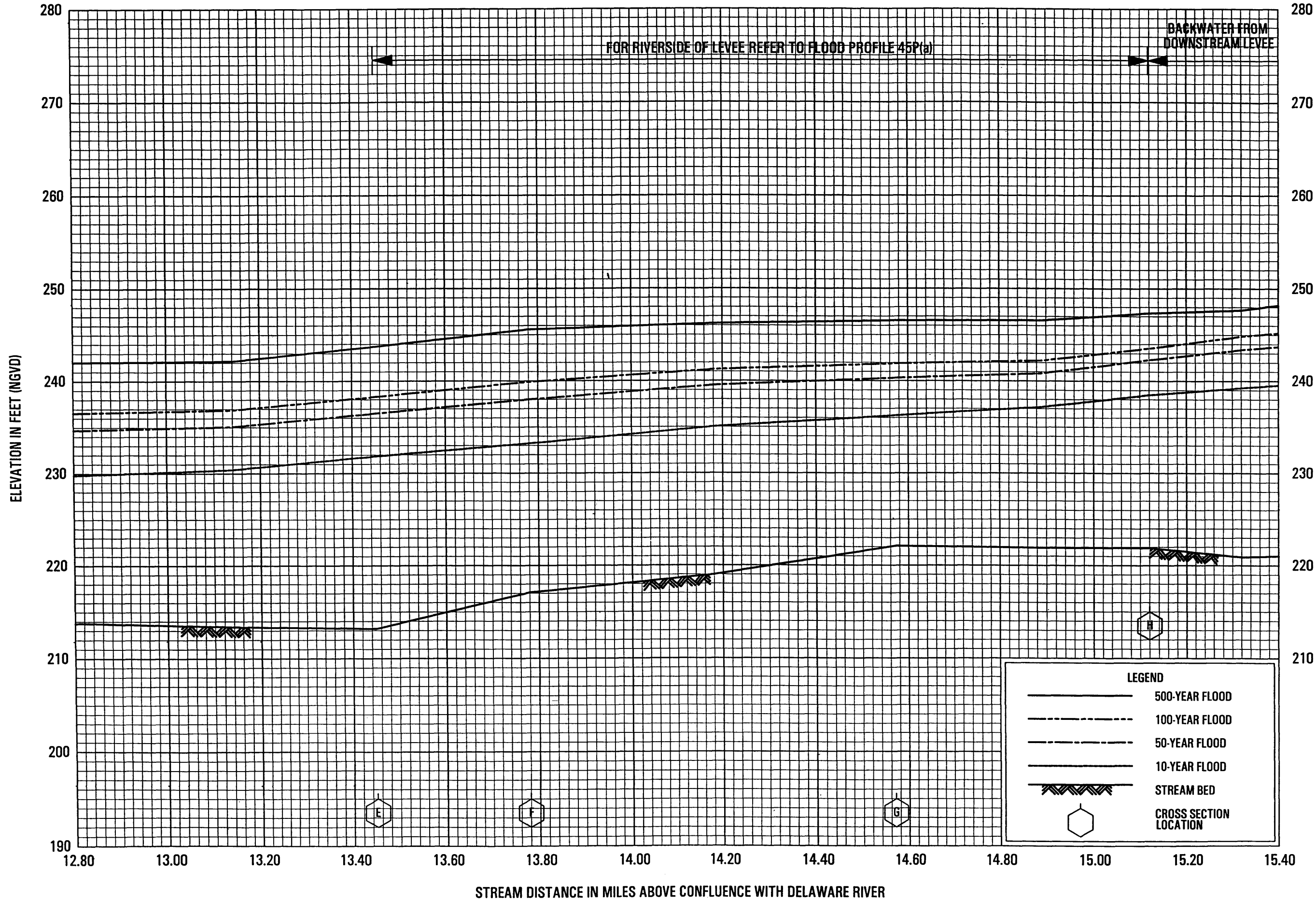


STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH DELAWARE RIVER

FLOOD PROFILES
LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

44P



FLOOD PROFILES

LEHIGH RIVER (WITHOUT LEVEE ANALYSIS)

