

FLOOD INSURANCE STUDY



KOSCIUSKO COUNTY, INDIANA AND INCORPORATED AREAS

KOSCIUSKO COUNTY



COMMUNITY NAME	COMMUNITY NUMBER
BURKET, TOWN OF *	180367
CLAYPOOL, TOWN OF *	180401
ETNA GREEN, TOWN OF *	180368
KOSCIUSKO COUNTY	180121
(Unincorporated Areas)	
LEESBURG, TOWN OF	180386
MENTONE, TOWN OF	180459
MILFORD, TOWN OF	180382
NAPPANEE, CITY OF *	180059
NORTH WEBSTER, TOWN OF	180465
PIERCETON, TOWN OF *	180431
SIDNEY, TOWN OF *	180476
SILVER LAKE, TOWN OF	180311
SYRACUSE, TOWN OF	180122
WARSAW, CITY OF	180123
WINONA LAKE, TOWN OF	180124

* NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED

REVISED: September 30, 2015



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
18085CV000A

NOTICE TO FLOOD INSURANCE STUDY USERS

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

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

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

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
B	X (shaded)
C	X

Initial Countywide FIS Effective Date: February 4, 1987

Revised Countywide FIS Date: September 30, 2015

TABLE OF CONTENTS

	Page
<u>INTRODUCTION</u>	1
1.1 Purpose of Study	1
1.2 Authority and Acknowledgments	2
1.3 Coordination	3
2.0 <u>AREA STUDIED</u>	3
2.1 Scope of Study	3
2.2 Community Description	7
2.3 Principal Flood Problems	8
2.4 Flood Protection Measures	9
3.0 <u>ENGINEERING METHODS</u>	9
3.1 Hydrologic Analyses	10
3.2 Hydraulic Analyses	13
3.3 Vertical Datum	14
4.0 <u>FLOODPLAIN MANAGEMENT APPLICATIONS</u>	15
4.1 Floodplain Boundaries	15
4.2 Floodways	16
5.0 <u>INSURANCE APPLICATION</u>	26
6.0 <u>FLOOD INSURANCE RATE MAP</u>	27
7.0 <u>OTHER STUDIES</u>	27
8.0 <u>LOCATION OF DATA</u>	27
9.0 <u>BIBLIOGRAPHY AND REFERENCES</u>	29

FIGURES

Figure 1 - Floodway Schematic	17
-------------------------------	----

TABLES

Table 1 – CCO Meeting Dates for Pre-Countywide FIS	3
Table 2 – Streams Previously Studied by Detailed Methods	4
Table 3 – Streams and Lakes Studied by Approximate Methods	4
Table 4 – Scope of Study	5
Table 5 – Flood Crest Elevations	9
Table 6 – Summary of Discharges	11
Table 7 – Summary of Elevations	12
Table 8 – Channel and Overbank Roughness Factors	14
Table 9 – Floodway Data	18
Table 10 – Community Map History	28

EXHIBITS

Exhibit 1 - Flood Profiles	Panel #'s
Deeds Creek	01P – 04P
Eagle Creek	05P
Lones Ditch	06P
Tippecanoe River	07P – 10P
Turkey Creek	11P – 13P
Walnut Creek	14P – 15P

Exhibit 2 - Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
KOSCIUSKO COUNTY, INDIANA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and Flood Insurance Rate Maps (FIRMs) in the geographic area of Kosciusko County, Indiana, including the Cities of Nappanee and Warsaw, the Towns of Burket, Claypool, Etna Green, Leesburg, Mentone, Milford, North Webster, Pierceton, Sidney, Silver Lake, Syracuse, and Winona Lake, and the unincorporated areas of Kosciusko County (hereinafter referred to collectively as Kosciusko County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. This information will also be used by Kosciusko 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 National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

Furthermore, the City of Nappanee and the Towns of Burket, Claypool, Etna Green, Pierceton, and Sidney do not have special flood hazard areas within their incorporated limits. However, for the purpose of complete county-wide mapping of Kosciusko County, these towns are still included in this FIS and FIRMs. The City of Nappanee is geographically located in Kosciusko and Elkhart County. Only the portions of the City of Nappanee that lie in Kosciusko County are included in the FIS report. See the separately published FIS Report and Flood Insurance Rate Map (FIRM) for flood hazard information.

1.2 Authority and Acknowledgments

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

Information of the authority and acknowledgements for each of the new studies and previously printed FIS reports and Flood Insurance Rate Maps (FIRMs) for communities within Kosciusko County was compiled and is shown below:

Kosciusko County

And Incorporated Areas: The previously effective FIS for Kosciusko County and Incorporated Areas is dated February 4, 1987. The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (COE), Louisville District (the Study Contractor) for the Federal Emergency management Agency (FEMA), under Inter-Agency Agreement No. EMW-E-0941, Project Order No. 11. This Study was completed in December, 1983 (Reference 1).

City of Nappanee:

The previously effective FIS for the City of Nappanee is dated February 15, 1983. The hydrologic and hydraulic analyses for this study were taken from the Unincorporated Areas of the County of Elkhart, Flood Insurance Study, which was completed in September, 1977 (Reference 2).

New Studies:

The hydrologic and hydraulic analyses for approximate stream reaches of Kosciusko County were performed by Christopher B. Burke Engineering Ltd., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E068104. The Indiana Department of Natural Resources managed the production of this study as part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 06-09 dated June 22, 2006 and funded under agreement number EMC-2006-CA-7016.

Redelineation of the previously effective flood hazard information for this FIS report, and correction to the North American Vertical Datum of 1988 was performed by Christopher B. Burke Engineering Ltd., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E068104. The Indiana Department of Natural Resources managed the production of this study as

part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 06-09 dated June 22, 2006 and funded under agreement number EMC-2006-CA-7016.

1.3 Coordination

The purpose of an initial Consultation Coordinated Officer’s (CCO’s) 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 previously effective FIS reports covering the geographic area of Kosciusko County, Indiana are shown in Table 1. The initial and final CCO meetings were attended by the study contractor, FEMA (or the Federal Insurance Administration), the Indiana Department of Natural Resources (IDNR), and the affected communities.

Table 1: CCO Meeting Dates for Initial Countywide FIS

<u>Community Name</u>	<u>Initial CCO Date</u>	<u>Final CCO Date</u>
Kosciusko County, and Incorporated Areas	August, 1982	November 27, 1984
City of Nappanee	*	September 8, 1982

*Date not available

For this Revised Countywide FIS, an initial CCO meeting was held on August 16, 2005, and was attended by the Natural Resources Conservation Service (NRCS), the Kosciusko County Soil & Water District, the Kosciusko Area Plan Commission and representatives from the city of Nappanee and Kosciusko County.

The results of the countywide study were reviewed at the final CCO meeting held on December 14, 2013, and attended by representatives of FEMA, IDNR and representatives from Kosciusko County, City of Warsaw, and Town of Winona Lake. All problems raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Kosciusko County, Indiana, including the incorporated communities listed in Section 1.1

All FIRM panels for Kosciusko County have been revised, updated, and republished as a part of this FIS. The FIRM panel index, provided as Exhibit 2, illustrates the revised FIRM panel layout.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards as identified during the initial CCO meeting. For this study, twenty-six (26) new stream reaches and thirty-three (33) lakes were studied using approximate methods. The scope and methods of new approximate studies were proposed and agreed upon by FEMA, the IDNR, and Kosciusko County.

The areas studied by detailed methods were selected with priority given to all known flood hazards areas and areas of projected development of proposed construction. This study incorporates a new detailed study of Deeds Creek and Lones Ditch, performed for and approved by IDNR. Five detailed stream reaches that were studied in previous FIS reports, flood hazard areas were redelineated using updated and revised topographic mapping.

This FIS update also incorporates the determination of letters issued by FEMA resulting in map changes (Letters of Map Change, or LOMC's). No Letters of Map Revision have been issued for Kosciusko County. Letters of Map Amendment (LOMA's) incorporated for this study are summarized in the Summary of Map Actions (SOMA) included in the Technical Support Data Notebook (TSDN) associated with this FIS update. Copies of the TSDN may be obtained from the Community Map Repository.

Table 2: Streams Previously Studied by Detailed Methods

Deeds Creek	Eagle Creek
Lones Ditch	Tippecanoe River
Turkey Creek	Walnut Creek

Table 3: Streams and Lakes Studied by Approximate Methods

Armev Ditch	Chippewanuck Creek
Coppes Ditch	Crazy Creek
Danner Ditch	Dausman Ditch
Deeds Creek	Eel River
Grassy Creek	Hurricane Creek
Keefer-Evans Ditch	Koontz Ditch
Little Yellow Creek	Martin Ditch
Meyer Ditch	Morrett Ditch
Nelson Ditch	Peterson Ditch
Plunge Creek	Sechrist Ditch
Shanton Ditch	Silver Creek
Swank Creek	Tippecanoe River

Table 3: Streams and Lakes Studied by Approximate Methods (continued)

Trimble Creek	Turkey Creek
Walnut Creek	William Baker Ditch
Wyland Ditch	Yellow Creek
Allen Lake	Banning Lake
Barrel-and-a-half Lake	Beaver Dam Lake
Big Barbee Lake	Big Chapman Lake
Carr Lake	Crystal Lake
Dewart Lake	Diamond Lake
Fish Lake	Hammond Lake
Hill Lake	Hoffman Lake
Irish Lake	James Lake
Kuhn Lake	Lake Wawasee
Little Barbee Lake	Little Chapman Lake
Loon Lake	McClures Lake
Muskelunge Lake	North Little Lake
Palestine Lake	Papakeechee Lake
Pike Lake	Reed Lake
Ridinger Lake	Rothenberger Lake
Sawmill Lake	Sechrist Lake
Sellers Lake	Sherburn Lake
Silver Lake	South Little Lake
Spear Lake	Syracuse Lake
Tippecanoe Lake	Wabee Lake
Webster Lake	Winona Lake
Yellow Creek Lake	

Table 4: Scope of Study

<u>Stream</u>	<u>Limits of Detailed Study</u>
Deeds Creek and Lones Ditch	Confluence with Tippecanoe River to 1200' upstream of C.R. 250 South
<u>Stream</u>	<u>Limits of Redelineation Study</u>
Tippecanoe River	Conrail railroad to Webster Lake Outlet
Walnut Creek	Confluence with Tippecanoe River to confluence with Eagle Creek
Eagle Creek	Confluence with Walnut Creek to Winona Lake outlet
Walnut Creek	Confluence with Eagle Creek to C.R. 300 South
Turkey Creek	C.R. 1250 North to Syracuse Lake outlet
Turkey Creek	Syracuse Lake outlet to Lake Wawasee Inlet

Table 4: Scope of Study (cont.)

