FLOOD INSURANCE STUDY

BROWN COUNTY, ILLINOIS
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BROWN COUNTY (UNINCORPORATED AREAS)	170989
*MOUND STATION	170010
*MOUNT STERLING, CITY OF	170009
RIPLEY, VILLAGE OF	170707
*VERSAILLES, VILLAGE OF	170744

*No Special Flood Hazard Areas Identified

Preliminary: August 31, 2016

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

17009CV000B

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 Community Map Repository. It is advisable to 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 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 Map Repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: October 16, 2009

Revised Countywide FIS Effective Date: To Be Determined

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FLOOD INSURANCE STUDY
BROWN COUNTY, ILLINOIS AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) and/or Flood Hazard Boundary Maps (FHBMs) in the geographic area of Brown County, Illinois, including: the City of Mount Sterling; the villages of Ripley, Mound Station, and Versailles and the unincorporated areas of Brown County (hereinafter referred to collectively as Brown 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 county that will be used to establish actuarial flood insurance rates. This information will also be used by Brown 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 C.F.R § 60.3.

The City of Mount Sterling and the villages of Mound Station and Versailles have no special flood hazard areas (SFHAs) identified. This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (i.e., annexation of new lands) or the availability of new scientific or technical data about flood hazards.

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 Acknowledgements

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

The FIS includes the unincorporated areas of, and incorporated communities within, Brown County. Information on the authority and acknowledgments for each jurisdiction included in this FIS, as compiled from their previously printed FIS reports, is shown below.

Pre-Countywide FISs

Brown County
(Unincorporated Areas): The hydrologic and hydraulic analyses for the FIS report dated November 1, 1985, (Reference 1) were obtained from "Illinois River Water Surface Profiles" (Reference 2).

The authority and acknowledgements for the City of Mount Sterling; the villages of Ripley, Mound Station, and Versailles are not included because there were no previously printed FISs for those communities.

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New hydrologic and hydraulic analyses for the Illinois River were prepared by the U.S. Army Corps of Engineers (USACE) and reported in the 2004 *Upper Mississippi River System Flow Frequency Study* (UMRSFFS) (Reference 3). Upon completion of the UMRSFFS, the 2005 *Illinois River, River Mile 80-286, Floodway Computation* was prepared for the Federal Emergency Management Agency (FEMA) under Contract Number HSFE05-04-X-0018 (Reference 4).

Planimetric base map information was derived from 2005 U.S. Geological Survey (USGS) digital orthophoto quarter quadrangles at a one-half meter ground resolution (Reference 5). Illinois State Geological Survey statewide ArcSDE raster mosaic of USGS digital raster graphs at a scale of 1:24,000 (Reference 6) and the USGS National Elevation Dataset were also used in the digitization (Reference 7).

The coordinate system used for the production of the digital FIRMs is Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD 83) Geodetic Reference System 1980 (GRS80) spheroid.

This countywide FIS was performed under the Cooperating Technical Partners (CTP) Partnership Agreement No. EMC-2006-CA-7015 between the Illinois Department of Natural Resources (hereinafter referred to as IDNR) and FEMA, per the Mapping Activity Statement (MAS) No. IDNR06-02. The FIS was written, compiled, and edited under the direction of Daniel Abraham, IDNR.

This Physical Map Revision

This Physical Map Revision removes the Provisionally Accredited Levee designation and accredits the McGee Creek Levee system in Brown County. The revision was performed by Strategic Alliance for Risk Reduction (STARR) under contract No. HSFEHQ-09-D-0370, Task Order No. HSFE05-10-J-0003. The levee certification (Reference 32) was submitted by Klingner and Associates, P.C. on behalf of the McGee Creek Drainage & Levee District.

Base Map information shown on this FIRM was provided in digital format by Farm Services Administration. This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2012.

The projection used in the preparation of this map was the UTM zone 15.

1.3 Coordination

Coordination and outreach activities were performed to create a climate of understanding and ownership of the mapping process at the state and local levels. These activities were ongoing throughout the entirety of the project.

Pre-Countywide FISs

The purpose of an initial Consultation Coordination Officer's (CCO) meeting, or project team meeting, is to discuss the scope of the project. An intermediate CCO meeting, or scoping meeting, is meant to continue outreach and create a climate of understanding throughout the process. A final CCO meeting, or open house, is held with public officials and the general public to review the results of the study. The dates of the initial and final CCO meetings held for the pre-countywide studies for Brown County's incorporated communities and unincorporated area are shown in Table 1, "CCO Meeting Dates for Pre-Countywide Studies."

Table 1 – CCO Meeting Dates for Pre-Countywide Studies

Community	Initial CCO Date	Final CCO Date
Brown County (unincorporated areas)	*	November 15, 1984

*Initial meeting not held

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The project team meeting was held on August 3, 2006, in Mount Sterling, Illinois, and attended by representatives of Brown County and the study contractor (IDNR). This meeting was intended to discuss various issues and concerns for the study area. A scoping meeting was held on August 24, 2006 in Mount Sterling, Illinois, and was attended by representatives from Brown County and IDNR.