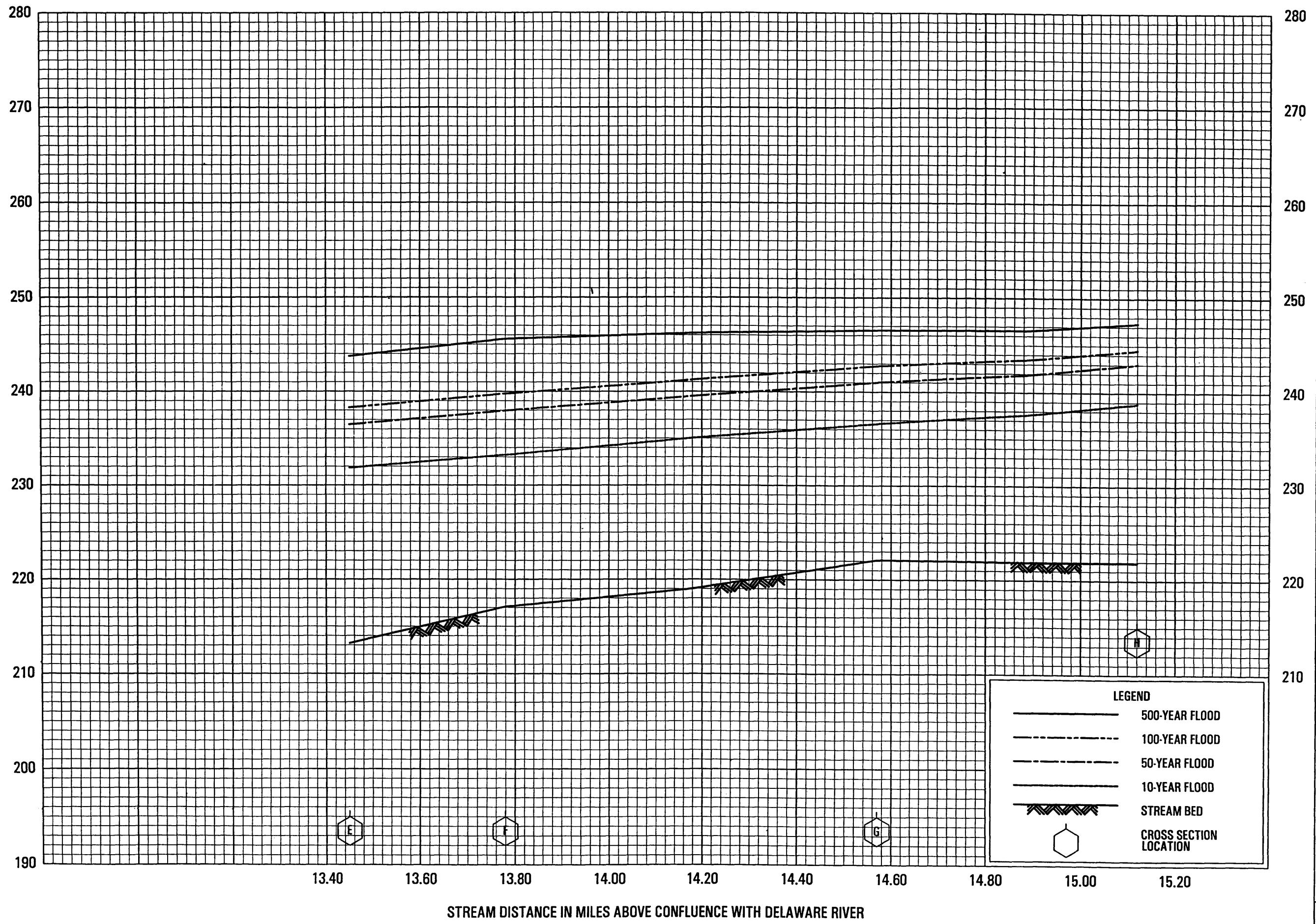
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

45P

ELEVATION IN FEET (NGVD)

