

FLOOD INSURANCE STUDY



UNION COUNTY, INDIANA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
LIBERTY, TOWN OF UNION COUNTY	180592
(Unincorporated Areas)	180411
WEST COLLEGE CORNER, TOWN OF*	180593

*No Special Flood Hazard Area



Preliminary:

Federal Emergency Management Agency



FLOOD INSURANCE STUDY NUMBER
18161CV000A

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
C	X

Initial Countywide FIS Effective Date:

TABLE OF CONTENTS

	Page
1.0 <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	4
2.3 Principal Flood Problems	5
2.4 Flood Protection Measures	5
3.0 <u>ENGINEERING METHODS</u>	5
3.1 Hydrologic Analysis	6
3.2 Hydraulic Analysis	6
3.3 Vertical Datum	7
4.0 <u>FLOODPLAIN MANAGEMENT APPLICATIONS</u>	8
4.1 Floodplain Boundaries	8
4.2 Floodways	9
5.0 <u>INSURANCE APPLICATION</u>	11
6.0 <u>FLOOD INSURANCE RATE MAP</u>	12
7.0 <u>OTHER STUDIES</u>	14
8.0 <u>LOCATION OF DATA</u>	14
9.0 <u>BIBLIOGRAPHY AND REFERENCES</u>	14

FIGURES

Figure 1 - Floodway Schematic	10
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TABLES

Table 1 – Streams Studied By Approximate Methods	4
Table 2 – Scope of Study	4
Table 3 – Population of Incorporated Cities and Towns in Union County	5
Table 4 – Summary of Stillwater Elevations	6
Table 5 – Community Map History	13

EXHIBITS

Exhibit 1 - Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
UNION 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 Union County, Indiana, including the Towns of Liberty and West College Corner, and the unincorporated areas of Union County (hereinafter referred to collectively as Union 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 Union 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 Town of West College Corner does not have special flood hazard area within its incorporated limits. However, for the purpose of complete county-wide mapping of Union County, this town is still included in this FIS and FIRMs.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into local GIS and be accessed more easily by the community.

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 Union County was compiled and is shown below:

Union County
(Unincorporated Areas) No previous FIS.

Liberty, Town of: No previous FIS.

West College Corner,
Town of: No previous FIS.

New Studies: The hydrologic and hydraulic analysis for approximate stream reaches of Union County was performed by AMEC Earth and Environmental, Inc., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E060019. 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 08-01 dated July 3, 2008 and funded under agreement number EMC-2007-CA-7027.

Redelineation of the previously effective flood hazard information for this FIS report, correction to the North American Vertical Datum of 1988, and conversion of the unincorporated and incorporated areas of Union County into the Countywide format was performed by AMEC Earth and Environmental, Inc., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E060019. 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 08-01 dated July 3, 2008 and funded under agreement number EMC-2007-CA-7027.

The coordinate system used for the production of the digital FIRMs is the Transverse Mercator projection, Indiana State Plane coordinate system, East Zone, referenced to the North American Datum of 1983 and the GRS1980 spheroid.

1.3 Coordination

The purpose of an initial Consultation Coordinated Officer's (CCOs) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. Since there are no previous FIS reports for the communities in Union County, the dates of the initial and final CCO meetings that may have been held for the previously effective FIRMs covering the geographic area of Union County, Indiana are not available. The initial and final CCO meetings may have been attended by the study contractor, FEMA (or the Federal Insurance Administration), the Indiana Department of Natural Resources (IDNR), and the affected communities.

For this countywide FIS, an initial CCO meeting was held on July 25, 2007, and was attended by IDNR, the Union County Plan District, the Union County Surveyor, and the West College Corner Council.

The results of the countywide study were reviewed at the final CCO meeting held on --, and attended by representatives of FEMA, IDNR and [REDACTED]. 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 Union County, Indiana, including the incorporated communities listed in Section 1.1.

All FIRM panels for Union County have been revised, updated, and republished in countywide format 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, six new stream reaches were studied using approximate methods. The scope and methods of new approximate studies were proposed and agreed upon by FEMA, the IDNR, and Union County. The US Army Corps of Engineers (USACE) completed Analysis for the Brookville Lake Flood Control Reservoir.

This FIS update also incorporates the determination of letters issued by FEMA resulting in map changes (Letters of Map Change, or LOMCs). There are no Letters of Map Revision (LOMRs) to include in this update. Letters of Map Amendment (LOMAs) incorporated for this study are summarized in the Summary of Map Actions (SOMA) included in the Technical Support Data Notebook (TSDN) associated with the FIS update. Copies of the TSDN may be obtained from the Community Map Repository.