<u>Stream</u>	<u>Limits of Approximate Study</u>
Deeds Creek Tributary (Heeter Ditch)	Confluence with Deeds Creek to Big Chapman Lake
Eel River	County line to county line
Grassy Creek	Confluence with Tippecanoe River to county line
Shanton Ditch	Confluence with Grassy Creek to 2600' upstream of Old Road 30
Little Yellow Creek	County Line to C.R. 800 South
Plunge Creek	Confluence with Eel River to 2700' upstream of C.R. 1000 South
Silver Creek	County Line to C.R. 950 South
Wyland Ditch	1800' downstream of C.R. 225 South to confluence with Babcock Branch
Peterson Ditch	1700' downstream of C.R. 225 to 2900' upstream of C.R. 700 South
Tippecanoe River Tributary	Muskellunge Lake to Norfolk and Southern railroad
Walnut Creek	Muskellunge Lake to 5200' upstream of C.R. 700 South
Pyle Ditch	Confluence with Tippecanoe River to 2600' upstream of C.R. 100 South
Pole Run Ditch	Confluence with Tippecanoe River to 5600' upstream of U.S. Hwy 30
Trimble Creek	Confluence with Tippecanoe River to Palestine Lake
Adams Ditch	Palestine Lake to Caldwell Lake Outlet
Trimble Creek	Palestine Lake to 2000' upstream of Norfolk Southern railroad
Robinson Ditch	Confluence with Tippecanoe River to 2700' upstream of C.R. 400 North
Danner Ditch	Confluence with Tippecanoe River to confluence with Arm No. 2
Danner Ditch	Confluence with Ridenour Ditch to 2900' upstream of county line
Arm No. 2	Confluence with Danner Ditch to C.R. 675 North
William Baker Ditch	Confluence with Tippecanoe River to C.R. 780 West
Coppes Ditch	Confluence with Turkey Creek to 2600' upstream of Harper Road
Dausman Ditch	County line to confluence with Fluegel Ditch
Yellow Creek	County line to Beaver Dam Lake inlet

Table 4: Scope of Study (cont.)

<u>Lakes</u>	
Banning Lake	Barrel-and-a-half Lake
Beaver Dam Lake	Big Barbee Lake
Big Chapman Lake	Caldwell Lake
Carr Lake	Crystal Lake
Dewart Lake	Diamond Lake
Fish Lake	Hammond Lake
Hill Lake	Hoffman Lake
Irish Lake	Kuhn Lake
Little Barbee Lake	Little Chapman Lake
Loon Lake	McClures Lake
Muskelunge Lake	North Little Lake
Palestine Lake	Ridinger Lake
Robinson Lake	Rock Lake
Sechrist Lake	Sellers Lake
Sherburn Lake	Shoe Lake
Silver Lake	Spear Lake
Wabee Lake	

2.2 Community Description

Kosciusko County is located northern Indiana and is bordered by Elkhart County to the north, Noble and Whitley Counties to the east, Wabash County to the south, Fulton County to the southwest, and Marshall County to the west.. Kosciusko County is located approximately 26 miles west of the City of Fort Wayne, Indiana, and has a total land area of 540 square miles. The City of Warsaw is the largest city within Kosciusko County. Kosciusko County is served by US route 30 and 150, and State Routes 13, 14, 15, 19, 25. According to the STATS Indiana, the population of Kosciusko County in 2010 was reported to be 77,358.

The climate in Kosciusko County is moderate and four seasonal. It is located far enough south and east of Lake Michigan to avoid most “lake effect” snow. According to the National Oceanic and Atmospheric Administration (NOAA), average daily temperatures for Kosciusko County range from 70 degrees Fahrenheit (F) in summer to 26 degrees F in winter. For the period of record between 1981 and 2010, annual average precipitation is approximately 38.88 inches.

The Town of Mentone is located in western Kosciusko County. The town is surrounded by unincorporated Kosciusko County in all directions except for on the west it is bordered by unincorporated Marshall County. According to STATS Indiana, the estimated population of Mentone in 2010 was 1,001. The major routes through Mentone are State Routes 19 and 25.

The Town of Milford is located in northern Kosciusko County. Milford is bordered by the Village of Milford Junction to the north and unincorporated Kosciusko County to the south, east and west. According to STATS Indiana, the estimated population of Milford in 2010 was 1,562. Milford is served by North State Route 15.

The City of Nappanee is located in northern Kosciusko County and southern Elkhart County. Nappanee is bordered by unincorporated Kosciusko County to the south and Unincorporated Elkhart County to the east, north, and west. According to STATS Indiana, the estimated population of Nappanee in 2010 was 6,648. The major routes through Nappanee are State Route 19 and U.S. Route 6.

The Town of North Webster is located in eastern Kosciusko County. North Webster is bordered by unincorporated Kosciusko County in all directions except to the east where it is bordered by unincorporated Noble County. According to STATS Indiana, the estimated population of North Webster in 2010 was 1,146. The major route through North Webster is State Route 13.

The Town of Silver Lake is located in southern Kosciusko County. Silver Lake is surrounded by unincorporated Kosciusko County in all directions. According to STATS Indiana, the estimated population of Silver Lake in 2010 was 915. The major routes through Silver Lake are State Routes 14 and 15.

The Town of Syracuse is located in northeastern Kosciusko County. Syracuse is surrounded by unincorporated Kosciusko County in all directions except to the north where it bordered by Elkhart County. According to STATS Indiana, the estimated population of Syracuse in 2010 was 2,810. The major route through Syracuse is State Route 13.

The City of Warsaw is located in central Kosciusko County. Warsaw is surrounded by unincorporated Kosciusko County in all directions except to the southeast where it is bordered by the Town Winona Lake. According to STATS Indiana, the estimated population of Warsaw in 2010 was 13,559. The major routes through Warsaw are U.S. Route 30 and State Routes 15 and 25.

The Town of Winona Lake is located in central Kosciusko County. Winona Lake is surrounded by unincorporated Kosciusko County in all directions except to the northwest where it is bordered by the City of Warsaw. According to STATS Indiana, the estimated population of Winona Lake in 2010 was 4,908.

2.3 Principal Flood Problems

Floods in the study reaches of the Tippecanoe River, Turkey Creek, and Walnut Creek are caused by runoff from intense rainfall and/or snowmelt. Flooding usually

occurs during winter and spring; however, floods have occurred during all season of the year.

Records of river stages and discharges on the Tippecanoe River are maintained in the study area from October 1943 to the present, by the U. S. Geological Survey. This gage is located in the Town of Oswego. Table 5 lists the flood crest stages and discharges for the past major floods.

Table 5: Flood Crest Elevations

USGS gage for Tippecanoe River at Oswego		
<u>Year</u>	<u>Peak Discharge (cfs)</u>	<u>Elevation (feet, NAVD 1988)</u>
1943	1,050	838.97
1982	950	838.82
1985	758	838.46
2008	661	838.11
2009	828	838.53

There are numerous large lakes in Kosciusko County. A report on flooding problems on Lake Tippecanoe states that properties around the lakes situated at low elevations experience flooding on a nearly annual basis.

2.4 Flood Protection Measures

The state of Indiana has also set regulations concerning development in a flood plain. The Indiana Flood Control Act of 1945, as amending, requires that the channels and that portion of the flood plain known as the floodway be kept free and clear of interference or obstructions which could restrict the flow rate in a significant manner. The Act stipulates that the Indiana Flood Plain Management Act of 1973 further requires that flood plain management regulations adopted after July 1, 1974, meet a minimum set of standards for the delineation and regulation of flood hazard areas.

3.0 ENGINEERING METHODS

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

between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent- annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Initial Countywide Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting Kosciusko County. Table 6 contains a summary of peak discharges for the 10-, 2-, 1-, and 0.2-percent annual chance floods, where applicable, for each flooding source studied in detail in Kosciusko County. Peak discharges in the table were compiled from the Initial Countywide FIS report for Kosciusko County and incorporated areas. Source citations refer to the source of the detailed study.

An in depth study of all USGS gaging stations within Kosciusko County was made in accordance with Bulletin No. 17B. Determination of the final discharge versus drainage area relationships considered omission of low and high outliers, weighting with the generalized skew, and historically adjusting the curves where possible. Previous studies for adjacent counties with similar runoff characteristics were examined to assure reasonableness of the adopted values. All frequency discharges for the streams were coordinated with the Indiana DRN, the USGS, and the U.S. Department of Agriculture, Soil Conservation Service.

Revised Countywide Analyses

Peak discharges for Deeds Creek and Lones Ditch were determined for this Revised Countywide FIS using GeoHMS tools in ESRI's ArcMap software and the HEC-HMS (version 3.3) routing techniques and software developed by the USACE. Topographic and land use data were obtained from 2005 aerial photography and digital elevation modeling. The models were calibrated using the gage at Pike Lake as well as the previously studied downstream ends.

The equations used to determine the discharges in the majority of the cases are taken from Estimation of Peak Discharges of Indiana Streams by using log Pearson (iii) distribution. The equations presented in the report are also included in the latest version of the National Flood Frequency (NFF) program by the USGS, and are included in the USGS StreamStats application. In some cases, the discharges for a stream have been coordinated with the Indiana Department of Natural Resources, the Natural Resources Conservation Service (formally the Soil Conservation Service), the

U.S. Geological Survey and the U.S. Army Corps of Engineers, through a Memorandum of Understanding dated May 6, 1976.

Table 6. Summary of Discharges

<u>Flooding Source And Location</u>	<u>Drainage Area (Square Miles)</u>	Peak Discharge (cfs)			
		<u>10% Annual Chance</u>	<u>2% Annual Chance</u>	<u>1% Annual Chance</u>	<u>0.2% Annual Chance</u>
Deeds Creek					
Upstream of Pike Lake	37.4	1,030	1,560	1,840	2,500
Upstream of Confluence with Heeter Ditch	27.3	880	1,330	1,550	2,120
At Old Road 30	21.0	690	1,040	1,210	1,660
Upstream of Confluence with McCarter Ditch	11.0	350	530	620	850
Eagle Creek					
At Mouth	34.7	525	700	770	920
Lones Ditch					
At Mouth	43.1	850	1,280	1,480	1,980
Upstream of Confluence with Hickman Lateral	41.2	810	1,220	1,420	1,900
Tippecanoe River					
At 100 North Road	248.0	1,550	2,050	2,250	2,950
Upstream of the Confluence of Walnut Creek	176.0	1,020	1,340	1,500	1,970
Downstream of U.S. Route 30	134.0	730	1,000	1,100	1,440
Near Oswego Lake	114.0	610	840	920	1,210
Upstream of Tippecanoe Lake	53.0	355	*	510	*
Turkey Creek					
At 1250 North Road	76.4	310	410	450	560
Downstream of Syracuse Lake	38.2	190	250	270	330

Table 6. Summary of Discharges (cont.)