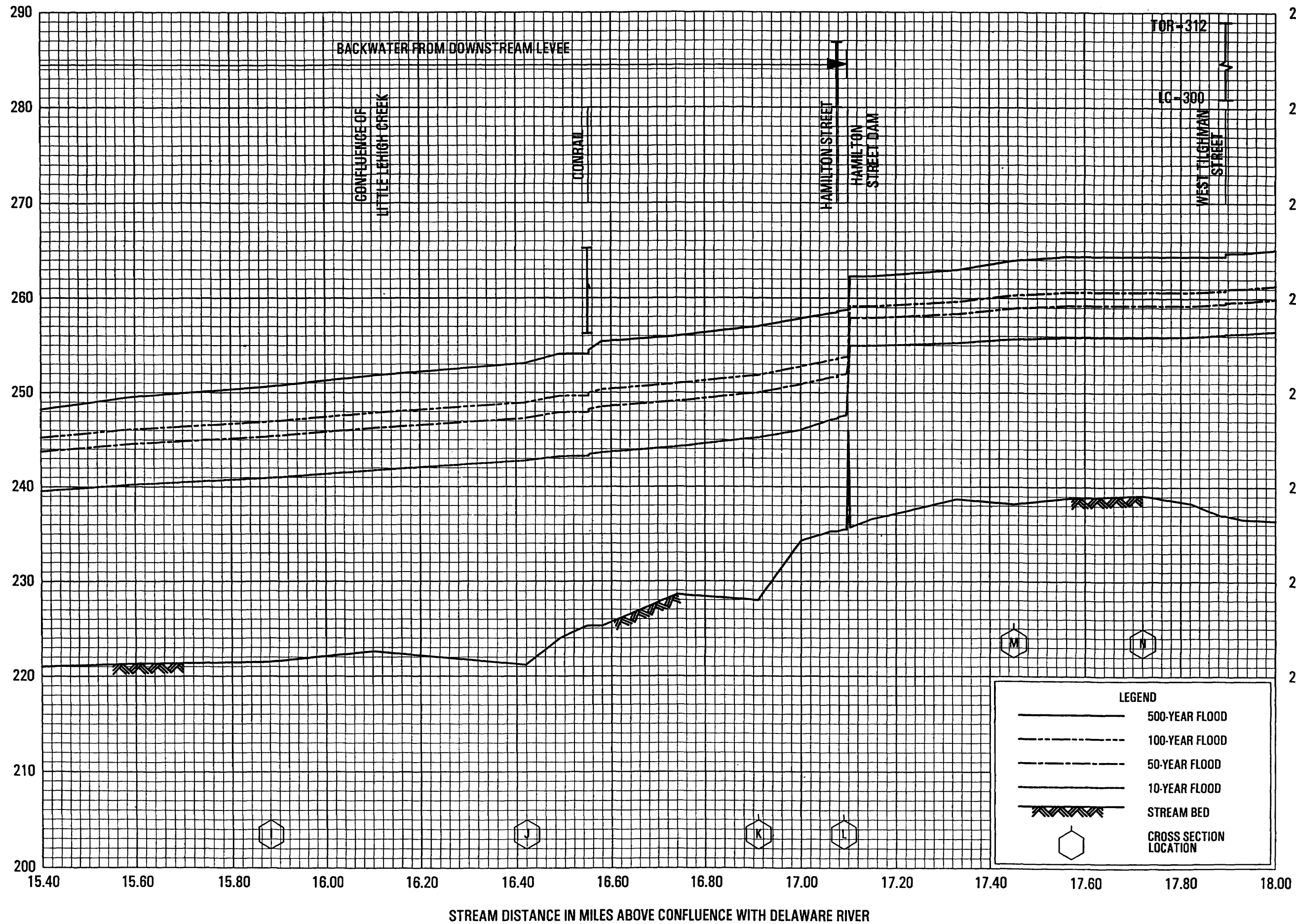


FLOOD PROFILES

LEHIGH RIVER (WITH LEVEE ANALYSIS)

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

ELEVATION IN FEET (NGVD)



FLOOD PROFILES

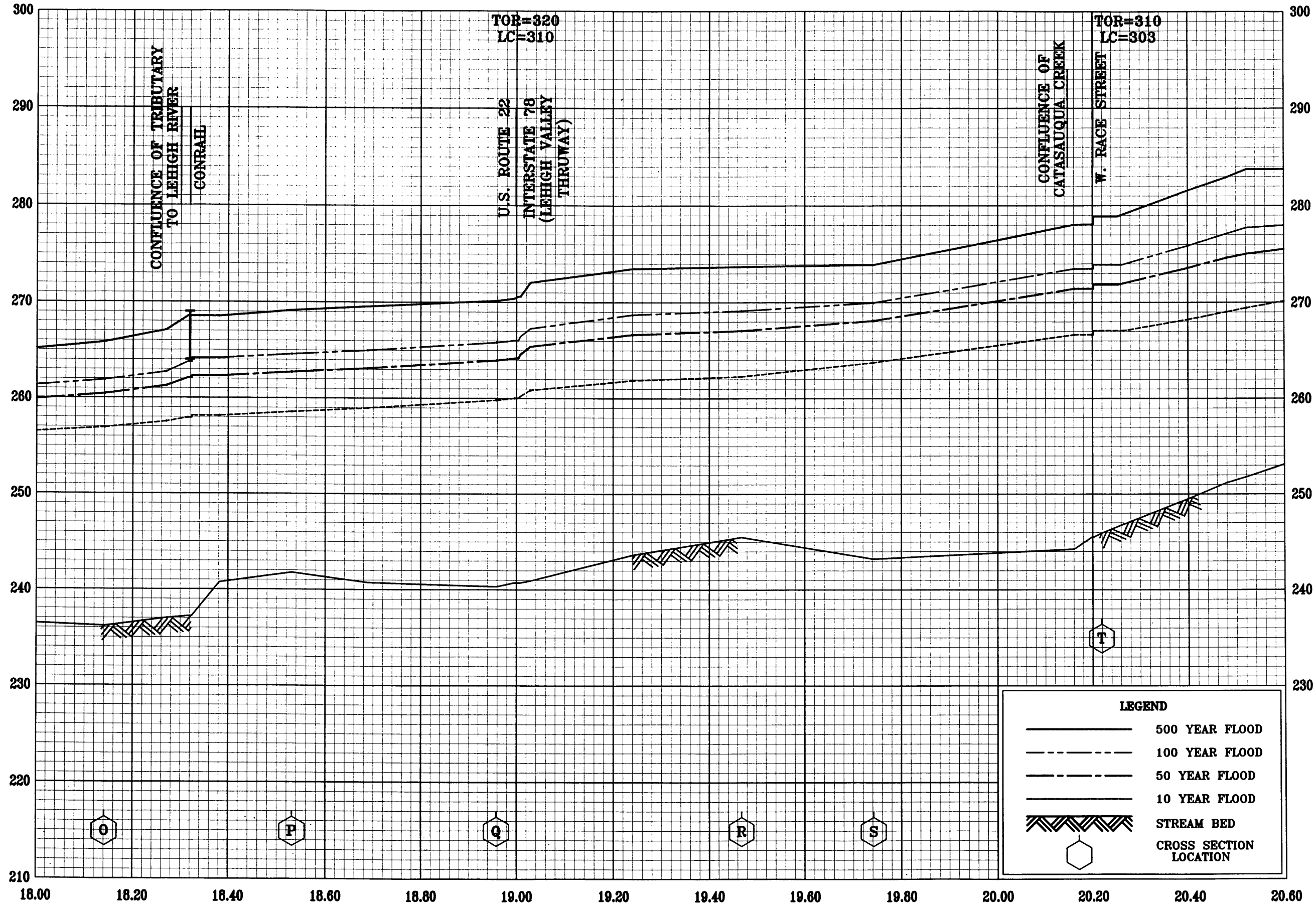
LEHIGH RIVER (WITHOUT LEVEE ANALYSIS)