Table 1: Streams Studied by Approximate Methods

College Creek	Dubois Creek
East Fork Whitewater River	Hanna Creek
Indian Creek	Little Four Mile Creek
Nutter Creek	Richland Creek
Simpson Creek	Silver Creek
West Fork Four Mile Run	

Table 2: Scope of Study

<u>Stream</u>	<u>Limits of Approximate Study</u>
East Fork Whitewater River	Limit of Brookville Lake 100 yr d/s of Clifton Road to Wayne Co Line
Hanna Creek	Mouth to County Road 200N
Indian Creek	Franklin County Line to CR 150N
Little Four Mile Creek	Indiana/Ohio State Line to Radar Creek
Richland Creek	Mouth to CR 550N
Silver Creek	Whitewater Lake to Wayne County Line
<u>Stream</u>	<u>Limits of Detailed Study</u>
Brookville Lake	Entire area within the County

2.2 Community Description

Union County is located along the state line with Ohio in east-central Indiana and is bordered by Wayne County to the north, Preble County, Ohio to the east, Butler County, Ohio to the southeast, Franklin County to the south, and Fayette County to the west. The total land area within the county is approximately 161.5 square miles. The largest community and county seat is Liberty which is located approximately 67 miles east of Indianapolis and 41 miles northwest of Cincinnati, Ohio. Union County is served by US Highway 27, State Routes 44, 101, and 227.

The climate in Union County ranges from hot and humid in the summertime to cold during the winter season. Average daytime temperatures during the summer fall around 71.9°F, while winter temperatures average at approximately 28.8°F. Precipitation for Union County totals an annual amount of 41.89 inches.

According to U.S. Census Data from the year 2000, the population of Union County was reported to be 7,349. Table 3 lists the population of the incorporated areas in Union County.

Table 3: Population of incorporated cities and towns in Union County 2000 Census

<u>Community</u>	<u>Population</u>
Liberty, Town of	2,061
West College Corner, Town of	634

2.3 Principal Flood Problems

Major flooding in Union County primarily occurs along the East Fork Whitewater River. Floods principally occur during the winter and spring months, but can occur during any season. Generally, two types of storm events cause flooding. During the winter and spring, storms of moderate intensity and long duration, coupled with frozen ground, cause flooding to occur. During the summer, thunderstorms which have high intensities and relatively short durations can cause floods. Localized flood problems in the incorporated areas are summarized below:

Liberty, Town of: Subject to flooding from Silver Creek.

West College Corner,
Town of: There are no principal flooding problems at this time.

2.4 Flood Protection Measures

There are no structural flood protection measures in Union County.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in Union 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 analysis reported herein reflects 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 Analysis

Hydrologic analysis was carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting Union County. There are no detailed studies in this Union County FIS. Therefore, there is no detailed hydrology for publication.

Stillwater elevations for floods of the selected recurrence intervals for Brookville Lake are shown in Table 5.

Table 4: Summary of Stillwater Elevations

Flooding Source And Location	Elevation (Feet, NAVD 1988)			
	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Brookville Lake				
Entire	*	*	772.5	*

*Data not available

Standard and accepted hydrologic methods were used to develop discharge data on the study streams in Union County.

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.

3.2 Hydraulic Analysis

Analysis of the hydraulic characteristics of flooding from the sources studied was 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.

For new approximate study areas, analysis was 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 was derived from topographic mapping from the 2005 statewide orthophotography project. Starting elevations were assumed to be normal depth.

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 -0.51 feet was calculated at the centroid of the county and used to convert all elevations in Union county from NGVD29 to NAVD88 using the National Geologic Survey's VERTCON online utility (VERTCON, 2005).

$$(NGVD29 - 0.51 = NAVD88)$$

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 mapping from the 2005 statewide orthophotography flight.

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 1).