<u>Flooding Source And Location</u>	<u>Drainage Area (Square Miles)</u>	Peak Discharge (cfs)			
		<u>10% Annual Chance</u>	<u>2% Annual Chance</u>	<u>1% Annual Chance</u>	<u>0.2% Annual Chance</u>
Walnut Creek					
At U.S. Route 30	60.2	1,045	1,660	2,000	3,150
Upstream of Confluence of Eagle Creek	23.8	520	970	1,220	2,000

*Data not available

A study was conducted to determine the 10- and 100-year elevations on selected lakes within Kosciusko County. This involved applying standard statistical analyses as described in Bulletin No. 17B (Interagency Advisory Committee on Water Data, Bulletin No. 17B, *Guidelines for Determining Flood Flow Frequency*, 1981) on actual lake data to determine the selected frequency elevation. The lake elevations using these analyses are shown in Table 7, Summary of Elevations. These values represent the more conservative results.

Table 7 – Summary of Elevations

<u>Flooding Source and Location</u>	Elevation (Feet, NAVD88)	
	<u>10-Year</u>	<u>100-Year</u>
Lake Tippecanoe	838.6	839.2
James Lake	838.6	839.2
Webster Lake	853.5	854.2
Winona Lake	812.6	813.1
Oswego Lake	838.6	839.2
Lake Wawasee	859.5	860.0
Syracuse Lake (Including Boner Lake)	859.1	859.9
Big Barbee Lake (Including Banning, Irish, Kuhn, Little Barbee, Sawmill and Sechrest Lakes)	839.6	840.3

Table 7 – Summary of Elevations (cont.)

<u>Flooding Source and Location</u>	<u>Elevation (Feet, NAVD88)</u>	
	<u>10-Year</u>	<u>100-Year</u>
Ridinger Lake	848.1	850.0
Pike Lake	809.5	811.6
Center Lake	806.3	807.4

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Cross sections for the backwater analyses were obtained from a variety of sources including: physical survey data, IDNR contour mapping, USGS topographic mapping, local contour mapping developed by Kosciusko County with a 2 foot elevation and from the statewide 2011 LiDAR project. Starting elevations were assumed to be normal depth.

Water-surface elevations for floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program for streams originally studied in the initial countywide Kosciusko County Flood Insurance Study. For the new approximate study reaches for this revised countywide FIS, the USACE HEC-RAS program was used. HEC-RAS is an updated version of the HEC-2 program used to perform step-backwater analyses.

Flood profiles were prepared for all streams studied by detailed methods and show computed water-surface elevations to an accuracy of 0.5 feet for floods of the selected recurrence intervals. For this revised countywide FIS, flood profiles and approved LOMRs have been consolidated into continuous stream reaches and adjusted to reflect the current vertical datum as described in Section 3.3. New profiles have been prepared for the new detailed studies and for the purposes of incorporating the LOMRs described in Section 2.1 above.

Starting elevations for all streams studied in detail were determined using normal depth.

Channel and overbank roughness factors (Manning’s “n” values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. Channel and overbank roughness factors used in the detailed studies are summarized by stream in Table 8.

Table 8. Channel and Overbank Roughness Factors

<u>Stream</u>	<u>Roughness Coefficients</u>	
	<u>Main Channel</u>	<u>Overbanks</u>
Deeds Creek	0.040-0.045	0.045-0.110
Eagle Creek	0.037	0.055
Lones Ditch	0.035-0.045	0.050-0.110
Tippecanoe River	0.040-0.060	0.050-0.075
Turkey Creek	0.040-0.050	0.045-0.060
Walnut Creek	0.035-0.040	0.050-0.060

For new approximate study areas, analyses were based on field inspection and modeling of the stream reaches using simplified HEC-RAS models. Structural measurements or field surveying was not performed. Cross section geometry derived from topographic mapping provided by Kosciusko County with a 2 foot elevation and from the statewide 2011 LiDAR project. Starting elevations were assumed to be normal depth.

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

3.3 Vertical Datum

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

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities.

In this revision, a vertical datum conversion of -0.43 was calculated at the centroid of the county and used to convert all elevations in Kosciusko County from NGVD29 to NAVD88 using the National Geodetic Survey's VERTCON online utility (VERTCON, 2005).

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the 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>).

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

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

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps provided by

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, V, and VE); and the 0.2-percent-annual-chance floodplain boundary corresponds to the

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

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

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

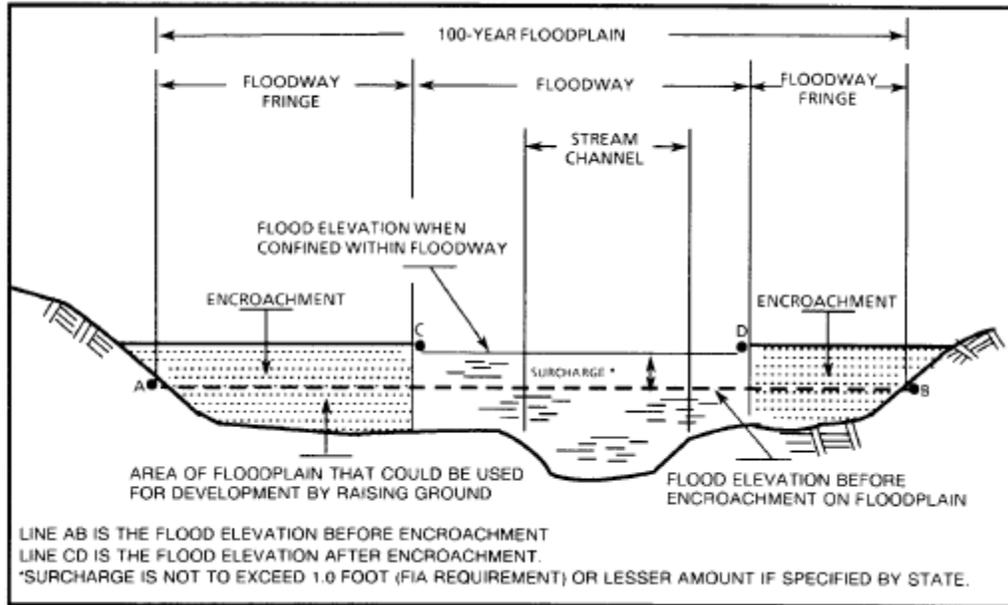
The State of Indiana, however, per Indiana Code IC 14-28-1 and Indiana Administrative Code 312 IAC 10, has designated that encroachment in the floodplain is limited to that which will cause no significant increase in flood height. As a result, floodways for this study are delineated based on a flood surcharge of less than 0.15 feet. The floodways in this study were approved by the IDNR, and are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this FIS report and on the FIRM 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 have been tabulated for selected cross sections (Table 9). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 0.14 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 1: Floodway Schematic



FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
DEEDS CREEK								
A	2.15	293	860	2.1	812.5	812.5	812.6	0.1
B	2.23	334	1,142	1.6	813.5	813.5	813.6	0.1
C	2.37	192	646	2.9	814.9	814.9	815.0	0.1
D	2.56	255	919	2.0	817.4	817.4	817.4	0.0
E	2.76	167	531	3.5	819.8	819.8	819.9	0.1
F	2.96	251	812	2.3	823.4	823.4	823.5	0.1
G	3.07	221	778	2.4	824.2	824.2	824.3	0.1
H	3.21	177	791	2.3	826.6	826.6	826.7	0.1
I	3.26	240	597	3.1	826.8	826.8	826.9	0.1
J	3.48	82	409	4.5	828.4	828.4	828.5	0.1
K	3.61	454	3,775	0.5	829.2	829.2	829.3	0.1
L	3.75	572	3,795	0.5	829.2	829.2	829.3	0.1
M	3.90	460	1,867	1.0	830.5	830.5	830.6	0.1
N	3.99	49	324	5.7	830.2	830.2	830.3	0.1
O	4.12	59	462	4.0	831.5	831.5	831.5	0.0
P	4.52	1,175	7,435	0.2	831.8	831.8	831.8	0.0
Q	4.81	663	3,790	0.4	831.8	831.8	831.8	0.0
R	4.95	385	1,862	0.8	831.8	831.8	831.9	0.1
S	5.09	278	1,702	0.9	833.3	833.3	833.4	0.1
T	5.15	125	677	2.3	833.3	833.3	833.4	0.1
U	5.37	200	1,084	1.4	833.7	833.7	833.8	0.1
V	5.65	407	2,907	0.5	834.1	834.1	834.2	0.1
W	5.82	645	4,287	0.4	834.2	834.2	834.3	0.1
X	6.02	638	3,681	0.4	834.2	834.2	834.3	0.1
Y	6.20	204	1,045	1.5	834.5	834.5	834.6	0.1
Z	6.28	256	1,215	1.3	834.7	834.7	834.8	0.1

¹ MILES ABOVE CONFLUENCE WITH TIPPECANOE RIVER

TABLE 9	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	KOSCIUSKO COUNTY, IN AND INCORPORATED AREAS	DEEDS CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
DEEDS CREEK								
AA	6.36	557	2,635	0.6	834.9	834.9	835.0	0.1
AB	6.51	388	1,445	0.8	835.9	835.9	836.0	0.1
AC	6.58	309	1,158	1.1	835.9	835.9	836.0	0.1
AD	6.67	221	575	2.1	836.3	836.3	836.4	0.1
AE	6.76	79	315	3.8	836.8	836.8	836.9	0.1
AF	6.92	108	370	3.3	838.4	838.4	838.5	0.1
AG	7.09	186	625	1.9	839.0	839.0	839.1	0.1
AH	7.32	181	682	1.8	840.2	840.2	840.3	0.1
AI	7.56	211	960	1.3	841.0	841.0	841.1	0.1
AJ	7.69	330	1,458	0.8	841.3	841.3	841.4	0.1
AK	7.82	408	1,544	0.8	841.4	841.4	841.5	0.1
AL	8.00	578	2,334	0.5	842.5	842.5	842.6	0.1
AM	8.20	79	303	4.0	842.8	842.8	842.9	0.1
AN	8.29	216	793	1.5	843.5	843.5	843.6	0.1
AO	8.43	446	1,736	0.7	849.0	849.0	849.0	0.0
AP	8.45	564	4,414	0.3	849.0	849.0	849.1	0.1
AQ	8.66	185	1,137	1.1	849.0	849.0	849.0	0.0
AR	8.78	521	3,400	0.4	849.2	849.2	849.2	0.0
AS	8.81	521	3,346	0.4	849.2	849.2	849.2	0.0
AT	8.99	679	3,639	0.2	849.2	849.2	849.2	0.0
AU	9.25	35	146	4.3	849.0	849.0	849.1	0.1
AV	9.50	121	255	2.4	852.4	852.4	852.5	0.1
AW	9.70	39	155	4.0	854.2	854.2	854.3	0.1
AX	9.85	45	197	3.2	856.5	856.5	856.5	0.0
AY	10.03	34	135	4.6	858.6	858.6	858.7	0.1
AZ	10.09	35	149	4.2	859.3	859.3	859.4	0.0