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

ELEVATION IN FEET (NGVD)



STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH DELAWARE RIVER

FLOOD PROFILES

LEHIGH RIVER

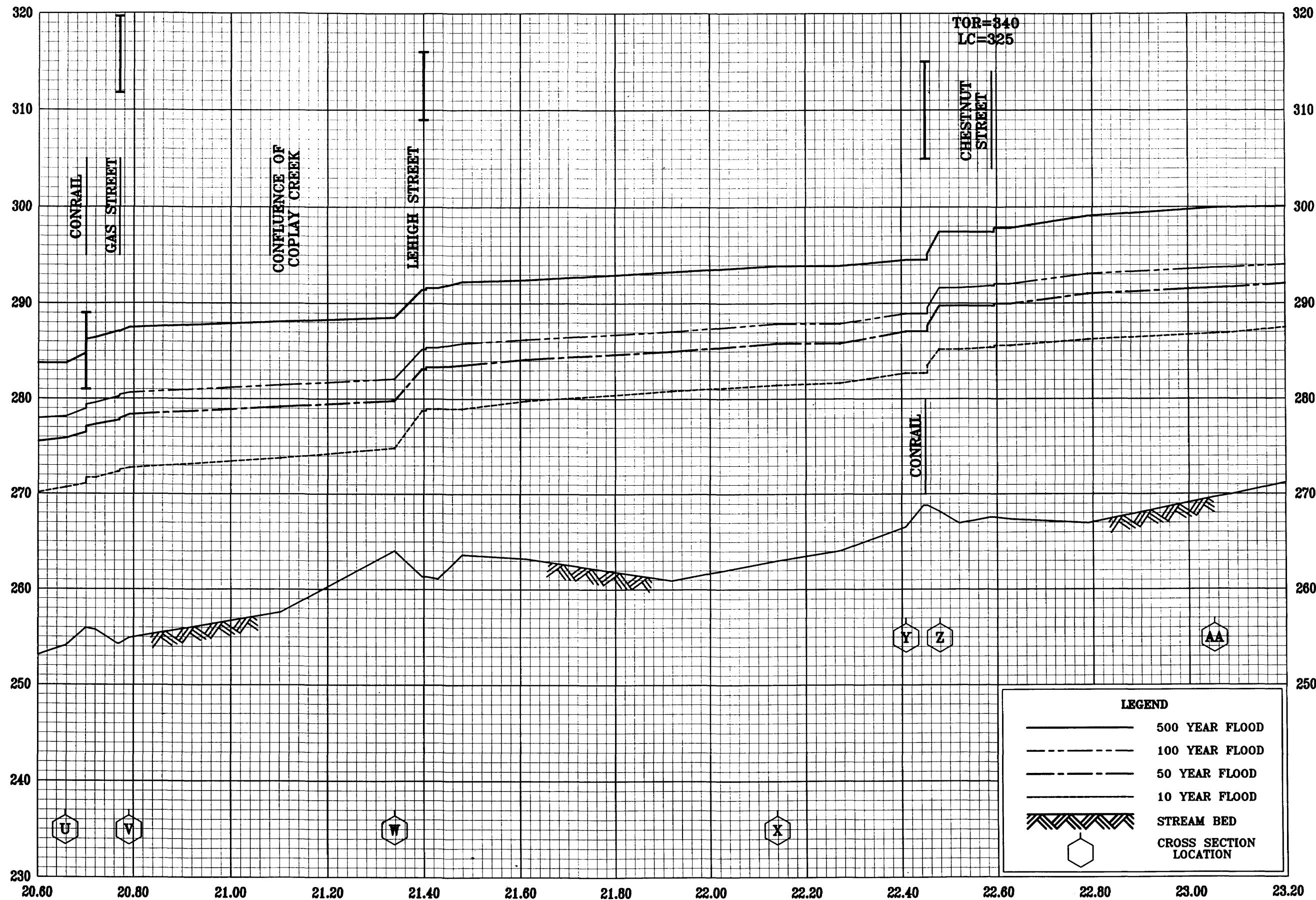
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