A preliminary FIRM and FIS were prepared by merging effective FIS text, tables, and profiles with new study data. A preliminary Summary of Map Actions (PSOMA) was also prepared for all affected communities. The PSOMA lists pertinent information regarding Letters of Map Change (LOMCs) that will be affected by the issuance of the FIRM (i.e., superseded, incorporated, and revalidated). Preliminary copies of the FIRM, FIS, and SOMA were distributed to community officials for public review and comment.

The results of the study were reviewed at the open house held on October 28, 2008 in Mount Sterling, Illinois, and attended by representatives of the United States Department of Agriculture Natural Resources Conservation Service. All problems raised at that meeting have been addressed in this study.

This Physical Map Revision

On November 11, 2010, Klingner & Associates on behalf of the McGee Creek Drainage & Levee District provided FEMA with documentation that the levee system complies with 44 CFR Section 65.10. Therefore, per FEMA guidance, the levee system is shown on the revised FIRM as providing protection from the 1-percent-annual-chance flood.

The results of the study were reviewed at the final meeting held on _____, and attended by representatives of_____. All issues and/or concerns raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Brown County including the incorporated areas listed in Section 1.1.

The flooding information for the entire county, including both incorporated and unincorporated areas is shown. The vertical datum was converted from the National Geodetic Vertical Datum of 1929 (NGVD 29) to the North American Vertical Datum of 1988 (NAVD 88).

Typically, areas studied by detailed methods are selected with priority given to all known flood hazards and areas of projected development or proposed construction. Approximate analyses are used to study those areas having low development potential or minimal flood hazards. Several streams in Brown County were studied by approximate methods.

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The streams, or portions of streams, listed in Table 2, "Limits of New or Revised Detailed Study," have new or revised hydrologic and hydraulic analyses for this countywide FIS.

Table 2 – Limits of New or Revised Detailed Study

Flooding Source	Limits of New or Revised Detailed Study
Illinois River	From the limit of flooding affecting the community at river mile 71.3 in Pike County to the Brown/Schuyler County Boundary at river mile 83.8, approximately the confluence of the La Moine River

The streams, or portions of streams, listed in Table 3, "Limits of Detailed Study," were studied in detail and included in this report. Limits of detailed study are also indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

Table 3 – Limits of Detailed Study

Flooding Source	Limits of Detailed Study
Illinois River	From the limit of flooding affecting the community at river mile 71.3 in Pike County to the Brown/Schuyler County Boundary at river mile 83.8, approximately the confluence of the La Moine River

Previous maps and reports for Brown County are community-based. The maps and reports for adjacent communities may not reflect the same data. The conversion from community-based mapping to countywide mapping includes resolution and consolidation of data within the countywide FIS, as well as showing the full extent of the floodplains and floodways through mapped reaches on the countywide FIRM.

The conversion to countywide mapping may result in new or revised base flood elevations (BFEs) and floodway data for communities. The countywide FIRM may show detailed studies where previously approximate studies were shown, and/or may show flood hazard areas where previously no flood hazard areas were shown, and/or may show floodway where previously no floodway was shown.

Also, special flood hazard areas were delineated for limited distances between study reaches using additional information from the model or interpolated for consistency.

Summary of Map Actions (SOMA)

FEMA issues determination letters for map changes (Letters of Map Change, or LOMCs). No letters issued by FEMA resulted in map changes (Letter of Map Revision [LOMR] and/or Special Response [SR]) of sufficient scale to be incorporated in the FIS revision.

This Physical Map Revision

For this Physical Map Revision, the McGee Creek Levee was revised from Provisional Accredited to Accredited and interior drainage behind the levee was incorporated.

2.2 Community Description

Brown County was established by the Illinois Secretary of State on February 1, 1839, when it was separated from Schuyler County (Reference 8). The county is serviced by U.S. Route 24, which runs east-west and connects Mount Sterling to Quincy, Illinois. State Route 107 also connects Mount Sterling to Griggsville to the south.

According to the U.S. Census Bureau, the population of Brown County was 6,937 in 2010 and was estimated at 6,832 in 2014 (Reference 9). Mount Sterling, the Brown County seat, is located in central Brown County. In 2010, Mount Sterling was the largest community in Brown County with a population of 2,025 (Reference 10).

Brown County is located in western Illinois at the confluence of the La Moine and Illinois Rivers. The Illinois River forms the eastern border of the county, and the La Moine River forms 22 miles of the northeastern border. Brown County is bordered by Schuyler County, Illinois to the north, Cass County, Illinois and Morgan County, Illinois to the east, Pike County, Illinois to the south and Adams County, Illinois to the west.

The Illinois River is a principal tributary of the Mississippi River and is formed by the confluence of the Kankakee and Des Plains Rivers in western Grundy County, approximately 10 miles southwest of Joliet. It flows westerly, to the "Great Bend" near Hennepin, Illinois in southeastern Bureau County. At the Great Bend the Illinois River turns to flow southerly. It is joined by the La Moine River on the border between Schuyler and Brown counties, approximately 84 miles upstream from its confluence with the Mississippi (Reference 11).