4.2 Floodways

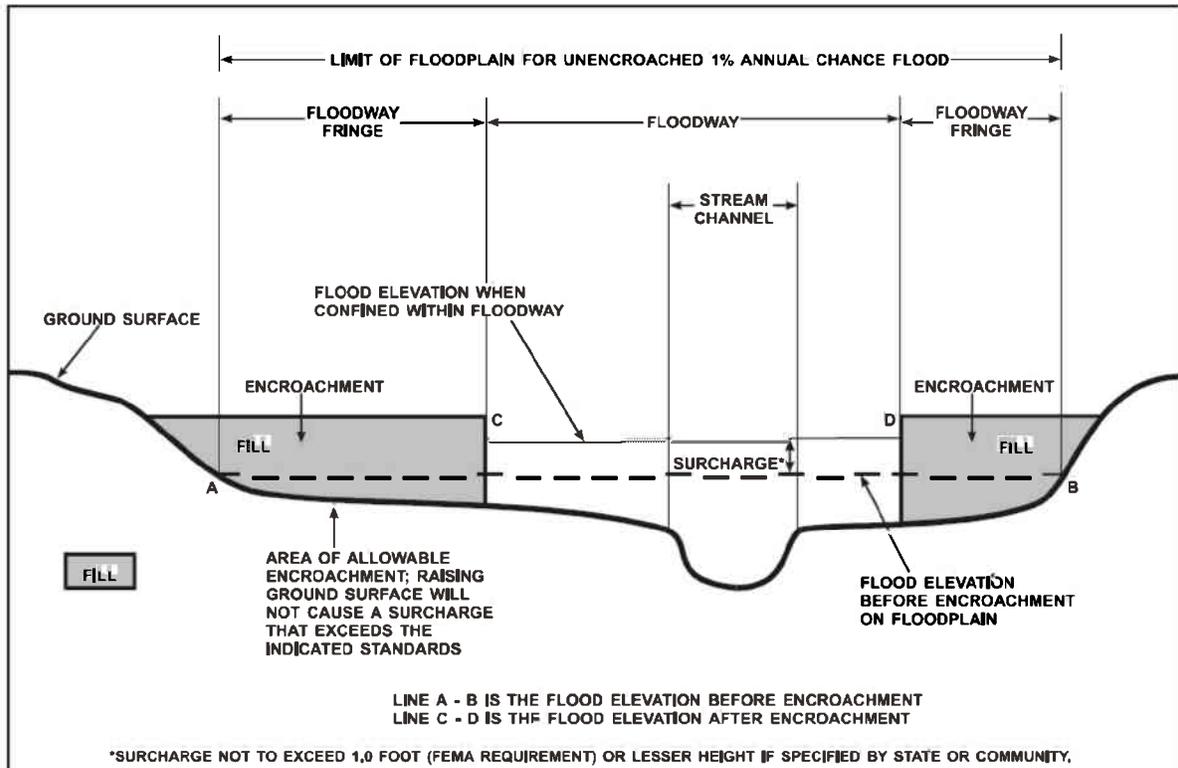
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development 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. No detailed studies have been performed for Union County; therefore no floodway data table is present in this report.

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 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 1.

Figure 1: Floodway Schematic



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 analysis. 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 analysis 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 analysis 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, and 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 analysis and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Union 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 9.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Liberty, Town of	TBD	None	TBD	None
Union County (Unincorporated Areas)	March 4, 1977	None	April 1, 1988	None
*West College Corner, Town of	TBD	None	TBD	None

*No Special Flood Hazard Area

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

**UNION COUNTY, IN
(AND INCORPORATED AREAS)**

COMMUNITY MAP HISTORY

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

9.0 BIBLIORAPHY AND REFERENCES

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2. “Historic Census for Indiana Incorporated and Census Designated Places from 1900 to 2000” STATS Indiana, Indiana Business Research Center, Indiana University Kelley School of Business, accessed at http://www.stats.indiana.edu/population/PopTotals/historic_counts_cities.asp
3. Indiana Administrative Code 310 IAC 10 Flood Plain Management accessed at <http://www.in.gov/legislative/iac/T03120/A00100.PDF>
4. Indiana Code IC 14-28-1, Flood Control Act, accessed at <http://www.in.gov/legislative/ic/code/title14/ar28/ch1.html>
5. Indiana Department of Natural Resources, Division of Water, Coordinated Discharges of Selected Streams in Indiana, accessed at http://www.in.gov/dnr/water/surface_water/coordinated_discharges/index.html
6. Indiana Department of Natural Resources, Division of Water, General Guidelines For The Hydrologic-Hydraulic Assessment Of Floodplains In Indiana, December 2002.
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11. U.S. Geological Survey, Surface-Water Data for Indiana, Peak-Flow Data for Union County. <http://nwis.waterdata.usgs.gov/in/nwis/peak>.