47P

ELEVATION IN FEET (NGVD)



STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH DELAWARE RIVER

FLOOD PROFILES

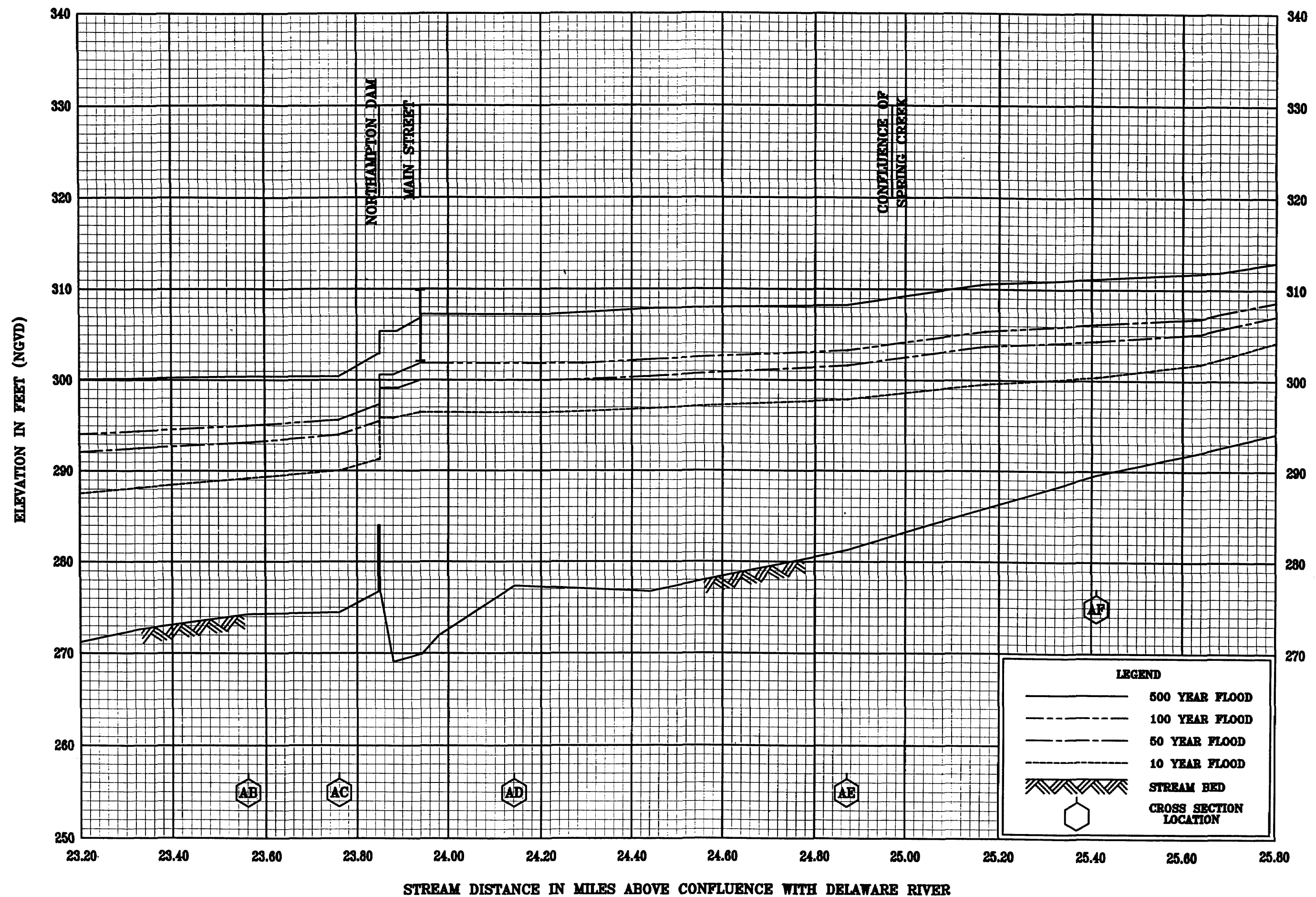
LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