¹ MILES ABOVE CONFLUENCE WITH TIPPECANOE RIVER

TABLE 9	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	KOSCIUSKO COUNTY, IN AND INCORPORATED AREAS	DEEDS CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
DEEDS CREEK								
BA	10.11	26	129	4.8	859.7	859.7	859.7	0.0
BB	10.17	27	120	5.2	860.4	860.4	860.4	0.0
BC	10.49	27	122	5.1	864.3	864.3	864.3	0.0
BD	10.54	28	144	4.3	865.1	865.1	865.1	0.0
BE	10.62	28	117	5.3	865.8	865.8	865.9	0.1
BF	10.65	42	204	3.1	866.4	866.4	866.5	0.1
BG	10.73	370	1,965	0.3	871.5	871.5	871.5	0.0
BH	10.79	270	1,358	0.5	871.5	871.5	871.5	0.0
BI	10.94	148	525	1.2	871.7	871.7	871.7	0.0
BJ	11.11	51	218	2.8	871.7	871.7	871.8	0.1
BK	11.20	46	205	3.0	872.2	872.2	872.3	0.1
BL	11.24	34	155	4.0	872.3	872.3	872.4	0.1
BM	11.31	36	234	2.7	873.1	873.1	873.2	0.1
BN	11.42	181	584	1.1	873.4	873.4	873.5	0.1

¹ MILES ABOVE CONFLUENCE WITH TIPPECANOE RIVER

TABLE 9	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	KOSCIUSKO COUNTY, IN AND INCORPORATED AREAS	DEEDS CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
EAGLE CREEK								
A	0.07 ¹	201	469	1.6	813.0	808.5 ²	808.5	0.0
B	0.41 ¹	37	209	3.7	813.0	809.6 ²	809.6	0.0
C	0.43 ¹	57	351	2.2	813.0	810.3 ²	810.3	0.0
D	0.59 ¹	103	415	1.9	813.0	810.6 ²	810.6	0.0
E	0.68 ¹	48	203	3.8	813.0	810.7 ²	810.7	0.0
F	0.73 ¹	49	205	3.8	813.0	810.9 ²	810.9	0.0
G	0.92 ¹	100	274	2.8	813.0	812.0 ²	812.0	0.0
H	1.09 ¹	51	269	2.9	813.0	812.6 ²	812.6	0.0
I	1.13 ¹	104	423	1.8	813.0	812.8 ²	812.8	0.0
J	1.26 ¹	255	998	0.8	813.0	813.0 ²	813.0	0.0
K	1.40 ¹	72	379	2.0	813.0	813.0 ²	813.0	0.0
LONES DITCH								
A	0.34 ³	135	564	2.6	809.7	809.5 ⁴	809.7	0.1
B	0.51 ³	103	579	2.6	810.1	810.1	810.2	0.1
C	0.56 ³	103	616	2.3	810.5	810.5	810.5	0.0
D	0.61 ³	107	667	2.1	810.5	810.5	810.6	0.1
E	0.66 ³	183	758	1.9	811.3	811.3	811.4	0.1
F	0.68 ³	249	1,095	1.3	811.5	811.5	811.6	0.1

¹ MILES ABOVE CONFLUENCE WITH WALNUT CREEK

² ELEVATIONS WITHOUT CONSIDERING BACKWATER FROM WALNUT CREEK

³ MILES ABOVE CONFLUENCE WITH TIPPECANOE RIVER

⁴ ELEVATIONS WITHOUT CONSIDERING BACKWATER FROM TIPPECANOE RIVER

TABLE 9	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	KOSCIUSKO COUNTY, IN AND INCORPORATED AREAS	EAGLE CREEK - LONES DITCH

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
TIPPECANOE RIVER								
A	143.61	311	1,403	1.6	802.2	802.2	802.3	0.1
B	143.93	211	1,274	1.8	803.2	803.2	803.3	0.1
C	144.39	242	1,435	1.6	804.6	804.6	804.7	0.1
D	144.43	252	1,506	1.5	804.9	804.9	804.9	0.0
E	144.59	460 [†]	1,574	1.4	805.2	805.2	805.2	0.0
F	144.65	481	2,370	0.9	805.4	805.4	805.5	0.1
G	145.09	460	2,241	1.0	805.9	805.9	806.0	0.1
H	146.00	520	2,442	0.9	807.2	807.2	807.3	0.1
I	146.70	282	1,559	1.4	808.0	808.0	808.1	0.1
J	147.09	200	1,551	1.5	808.7	808.7	808.8	0.1
K	147.57	250	433	3.5	809.3	809.3	809.4	0.1
L	148.95	820	3,605	0.3	810.5	810.5	810.5	0.0
M	149.54	625	2,238	0.5	810.9	810.9	810.9	0.0
N	149.81	625 [†]	1,750	0.6	811.5	811.5	811.5	0.0
O	150.50	700 [†]	1,826	0.6	813.7	813.7	813.7	0.0
P	150.87	800 [†]	1,810	0.6	814.9	814.9	814.9	0.0
Q	151.23	150	294	3.7	817.4	817.4	817.4	0.0
R	151.50	320	935	1.1	819.4	819.4	819.4	0.0
S	151.98	400 [†]	3,558	0.3	820.5	820.5	820.5	0.0
T	152.06	320	1,048	1.0	820.6	820.6	820.6	0.0
U	152.36	437	1,261	0.8	821.5	821.5	821.5	0.0
V	153.44	658	1,690	0.6	823.8	823.8	823.8	0.0
W	154.39	380	1,728	0.6	825.8	825.8	825.8	0.0
X	155.38	400	1,090	1.0	828.0	828.0	828.0	0.0
Y	157.53	350	1,009	0.9	832.8	832.8	832.8	0.0
Z	157.96	430	578	1.8	834.5	834.5	834.5	0.0

¹ MILES ABOVE MOUTH

[†] FLOODWAY WIDTH MAY DIFFER FROM FIRM. PLEASE SEE FIRM FOR REGULATORY WIDTH

TABLE 9

**FEDERAL EMERGENCY MANAGEMENT
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS**

FLOODWAY DATA

TIPPECANOE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH	SECTION AREA	MEAN VELOCITY	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
		(FEET)	(SQ. FEET)	(FT/SEC)	(FEET, NAVD)	(FEET, NAVD)	(FEET, NAVD)	(FEET)
TIPPECANOE RIVER								
AA	164.13	97	194	2.6	839.2	839.2	839.2	0.0
AB	164.79	214	214	2.4	840.5	840.5	840.5	0.0
AC	165.24	66	186	2.7	844.0	844.0	844.0	0.0
AD	165.30	133	404	1.3	844.9	844.9	844.9	0.0
AE	165.57	251	529	1.0	845.2	845.2	845.2	0.0
AF	165.86	154	344	1.5	845.6	845.6	845.6	0.0
AG	165.90	67	175	2.9	845.7	845.7	845.7	0.0
AH	165.98	89 [†]	205	2.5	846.2	846.2	846.2	0.0
AI	166.03	55 [†]	155	3.3	846.6	846.6	846.6	0.0
TURKEY CREEK								
A	2.57	59	178	2.5	820.0	820.0	820.0	0.0
B	2.62	54	191	2.4	820.2	820.2	820.2	0.0
C	2.86	53	232	1.9	820.9	820.9	820.9	0.0
D	3.12	62	210	2.1	821.6	821.6	821.6	0.0
E	3.17	69	232	1.9	821.9	821.9	821.9	0.0
F	3.37	82	278	1.6	822.3	822.3	822.3	0.0
G	3.62	41	126	3.1	823.0	823.0	823.0	0.0
H	3.66	36	124	3.1	823.2	823.2	823.2	0.0
I	3.84	46	118	3.3	824.9	824.9	824.9	0.0
J	3.89	40	116	3.4	825.5	825.5	825.5	0.0
K	3.93	83	149	2.6	826.1	826.1	826.1	0.0
L	4.10	54	148	2.6	827.3	827.3	827.3	0.0
M	4.63	70	194	2.0	830.0	830.0	830.0	0.0
N	4.69	68	168	2.3	830.3	830.3	830.3	0.0

¹ MILES ABOVE MOUTH

[†] FLOODWAY WIDTH MAY DIFFER FROM FIRM. PLEASE SEE FIRM FOR REGULATORY WIDTH

TABLE 9

**FEDERAL EMERGENCY MANAGEMENT
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS**

FLOODWAY DATA

TIPPECANOE RIVER - TURKEY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FT/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET, NAVD)	(FEET, NAVD)	(FEET, NAVD)	(FEET)
TURKEY CREEK								
O	5.14	46	170	2.3	832.8	832.8	832.8	0.0
P	5.70	52	149	2.6	836.0	836.0	836.0	0.0
Q	5.98	43	145	2.7	838.1	838.1	838.1	0.0
R	6.03	58	160	2.4	838.3	838.3	838.3	0.0
S	6.35	45	152	2.6	840.1	840.1	840.1	0.0
T	6.44	50	176	2.2	840.6	840.6	840.6	0.0
U	7.09	71	223	1.8	842.6	842.6	842.7	0.1
V	7.37	56	196	2.0	843.5	843.5	843.6	0.1
W	7.43	54	184	2.1	843.8	843.8	843.9	0.1
X	7.89	53	224	1.7	845.4	845.4	845.5	0.1
Y	7.92	64	183	2.1	845.5	845.5	845.6	0.1
Z	8.57	61	199	2.0	848.3	848.3	848.3	0.0
AA	8.59	71	215	2.8	848.5	848.5	848.5	0.0
AB	9.32	76	183	2.1	851.5	851.5	851.6	0.1
AC	9.36	60	193	2.0	851.9	851.9	851.9	0.0
AD	9.72	47	185	2.1	853.4	853.4	853.4	0.0
AE	9.89	45	179	2.2	854.0	854.0	854.0	0.0
AF	9.92	49	192	1.6	854.2	854.2	854.2	0.0
AG	10.05	78	137	2.2	854.4	854.4	854.4	0.0
AH	10.18	40	119	2.3	854.8	854.8	854.8	0.0
AI	10.21	74 [†]	183	1.5	855.8	855.8	855.8	0.0