The La Grange Lock and Dam is located at river mile 80.2 on the Illinois River and is the river's southernmost navigation lock and dam. The navigational structure was built by the USACE in 1939 and is maintained and operated by the USACE (Reference 12). The lock and dams on the Illinois River maintain a navigational depth and allow boats to travel on the river with limited river incline (Reference 13).

Illinois residents enjoy the variety of four distinct seasons. Illinois' climate is humid continental with cold winters, warm to hot summers, and frequent short fluctuations in temperature, humidity, cloudiness, and wind direction. Prevailing winds are from the west (Reference 14). In Brown County, the average annual high temperature is 61.6 degrees Fahrenheit (°F) while the average annual low is 41.2°F. The highest temperature recorded at the Rushville, Illinois climate station

(Station No. 117551) is 113°F on July 15, 1936. The lowest temperature recorded was -26°F on February 13, 1905. Average annual precipitation is 39.32 inches, which includes an average annual snowfall of 18.1 inches. The majority of precipitation (61 percent) falls between April and September (Reference 15).

Brown County encompasses approximately 306 square miles of land within the corn belt of the United States. Cropland comprises 41.7 percent of the county with 32.1 percent in row crops and 9.6 percent in small grains. The remainder of the county is covered in forest (30.0 percent), grassland (24.5 percent), wetland (1.4 percent), open water (1.8 percent), and urban/built-up land (0.7 percent). The county ranks first in the state in percentage of perennial streams (1.2 percent) (Reference 16). At Brown County's western border, Brown shares Siloam Springs State Park with Adams County. The 3,323 acre park supports activities such as hunting, fishing, camping, boating, picnicking, hiking and bird watching (Reference 17).

Brown County is located in the La Moine and Lower Illinois Watersheds. The county is drained by the La Moine and Illinois Rivers and the McKee Creek. These streams are connected to smaller tributaries, which make up 2,438 total acres of streams scattered throughout the county (Reference 15). At 100 miles in length (Reference 18), the La Moine River is the sixth largest tributary to the Illinois River and drains the northern half of Brown County. At about 27 miles in length, the McKee Creek is the longest stream in the county (Reference 19, 20).

The majority of the topography of Brown County is rugged timberland where streams have deeply incised the upland hillside revealing glacial drift and shale residuum. The majority of the streams in the county are clear and have gravel, rock or sandy bottoms. The soil is nearly level to steep sloping with moderate to well-drained soils formed in loess and glacial till. In the western portion of the county, there is upland prairie on nearly level to sloping land with fertile loess soil. The lower Illinois River bottom contains silty clayey soils on land that is nearly level, well drained to very poorly drained soils formed in fine to moderately fine textured alluvium (Reference 20).

The soil in Brown County has allowed agriculture to become the main industry in the county. The sale of livestock makes up about half of the agricultural sales. The county's geological resources allow for mining and related industries. Sand, limestone, clay, gravel, as well as fuel resources such as coal, oil, and gas are prevalent in the county (Reference 20). The county also ranks eighth in the state in acreage covered by woodland or forest, which allows timber industry to thrive (Reference 15).

The Illinois River floodplain of Brown County has been levied, drained and converted for agricultural use. Two initiatives have worked to return large tracts of land to their previous natural order.

North of the La Grange Lock and Dam, at the confluence of the La Moine and Illinois Rivers, the Illinois Department of Transportation (IDOT) has acquired

1,645 acres of farmland for wetland restoration called the La Grange Wetland Mitigation Bank. The area once held floodwaters from the La Moine and Illinois Rivers until the 1940s when the area was converted to agricultural land through the use of levees and drainage systems. The acquired land included drainage ditches, levees and pipes, and a 12,000 gallon-per-minute diesel-powered pump. IDOT has "deactivated" the pump, pipes, and drains and has not repaired a breached levee in order to help the area once again provide floodwater and sediment storage for the watershed. IDOT is also actively restoring habitat and re-establishing backwater lake areas to return the area to its original ecological state. The area will provide habitat restoration for state and federally threatened species including decurrent false aster, Bald Eagle and other state or federally listed birds (Reference 21).

South of the La Grange Lock and Dam, along the Illinois River, the Nature Conservancy has acquired 2,026 acres of river bottom in Brown County that has been dedicated to wetland restoration. The Merwin Preserve at Spunky Bottoms lies east of County Highway 12/La Grange Locks Road and between Little Creek and Camp Creek. The wetland area was created from previously drained farmland located across the river from Meredosia National Wildlife Refuge by allowing water that was previously pumped out to be retained. The Nature Conservancy planted upland prairie and hardwood trees and allowed native plant species to survive. The Nature Conservancy is working with the USACE to reconnect the wetland area with the Illinois River to encourage biodiversity and increase wetland and riverine health (Reference 22).

2.3 Principal Flood Problems

Floods within Brown County occur during all seasons of the year, yet the Illinois River shows marked seasonal characteristics. Floods on the Illinois River are most likely to occur in the months of February, March, April, and May due to a combination of melting snow cover and increased precipitation during spring. The lower Illinois River possesses unique flood characteristics because of its natural, relatively low gradient. Floodwaters rise slowly, persist for unusually long periods, and recede slowly (Reference 1).