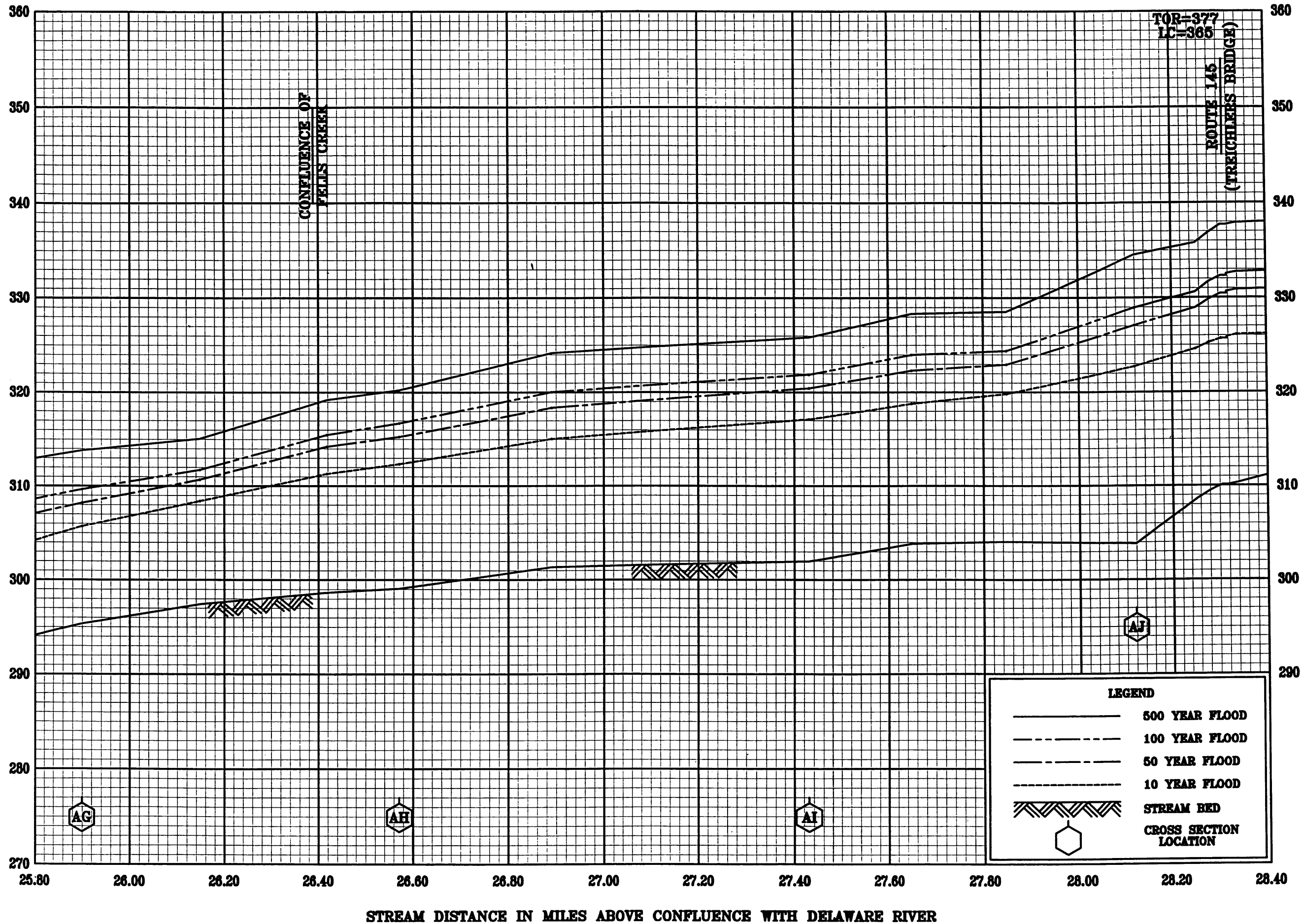
LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

48P



ELEVATION IN FEET (NGVD)