¹ MILES ABOVE MOUTH

[†] FLOODWAY WIDTH MAY DIFFER FROM FIRM. PLEASE SEE FIRM FOR REGULATORY WIDTH

TABLE 9

FEDERAL EMERGENCY MANAGEMENT
**KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS**

FLOODWAY DATA

TURKEY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH	SECTION AREA	MEAN VELOCITY	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
		(FEET)	(SQ. FEET)	(FT/SEC)	(FEET, NAVD)	(FEET, NAVD)	(FEET, NAVD)	(FEET)
WALNUT CREEK								
A	0.15	291	949	2.1	809.1	809.0 ²	809.0	0.0
B	0.38	205	1,037	1.9	809.4	809.4	809.4	0.0
C	0.52	110	678	2.9	809.7	809.7	809.7	0.0
D	0.59	145	576	3.5	809.9	809.9	809.9	0.0
E	1.06	324	1,198	1.7	811.1	811.1	811.1	0.0
F	1.38	306	975	2.0	811.6	811.6	811.6	0.0
G	1.48	353	1,009	2.0	811.9	811.9	811.9	0.0
H	1.51	308	660	3.0	811.9	811.9	811.9	0.0
I	1.53	424 [†]	792	2.5	812.3	812.3	812.3	0.0
J	1.57	466	1,192	1.7	812.4	812.4	812.4	0.0
K	1.60	279 [†]	1,010	2.0	812.6	812.6	812.6	0.0
L	1.80	302	1,656	1.2	812.9	812.9	812.9	0.0
M	2.45	381	920	1.3	813.7	813.7	813.7	0.0
N	2.64	300	573	2.1	814.4	814.4	814.4	0.0
O	2.77	237	447	2.7	815.2	815.2	815.2	0.0
P	2.97	133	379	3.2	816.7	816.7	816.7	0.0
Q	3.01	84 [†]	269	4.5	817.0	817.0	817.0	0.0
R	3.81	258	522	2.3	824.7	824.7	824.7	0.0
S	3.89	134 [†]	417	2.9	825.3	825.3	825.3	0.0
T	4.05	125 [†]	255	4.8	827.1	827.1	827.1	0.0
U	4.35	138	228	4.6	833.0	833.0	833.0	0.0
V	4.51	52	226	4.6	835.5	835.5	835.5	0.0
W	4.54	56	240	4.4	835.8	835.8	835.8	0.0
X	4.87	99	319	3.3	838.1	838.1	838.1	0.0
Y	5.25	50	255	4.1	840.2	840.2	840.2	0.0
Z	5.30	52	267	3.9	840.4	840.4	840.4	0.0

¹ MILES ABOVE MOUTH

[†] FLOODWAY WIDTH MAY DIFFER FROM FIRM. PLEASE SEE FIRM FOR REGULATORY WIDTH

² ELEVATIONS WITHOUT CONSIDERING BACKWATER FROM TIPPECANE RIVER

TABLE 9	FEDERAL EMERGENCY MANAGEMENT	FLOODWAY DATA
	KOSCIUSKO COUNTY, IN AND INCORPORATED AREAS	WALNUT CREEK

5.0 INSURANCE APPLICATIONS

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

Zone A

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

Zone AE

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

Zone X

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

6.0 FLOOD INSURANCE RATE MAP

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

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

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

The current FIRM presents flooding information for the entire geographic area of Kosciusko County. Previously, separate FIRMs were prepared for each identified flood prone incorporated community and for the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 10.

7.0 OTHER STUDIES

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, Region V, 536 S. Clark Street, 6th Floor, Chicago, IL 60605

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Burket, Town of ^{1,2}	N/A	N/A	N/A	
Claypool, Town of ^{1,2}	N/A	N/A	N/A	
Etna Green, Town of ^{1,2}	N/A	N/A	N/A	
Kosciusko County ³ (Unincorporated Areas)	December 27, 1974	September 9, 1977	N/A	None
Leesburg, Town of ²	N/A	N/A	N/A	
Mentone, Town of ³	July 20, 1979	None	N/A	None
Milford, Town of ³	March 21, 1975	None	N/A	None
Nappanee, City of ¹	May 24, 1974	None	August 15, 1983	
North Webster, Town of ²	N/A	None	N/A	None
Pierceton, Town of ^{1,2}	N/A	N/A	N/A	
Sidney, Town of ^{1,2}	N/A	N/A	N/A	
Silver Lake, Town of ²	N/A	None	N/A	None
Syracuse, Town of ³	August 9, 1974	June 11, 1976	N/A	None
Warsaw, City of ³	May 10, 1974	May 28, 1976	N/A	None
Winnona Lake, Town of	May 3, 1974	April 30, 1976	September 4, 1985	

¹No Special Flood Hazard Areas identified

²This community does not have map history prior to the first county wide mapping

³This community did not have a FIRM prior to the first county wide FIRM for Kosciusko County

TABLE 10

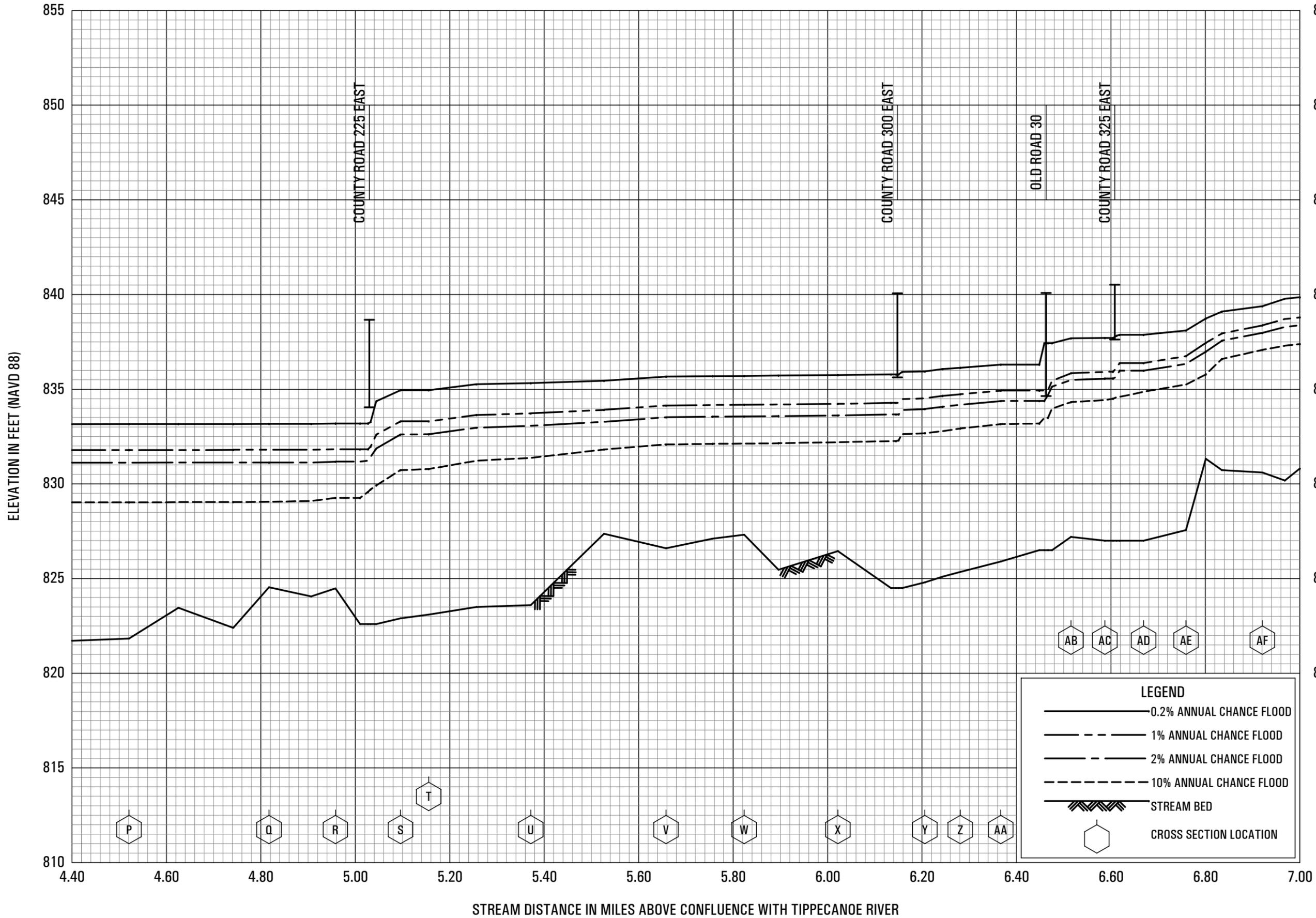
FEDERAL EMERGENCY MANAGEMENT AGENCY

KOSCIUSKO COUNTY, IN
(AND INCORPORATED AREAS)