The severity of floods is directly related to flood stage (the height of the floodwaters) at a given location. Early records of flood heights were marked on buildings and recorded by settlers in the area. Complete records of flood stages and discharges on the main stem of the lower Illinois River date back to 1921 when the first continuous gage records were initiated at Beardstown, Illinois. Continuous records of stage at other sites began in the late 1800s or early 1900s, including the USACE gage at Hardin initiated in 1932. These records, along with additional miscellaneous flood stage records, present a reliable record of flood stages on the Illinois River (Reference 1).

The earliest authentic account of flooding is the flood of 1844. The flood occurred before the establishment of the present stream gages but was so remarkable that it left well-authenticated high water marks throughout the river

valley. The 1844 flood reached an elevation of 436.6 feet National Geodetic Vertical Datum (NGVD 1929) at Hardin. The peak discharge of the 1844 flood has been estimated at 126,000 cubic feet per second (cfs) at Beardstown (Reference 1).

The USACE gage on the Norfolk Southern Railroad Bridge, 0.4 miles east of Valley City, measures velocity and river stages on the Illinois River (Reference 23). In this location, the flood stage occurs 11 feet above the gage (Reference 24). The record flood stage of 28.61 feet occurred on May 26, 1943. The 10 greatest peak streamflow and river stages of record on the Illinois River at the Valley City gage are listed in Table 4, "Historical Flood Data." The datum of gage is 418.00 feet above NGVD 1929. The information for this table was collected from USGS Water Resources Data: National Water Information System (Reference 23).

Table 4 - Historical Flood Data - Illinois River

Illinois River at Valley City, Illinois - USGS Gage Number 05586100

Datum of gage is 418.00 feet above NGVD 1929

Flood Stage: 11 feet

Date	Peak Streamflow (cfs)	River Stage (feet)
May 26, 1943	123,000	28.61
March 10, 1985	122,000	27.62
April 19, 1979	111,000	27.28
May 31, 1995	109,000	26.45
April 28, 2013	113,000	26.52
December 12, 1982	112,000	26.40
March 24, 1982	104,000	25.56
May 19, 2002	106,000	25.52
May 23, 1933	90,800	25.50
April 20, 1922	93,100	25.10

River stage levels on the La Moine River in Brown County are measured by the USACE gage east of the village of Ripley. The 15 greatest peak streamflow and river stages of record at the Ripley gage are listed in Table 5, "Historical Flood Data (La Moine River)". The datum of gage is 431.10 feet above NGVD 1929. The information for this table was collected from USGS Water Resources Data: National Water Information System (Reference 25).

Table 5 - Historical Flood Data – La Moine River

La Moine River at Ripley, Illinois - USGS Gage Number 5585000

Datum of gage is 431.10 feet above NGVD 1929

Flood Stage: 22 feet

Date	Peak Streamflow (cfs)	River Stage (feet)
April 21, 2013	37,200	32.59
May 18, 1995	26,100	29.15
March 7, 1985	28,000	29.07
May 8, 1996	26,100	29.07
June 23, 1990	27,300	28.96
November 19, 1985	22,000	28.63
September 27, 1970	24,100	28.42
May 15, 2002	20,000	28.41
October 7, 1986	23,400	28.10
September 26, 1961	18,600	27.43
December 5, 1982	21,000	27.27
July 27, 1993	16,600	26.98
July 10, 1969	17,100	26.96
May 19, 2009	18,100	26.81
June 6, 1980	18,800	26.74

During the summer of 1993, the upper Mississippi River and tributaries, such as the Illinois River, experienced severe flooding from the middle of June until early August. Rainfall totals surpassed 12 inches in many Midwestern states including Illinois. Now known as "The Great Flood of 1993," estimates of economic damages range from $10 to $20 billion, making it the costliest flood in U.S. history until the 2005 hurricane season (Reference 26). Businesses, residences (estimates range from 50,000 to 55,000 homes), water and wastewater facilities, transportation routes, levees, and crops were damaged or destroyed by flood-waters. Nineteen Illinois levees failed during this flood, with such failures typically resulting in more extreme damages than that caused by naturally rising floodwater. The intensity, area inundated, and long duration of the 1993 flooding make this flood one of the greatest natural disasters in U.S. history (Reference 27).

2.4 Flood Protection Measures

The McGee Creek Levee provides protection from flooding for an area north of the McGee Creek and west of the Illinois River. The current accreditation status for this levee can be located on the FIRM.

Other levees exist in the study area that provide the county with some degree of protection against flooding. However, levees that do not protect against the 1-

percent-annual-chance flood are not considered in the hydraulic analysis of the 1-percent-annual-chance floodplain.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in Brown 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 which equals or exceeds the 1-percent-annual-chance flood 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 Brown County 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 peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

Pre-Countywide FISs

Due to new detailed study data, pre-countywide study data on the Illinois River have been superseded. No other detailed studies were included previously.

October 16, 2009
Countywide FIS

Information on the methods used to determine peak discharge-frequency relationships for the streams studied as part of this countywide FIS is shown below.