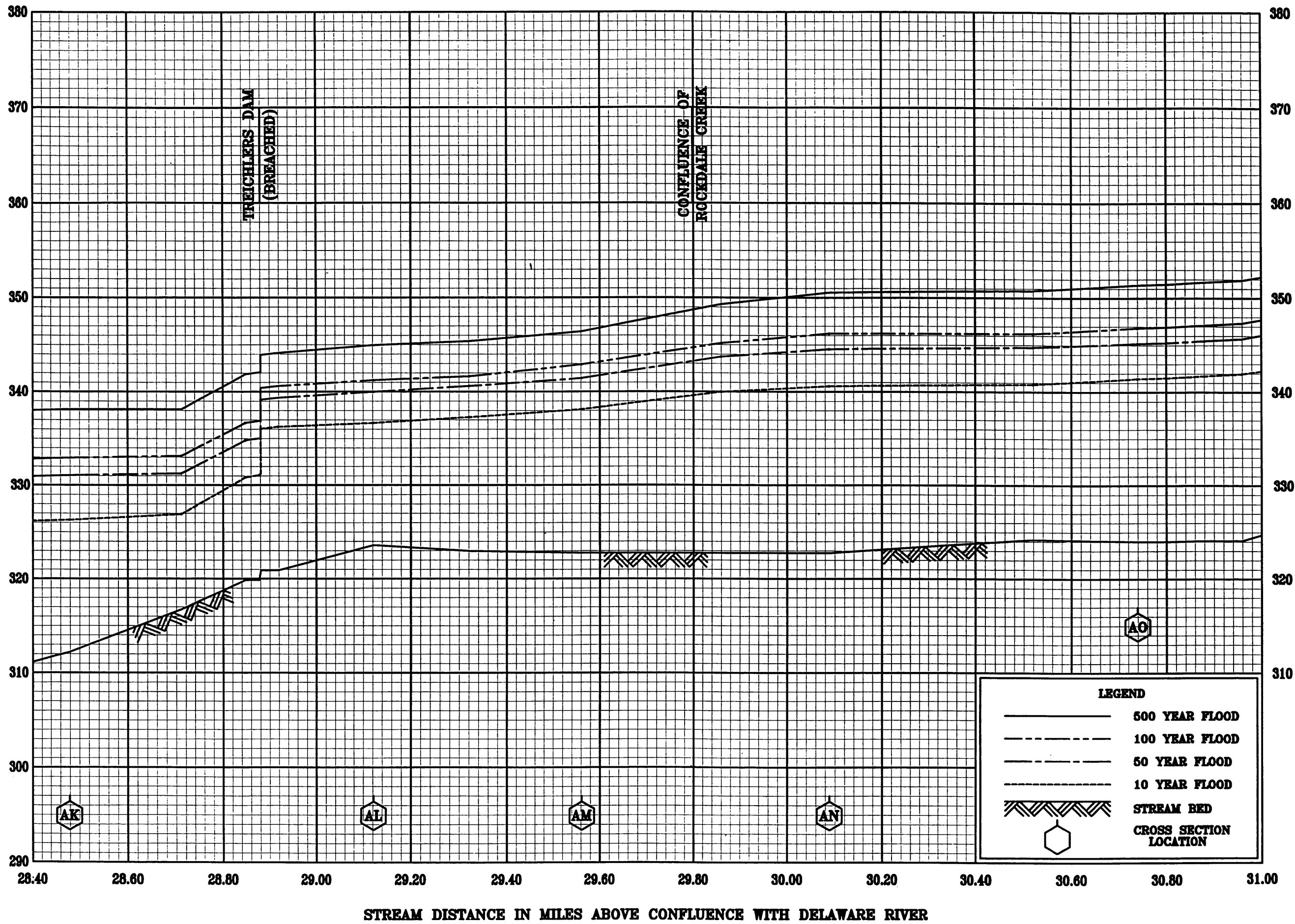


FLOOD PROFILES
LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

50P

ELEVATION IN FEET (NGVD)



FLOOD PROFILES

LEHIGH RIVER

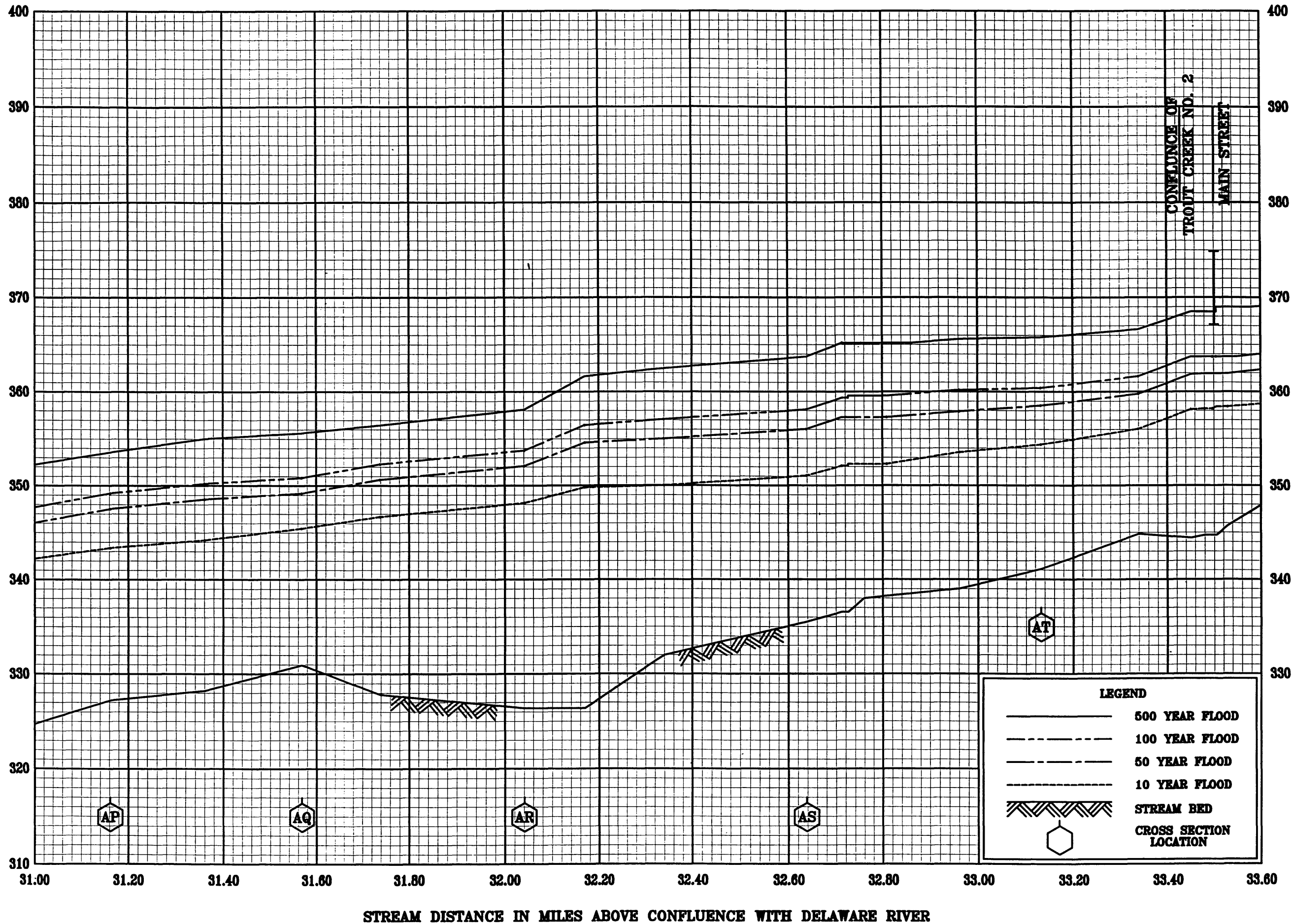
FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