COMMUNITY MAP HISTORY

9.0 **BIBLIOGRAPHY AND REFERENCES**

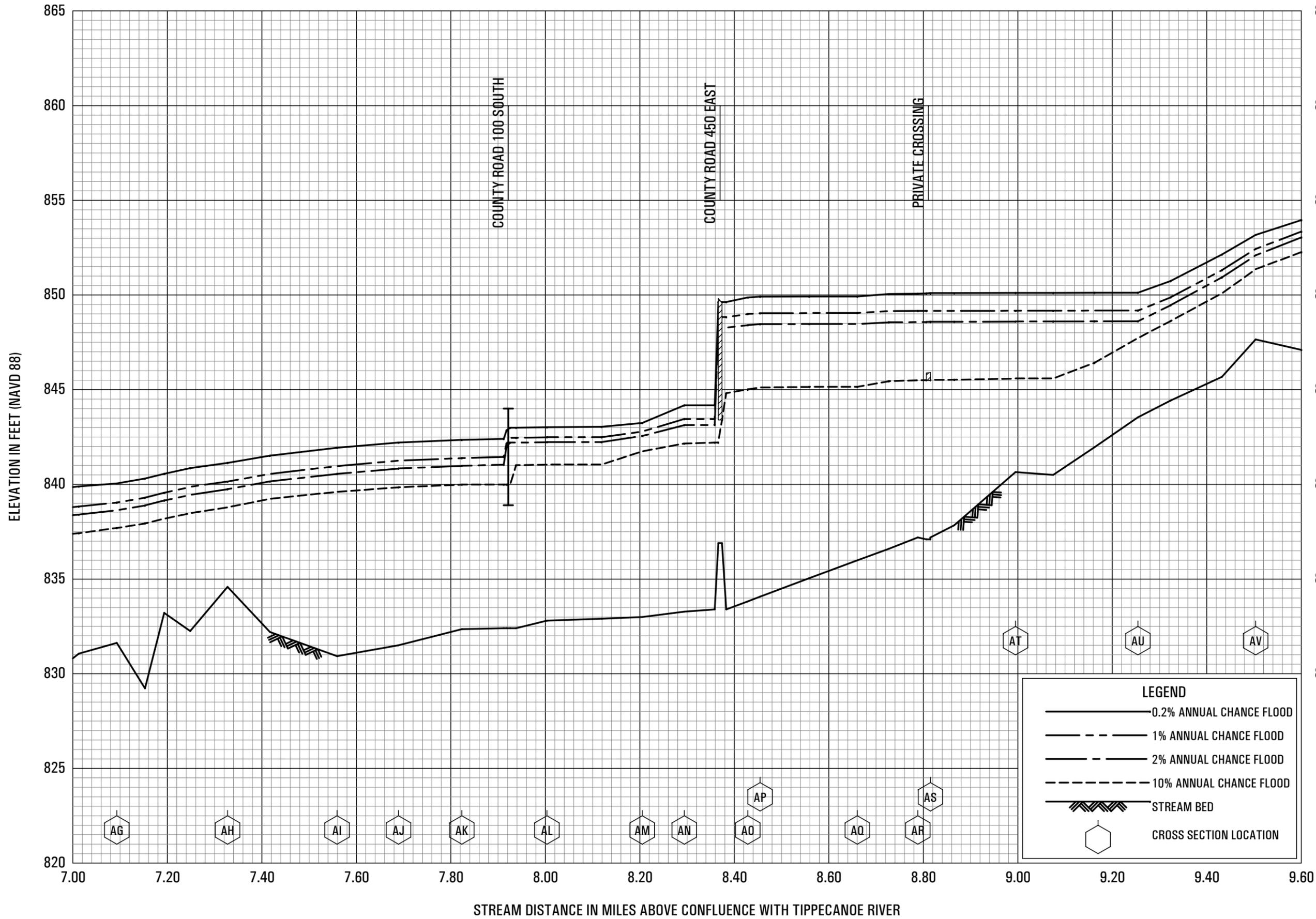
1. Federal Emergency Management Agency, Flood Insurance Study, Kosciusko County, IN, and Incorporated Areas, Washington D.C., February 4, 1987.
2. Federal Emergency Management Agency, Flood Insurance Study, Elkhart County, IN, Unincorporated Areas, Washington D.C., June 5, 1985.
3. “Population Counts, Estimates and Projections”, STATS Indiana, Indiana Business Research Center, Indiana University Kelley School of Business, accessed at www.stats.indiana.edu/pop_totals_topic_page.html.
4. National Oceanic and Atmospheric Administration, National Climatic Data Center, Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Days, 1971-2000, Climatography of the United States No. 81, 2002
5. “Peak Streamflow for Indiana”, United States Geological Survey, National Water Information System, accessed at <http://nwis.waterdata.usgs.gov/in>.
6. U.S. Army Corps of Engineers, HEC-2 Water-Surface Profiles Computer Program 723-X6, L202A, Davis, California, November 1976.



FLOOD PROFILES

DEEDS CREEK

**FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS**

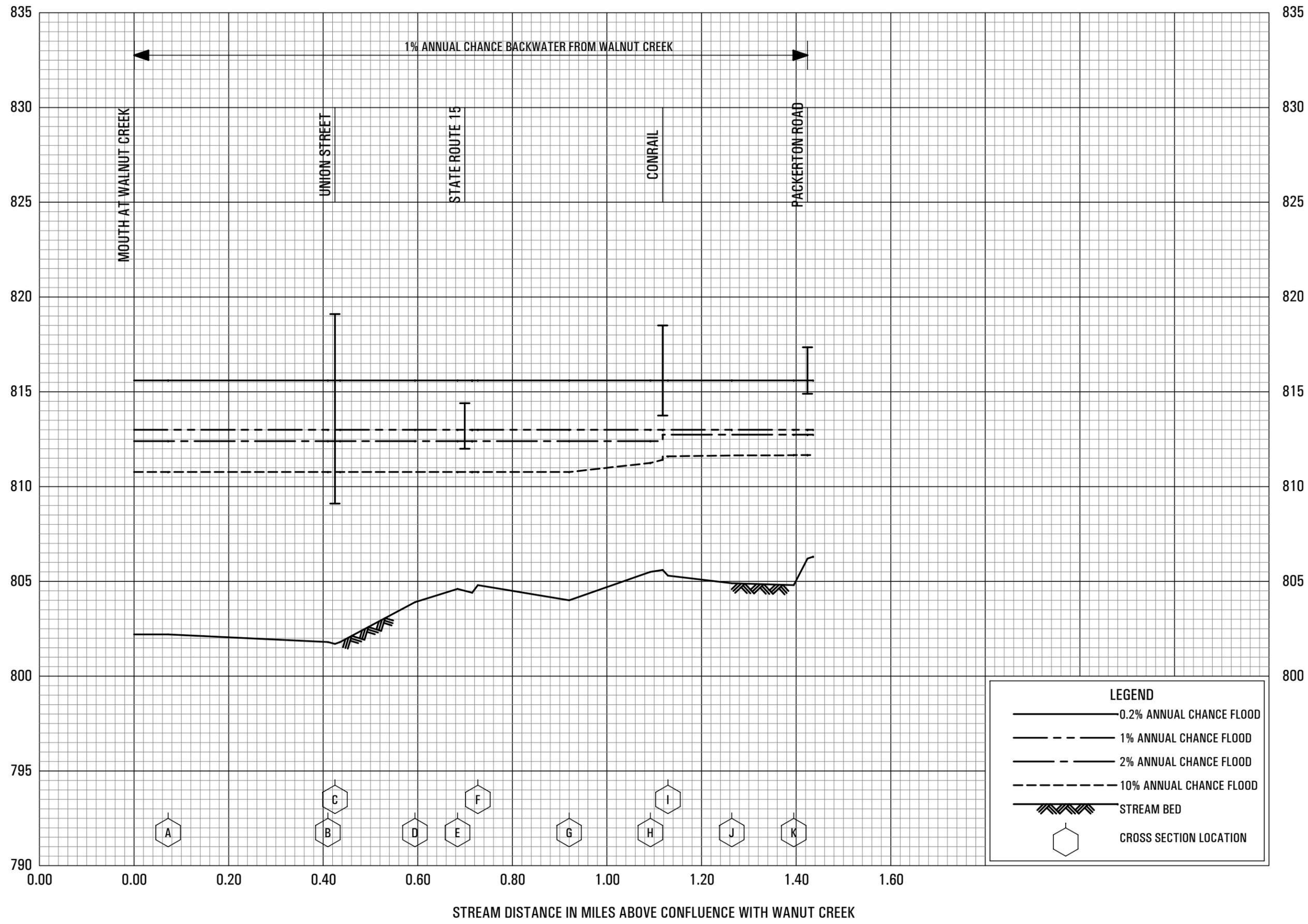


FLOOD PROFILES

DEEDS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
 AND INCORPORATED AREAS

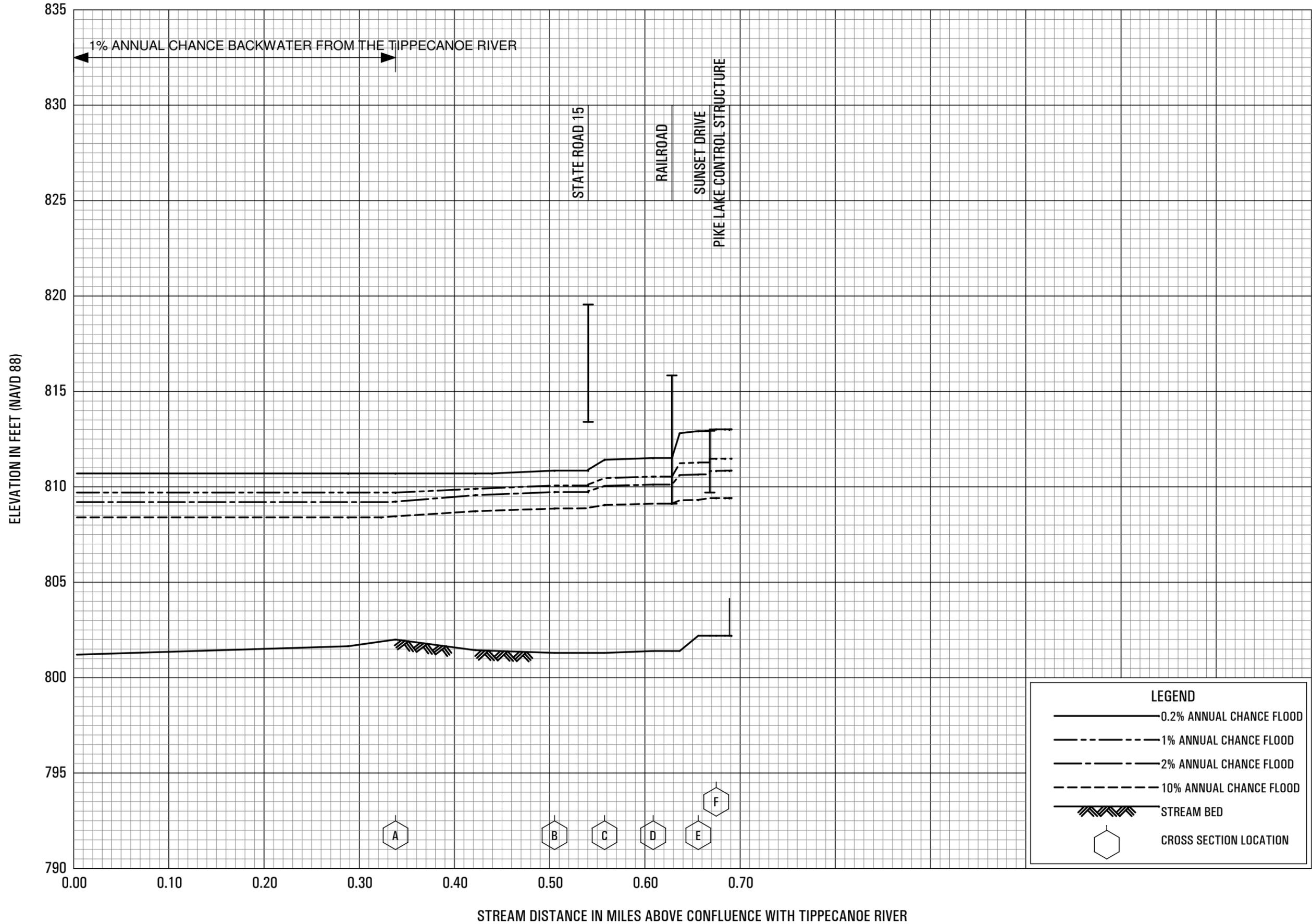
ELEVATION IN FEET (NAVD 88)