The following information on the hydrologic analysis for the Illinois River supersedes the hydrologic analysis for the Illinois River from the FIS for Brown County, Illinois unincorporated areas dated November 1, 1985 (Reference 1).

Illinois River flood elevations were determined by the January 2004 *Upper Mississippi River System Flow Frequency Study* (UMRSFFS) (Reference 3). The UMRSFFS was developed by 5 Corps of Engineer Districts (St. Paul, Rock Island, Omaha, Kansas City, St. Louis) and coordinated through representatives

from 7 federal agencies and 7 states. The study addresses flooding of the Illinois River from Lockport to the mouth, the Missouri River below the Gavins Point Dam to the mouth, and the Mississippi River from St. Paul to the confluence with the Ohio River. The St. Louis District conducted the study of the Illinois River from the confluence with the Mississippi River to the La Grange Lock and Dam tailwater (river mile 80.2). The Rock Island District conducted the study of the Illinois River from river mile 80.2 to Lockport, Illinois.

Technical aspects of the study include impacts of levees, land use change, and climate variation. The Illinois River flows were determined using data from the period 1940 to 1998. In situations where historic records were not adequate to develop discharge frequency relationships or to verify the results, hydrologic modeling was used to create synthetic flows based on rainfall.

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

Table 6 - Summary of Discharges

		Peak Discharges (cubic feet per second)			
Flooding Source and Location	*Drainage Area (square miles)*	*10-Percent-Annual-Chance*	*2-Percent-Annual-Chance*	*1-Percent-Annual-Chance*	*0.2-Percent-Annual-Chance*
ILLINOIS RIVER					
At Meredosia, IL Gage	26,030	93,000	121,000	132,000	157,000
At Kingston Mines, IL Gage	15,820	72,000	90,000	98,000	114,000

This Physical Map Revision

The McGee Creek Levee Interior Ponding Area was modeled using the USACE HEC-HMS, computer program that was submitted by Klingner and Associates, P.C., as part of their levee certification (Reference 32). The precipitation data was taken from Bulletin 71: Rainfall Frequency Atlas of the Midwest (Reference 33) and was also used for the analysis.

Stillwater elevations for Brown County are shown in Table 7, "Summary of Stillwater Elevations."

Table 7 - Summary of Stillwater Elevations

	Water Surface Elevations (NAVD88)			
Flooding Source	*10-Percent-Annual-Chance*	*2-Percent-Annual-Chance*	*1-Percent-Annual-Chance*	*0.2-Percent-Annual-Chance*
McGee Creek Levee Interior Ponding Area	-	-	426.0	-

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 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. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. 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.

Pre-Countywide FIS

Due to new detailed study data, pre-countywide study data on the Illinois River have been superseded. No other detailed studies were included previously.

October 16, 2009
Initial Countywide FIS

The following information on the hydraulic analysis for the Illinois River supersedes the hydraulic analysis for the Illinois River from the FIS for Brown County, Illinois unincorporated areas dated November 1, 1985 (Reference 1).

Cross sections for the Illinois River to river mile 43.0 were developed using channel hydrographic surveys in conjunction with Scientific Assessment and Strategy Team (SAST) floodplain Digital Terrain Data collected in 1995 and 1998. Cross sections for the Illinois River from river mile 43 to 80.2 were taken from existing HEC models. Cross sections for the Illinois River from river mile 80.2 to 286 were created from a combination of floodplain digital terrain models and digital hydrographic surveys. The floodplain digital terrain models were developed from 1998 aerial photography and photogrammetry and digital hydrographic surveys that date from 1997 or later; supplemented as necessary with USGS National Elevation Dataset (NED) 1/3 arc second coverage (Reference 7). For areas where no digital hydrographic surveys were available, such as in some side channels and chutes, depths were estimated from the most current printed surveys available (Reference 3).

The UMRSFFS (discussed in Section 3.1) is based on an unsteady flow model (UNET). Levee failure was assumed at the top of existing levee grade based on an upstream and a downstream point. The UNET model was calibrated by both stage and discharge at gaging locations primarily by adjusting roughness coefficients and estimated lateral inflows. Some special considerations and techniques were required to address especially complex flow reaches and levee failure impacts. Backwater effects from the UMRSFFS have been considered for tributaries to the Illinois River within the county.

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 (see Section 4.2), selected cross section locations are also shown on the FIRMs (Exhibit 2).

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. The range of the Manning's "n" coefficients for each stream is shown in Table 7, "Roughness Coefficients (Manning's 'n' Values)."

Table 8 – Roughness Coefficients (Manning's "n" Values)

Stream	Channel "n"	Overbank "n"
Illinois River	0.020 - 0.040	0.035 - 0.150

Flood profiles (Exhibit 1) are a graph of computed flood elevations for studied streams. Flood profiles typically show the following elevations in feet: the streambed, 10-, 2-, 1- and 0.2-percent-annual-chance floods. Streams or reaches of streams studied by detailed methods usually have all of the above flood elevations and cross-section locations marked. Streams or reaches of streams studied by limited detail or approximate methods may or may not have flood profiles containing some flood elevation information.