51P

ELEVATION IN FEET (NGVD)

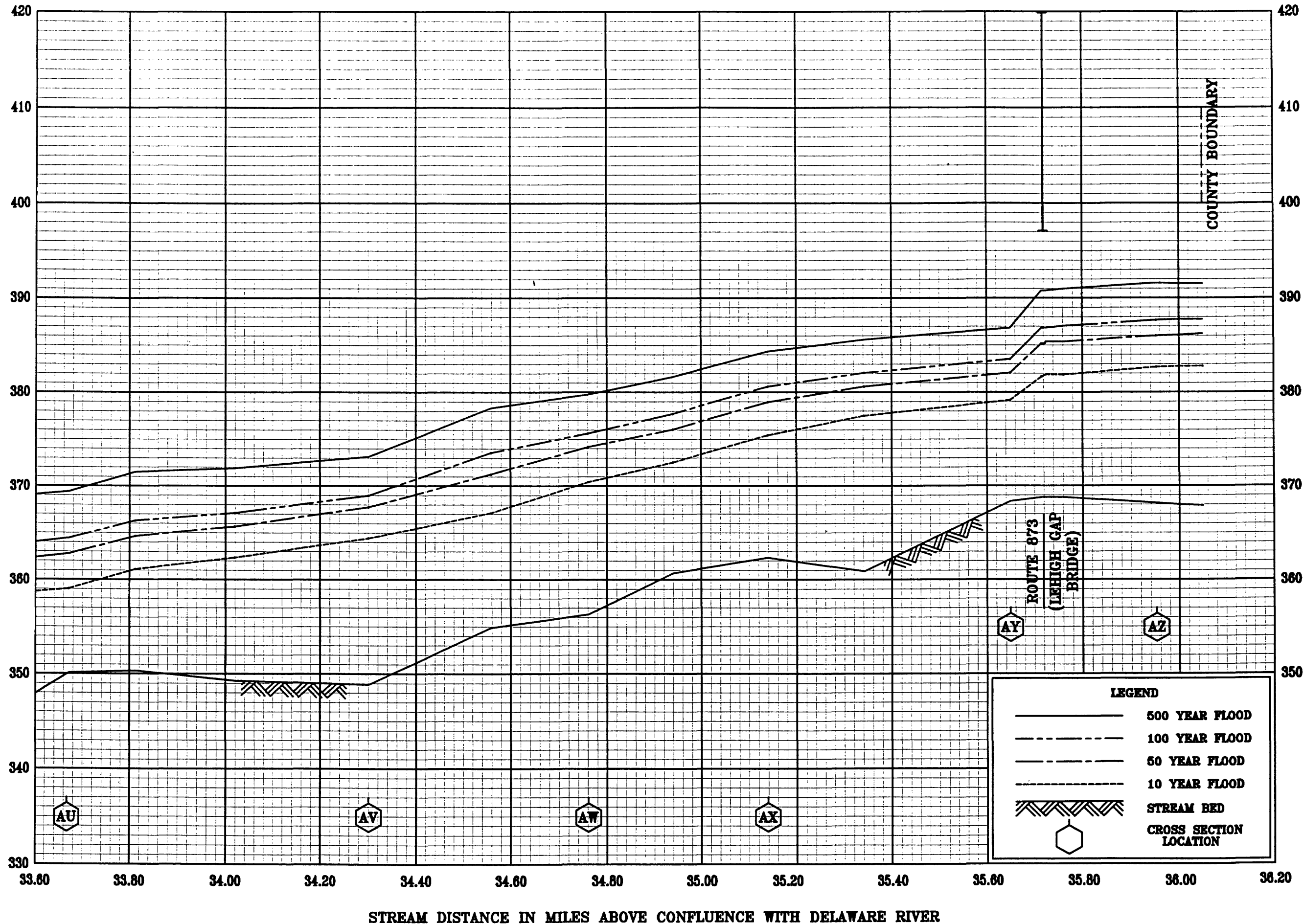


FLOOD PROFILES
LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
LEHIGH COUNTY, PA
(ALL JURISDICTIONS)

52P

ELEVATION IN FEET (NGVD)



FLOOD PROFILES

LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEHIGH COUNTY, PA

(ALL JURISDICTIONS)

53P