FLOOD PROFILES

EAGLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS

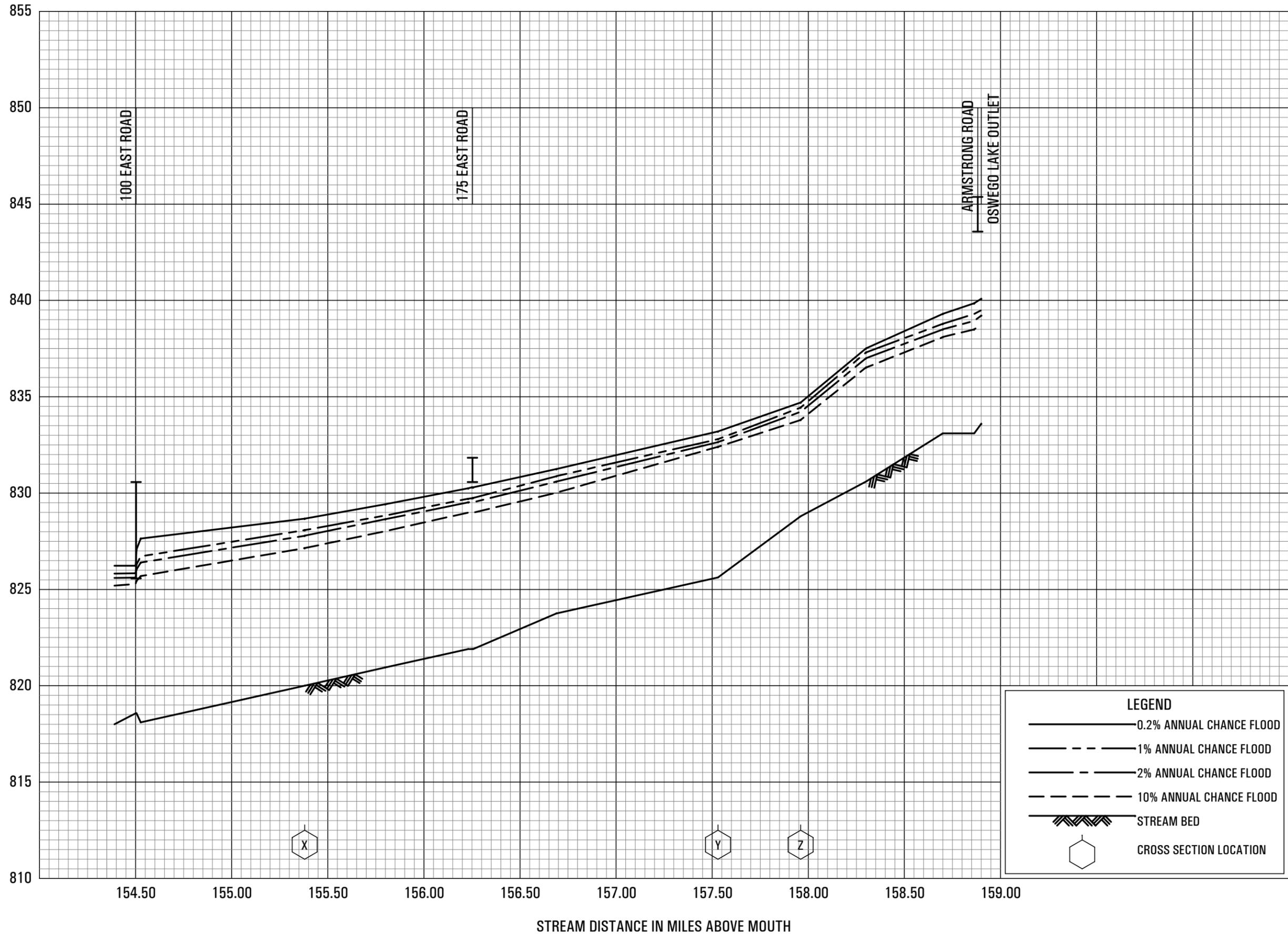


FLOOD PROFILES

LONES DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
 AND INCORPORATED AREAS

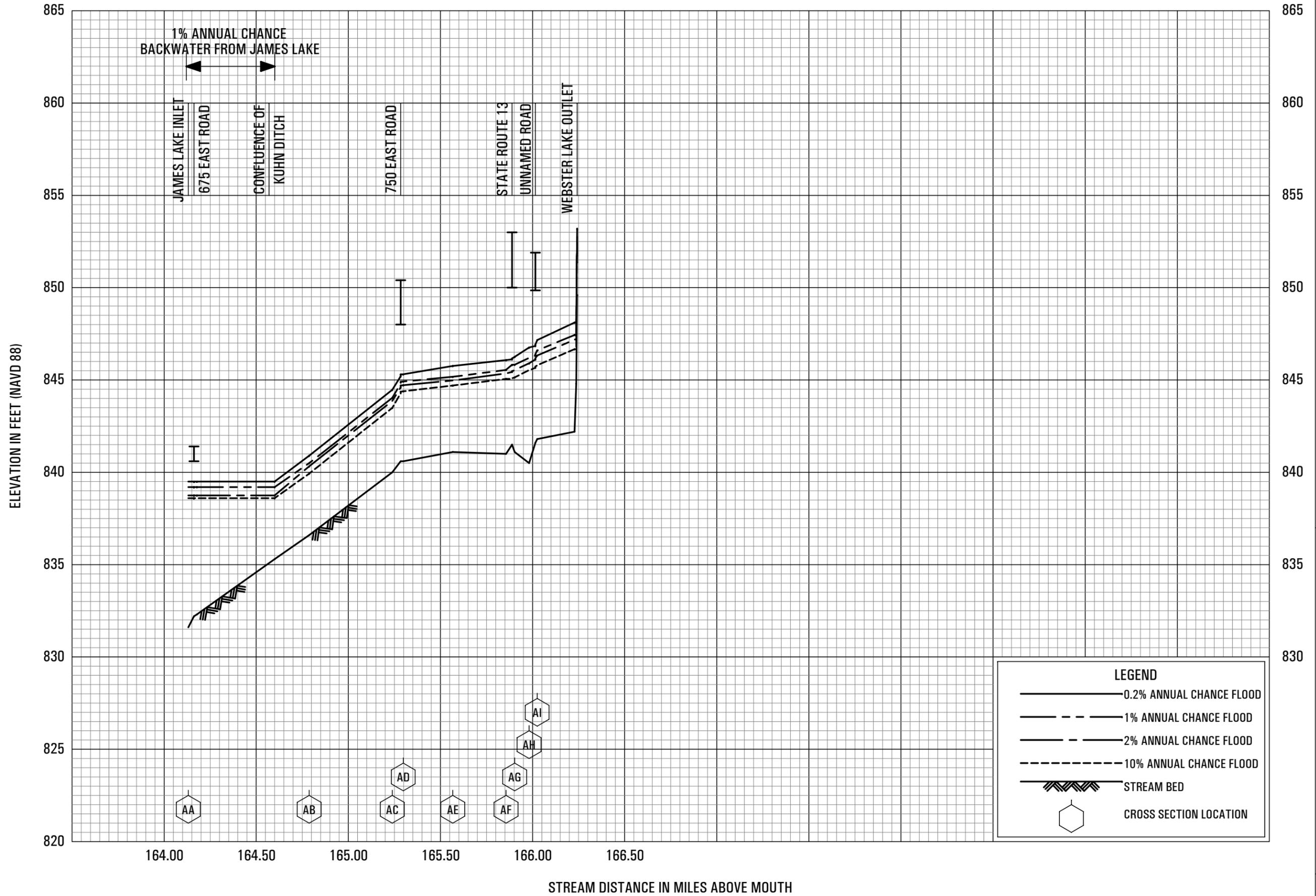
ELEVATION IN FEET (NAVD 88)