The Illinois River centerline is the jurisdictional divide between many counties within the watershed. Due to the lateral sharing of the floodplain and the longitudinal overlap of the limits of flooding affecting each county, portions of the Illinois River Flood Profiles are duplicated within adjacent countywide FIS(s).

This Physical Map Revision

No hydraulic analysis was computed for this PMR.

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 and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent counties may be referenced to NGVD 29. This may result in differences in base flood elevations (BFEs) across the county boundary.

Effective information for this FIS was converted from NGVD 29 to NAVD 88 based on data presented in Figure 1 and Table 8a. Computations show a single average conversion factor of -0.303 feet (NGVD 29 – 0.303 = NAVD 88) for the county. The conversion factor was applied uniformly across the county, with the exception of the Illinois River, and was used to prepare the Floodway Data Tables, Flood Profiles, and FIRMs.

The cross section specific conversion factor (cross section-by-cross section) method was applied to the Illinois River for Brown County. The cross section specific conversion factor method is applied to all reaches of the Illinois River for consistency within the state.

The data presented in the *Upper Mississippi River System Flow Frequency Study* (Reference 3) were incorporated into this FIS and associated FIRMs. This information was converted to NAVD 88 based on data presented in Table 8b. A conversion factor was calculated using the latitude and longitude of each Illinois River cross section. The conversion factor for each cross section was used to prepare the new Illinois River Floodway Data Tables, Flood Profiles, and FIRMs.

For more information on NAVD 88, see *Guidelines and Specifications for Flood Hazard Mapping Partners Appendix B: Guidance for Converting to the North American Vertical Datum of 1988* (Reference 28) available at http://www.fema.gov/plan/prevent/fhm/dl_cgs.shtm 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 county. Interested individuals may contact FEMA to access these data.

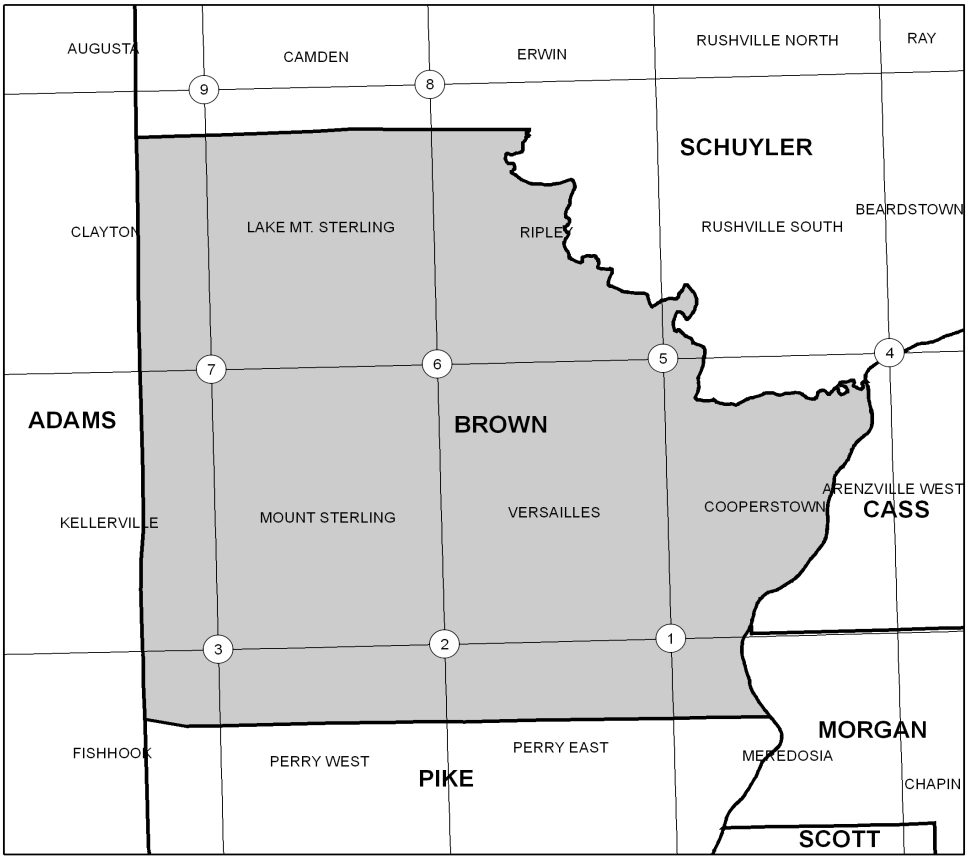

Figure 1 – Vertical Datum Conversion
The change in elevation for each Point ID is listed in Table 9a.

Table 9a - Vertical Datum Conversions
Datum Conversions - Brown County

Point ID #	Quadrangle Name	Corner	NAD83 Latitude (dec. deg.)	NAD83 Longitude (dec. deg.)	NGVD 29 to NAVD 88 Elevation Change (feet)
1	Meredosia	NW	39.875	90.625	-0.341
2	Perry East	NW	39.875	90.750	-0.302
3	Perry West	NW	39.875	90.875	-0.272
4	Arenzville West	NW	40.000	90.500	-0.374
5	Cooperstown	NW	40.000	90.625	-0.328
6	Versailles	NW	40.000	90.750	-0.289
7	Mount Sterling	NW	40.000	90.875	-0.249
8	Ripley	NW	40.125	90.750	-0.302
9	Lake Mt. Sterling	NW	40.125	90.875	-0.272

Range of conversion values	-0.374 to -0.249
Average conversion factor	**-0.303**
Maximum variance from the average conversion (Within 0.25 foot tolerance)	0.071
Maximum variance from a no-conversion value	0.374

Table 9b - Vertical Datum Conversions
Cross Section Specific (cross section-by cross-section) Conversion Factors
Illinois River

Cross Section ID	NAD83 Latitude (dec. deg.)	NAD83 Longitude (dec. deg.)	NGVD29 to NAVD88 Elevation Change (feet)
71.44	39.833	90.566	-0.4
71.9	39.837	90.570	-0.4
72.4	39.843	90.575	-0.4
72.7	39.847	90.578	-0.4
72.8	39.848	90.579	-0.4
73.1	39.852	90.582	-0.4
73.2	39.854	90.582	-0.4
73.7	39.861	90.584	-0.4
74.2	39.868	90.586	-0.4
74.7	39.876	90.584	-0.4
75	39.880	90.581	-0.4
75.5	39.887	90.578	-0.4
76	39.893	90.574	-0.4
76.5	39.896	90.565	-0.4
77	39.900	90.557	-0.4
77.5	39.905	90.550	-0.4
78	39.911	90.545	-0.4
78.5	39.917	90.539	-0.4
79	39.924	90.537	-0.4
79.3	39.928	90.537	-0.4
79.5	39.931	90.537	-0.4
80.1	39.939	90.534	-0.4
80.35	39.943	90.533	-0.4
80.7	39.948	90.531	-0.4
81.1	39.952	90.525	-0.4
81.6	39.959	90.521	-0.4
82.1	39.963	90.515	-0.4
82.6	39.971	90.510	-0.4
83.1	39.978	90.512	-0.4
83.6	39.985	90.513	-0.4

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 Floodway Data 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 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 the flooding sources 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, floodplain boundaries were interpolated on the basis of topographic maps at a scale of 1:24,000 (Reference 6, 7).

Where available along the Illinois River, digital terrain data provided by the USACE Rock Island and St. Louis Districts were used to delineate the floodplain (Reference 29). In areas along the Illinois River where the digital terrain data were not available, the USGS National Elevation Dataset was supplemented as available data (Reference 7).

For the McGee Creek Levee Interior Ponding Area the boundary of the 1-percent-annual-chance flood was delineated using the submitted floodplain boundary from the levee certification package from on-site survey.

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, AH, AO, and AE); 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 or collinear, 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, has the potential to reduce flood-carrying capacity, increase flood heights and velocities, and increase flood hazards in areas beyond the encroachment itself. 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 (see Figure 2, "Floodway Schematic"). Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. In Illinois, however, under the *Rivers, Lakes and Streams Act* encroachment in the floodplain is limited to that which will cause only an insignificant increase in flood heights (Reference 30). This more stringent criterion limits the increase in flood heights to 0.1 foot, no more than a 10 percent reduction in floodplain volume, and no more than a 10 percent increase in average velocity. This has generally been interpreted as the least surcharge measurable, consistent with the encroachment option of the computer program utilized for the floodway determination.

The area between the floodway and the 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 by more than 0.1 foot at any point. Typical relationships between the floodway and the flood fringe and their significance to floodplain development are shown in Figure 2, "Floodway Schematic."