FLOOD PROFILES

TIPPECANOE RIVER

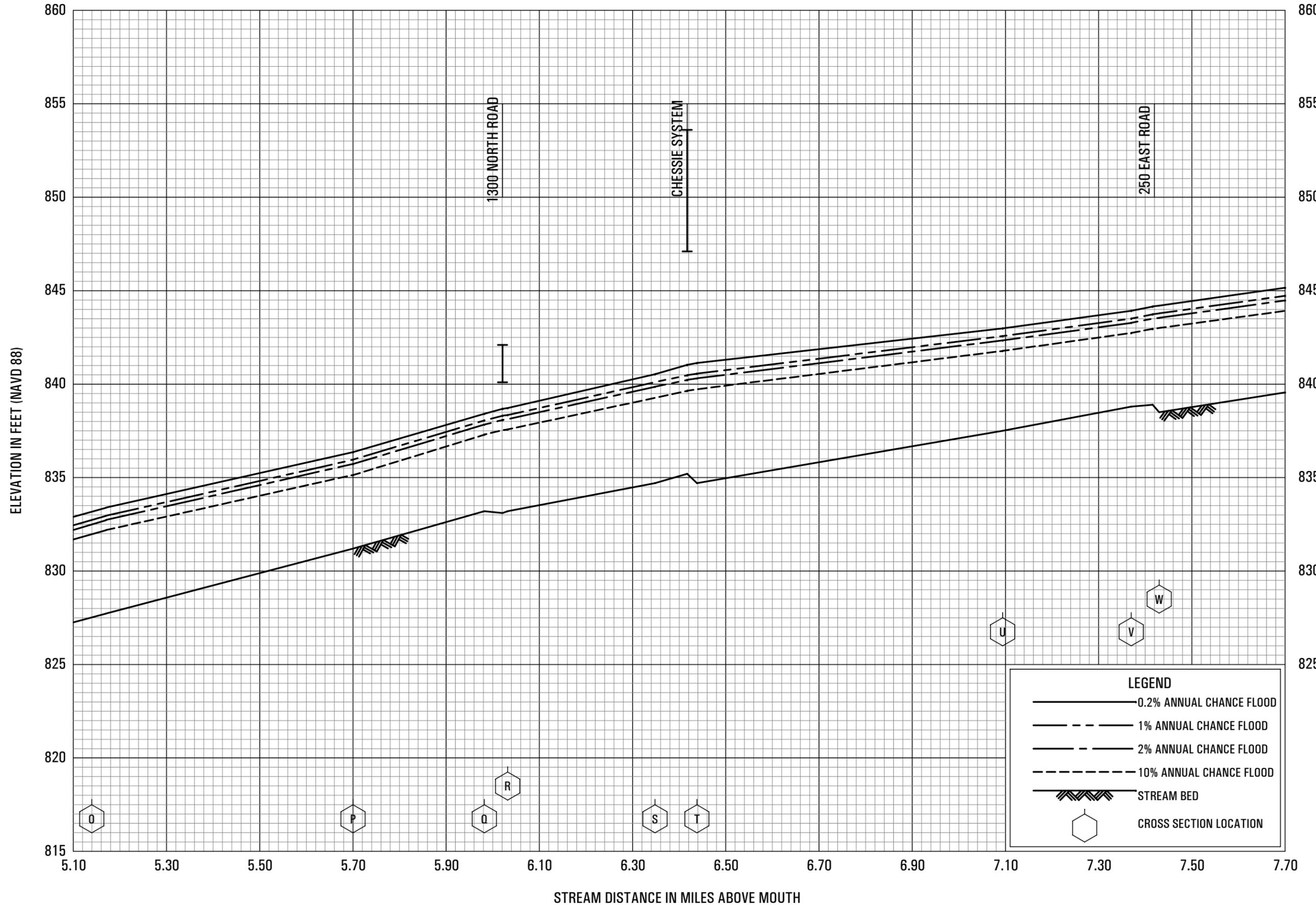
FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS



FLOOD PROFILES

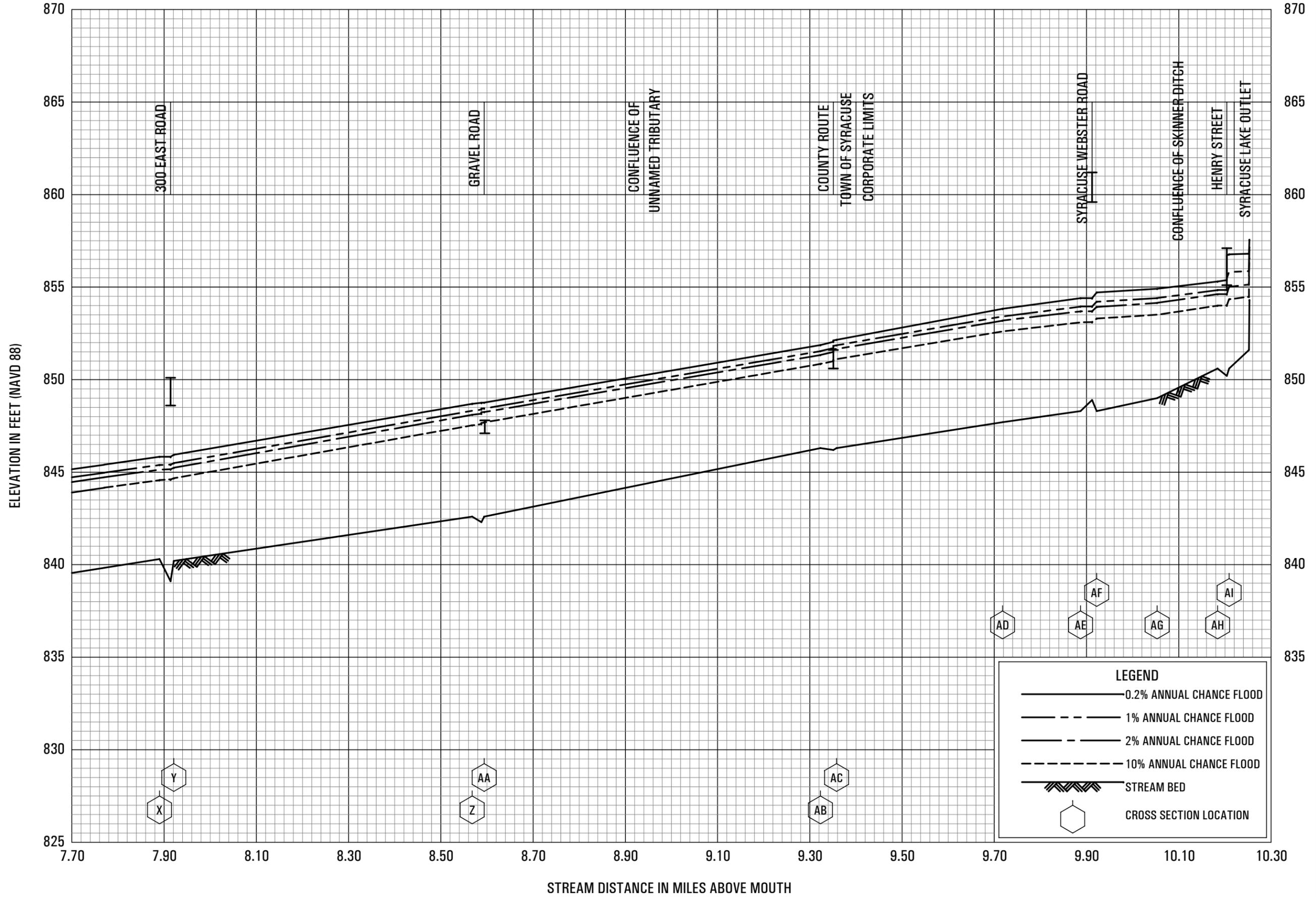
TIPPICANOE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
 AND INCORPORATED AREAS



FLOOD PROFILES
TURKEY CREEK

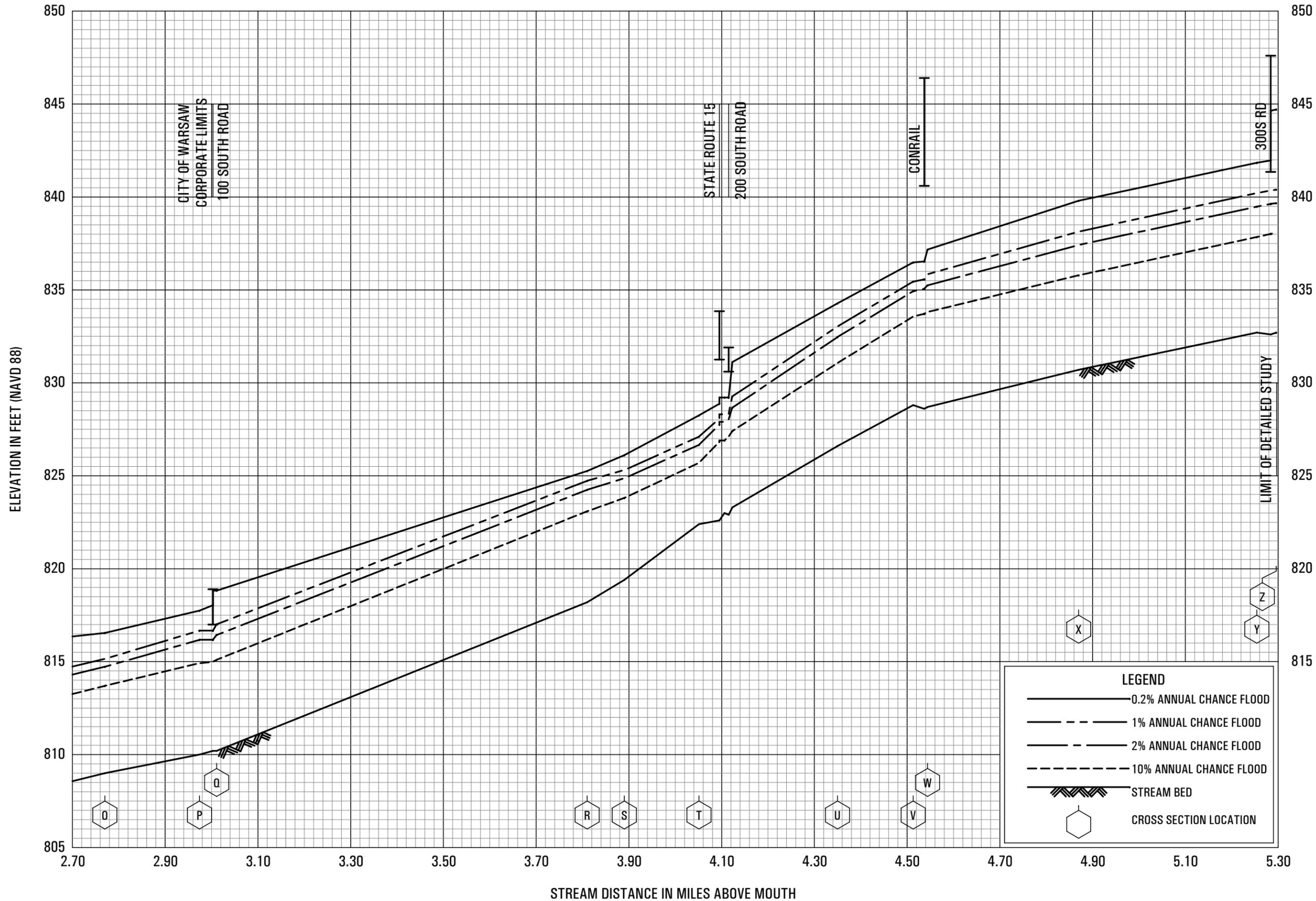
FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS



FLOOD PROFILES

TURKEY CREEK

**FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
AND INCORPORATED AREAS**



FLOOD PROFILES

WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
KOSCIUSKO COUNTY, IN
 AND INCORPORATED AREAS