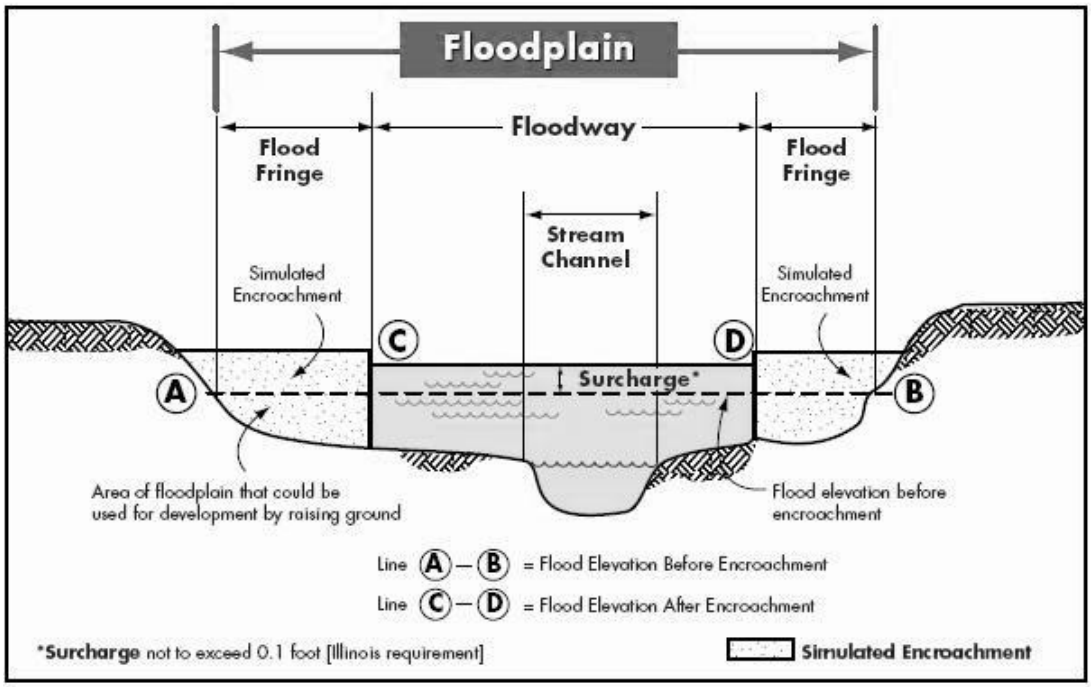

Figure 2 - Floodway Schematic

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 10, "Floodway Data"). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Illinois River extend beyond the county boundary.

Floodway calculations for the Illinois River are based on the September 2005 *Illinois River, River Mile 80 to 286, Floodway Computation* (Reference 4) performed by the Rock Island District of the Corps of Engineers. The study extends from La Grange Lock and Dam to Brandon Road Lock and Dam.

The objective of the study was to produce a floodway consistent with the results of the UMRSFFS (discussed in Section 3.1). A steady flow HEC-RAS model was built and calibrated to the 1-percent-annual-chance UMRSFFS profile only. The model was not calibrated to other frequency events or to "natural" conditions. This model was used to compute the floodway.

The Floodway Data Tables for the Illinois River are a special case. A floodway was not calculated for the Illinois River downstream of the La Grange Dam. Therefore, the Floodway Data Table for river miles 0 to 80 reports only the regulatory 1-percent-annual-chance floodwater surface elevations from the UNET model. A floodway was calculated for river miles 80 to 286. Regulatory 1-percent-annual-chance floodwater surface elevations are reported from the UNET model and floodway widths from the HEC-RAS model. However, floodway section areas, floodway mean velocities, and 1-percent-annual-chance floodwater surface elevations with floodways are not reported from the steady state hydraulic models.

In the State of Illinois, any portion of a stream or watercourse that lies within the floodway fringe of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the widths listed in the floodway data table in the Flood Insurance Study. The floodway as shown on the FIRM should be used for regulatory purposes.

In Illinois, along streams where floodways have not been computed, the community must obtain state permit approval (when applicable) for development. This ensures that the cumulative effect of development in the floodplain will not cause an increase in the base flood elevations that creates a potential for flood damages.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FROM UNET MODEL	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Illinois River								
71.44	71.44	*	*	*	447.6	447.6	*	*
71.9	71.90	*	*	*	447.7	447.7	*	*
72.4	72.40	*	*	*	447.8	447.8	*	*
72.7	72.70	*	*	*	447.8	447.8	*	*
72.8	72.80	*	*	*	447.8	447.8	*	*
73.1	73.10	*	*	*	447.9	447.9	*	*
73.2	73.20	*	*	*	447.9	447.9	*	*
73.7	73.70	*	*	*	448.0	448.0	*	*
74.2	74.20	*	*	*	448.1	448.1	*	*
74.7	74.70	*	*	*	448.2	448.2	*	*
75	75.00	*	*	*	448.2	448.2	*	*
75.5	75.50	*	*	*	448.3	448.3	*	*
76	76.00	*	*	*	448.4	448.4	*	*
76.5	76.50	*	*	*	448.5	448.5	*	*
77	77.00	*	*	*	448.6	448.6	*	*
77.5	77.50	*	*	*	448.7	448.7	*	*
78	78.00	*	*	*	448.7	448.7	*	*
78.5	78.50	*	*	*	448.8	448.8	*	*
79	79.00	*	*	*	448.9	448.9	*	*
79.3	79.30	*	*	*	449.0	449.0	*	*
79.5	79.50	*	*	*	449.0	449.0	*	*
80.1	80.10	*	*	*	449.1	449.1	*	*

[1] Miles above the confluence with the Mississippi River

* Data not available

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

BROWN COUNTY, IL AND INCORPORATED AREAS

FLOODWAY DATA

ILLINOIS RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FROM UNET MODEL	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Illinois River (continued)								
80.35	80.35	2310/1449[2]	*	*	449.2	449.2	*	*
80.7	80.70	2800/2003[2]	*	*	449.2	449.2	*	*
81.1	81.10	4565/3628[2]	*	*	449.3	449.3	*	*
81.6	81.60	5670/4704[2]	*	*	449.5	449.5	*	*
82.1	82.10	8110/7393[2]	*	*	449.6	449.6	*	*
82.6	82.60	10,180/9147[2]	*	*	449.7	449.7	*	*
83.1	83.10	10,920/9767[2]	*	*	449.9	449.9	*	*
83.6	83.60	12,660/10,880[2]	*	*	450.1	450.1	*	*

[1] Miles above the confluence with the Mississippi River

[2] Total width/width within Brown County

* Data not available

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

BROWN COUNTY, IL AND INCORPORATED AREAS

FLOODWAY DATA

ILLINOIS RIVER

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 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 base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance 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 the selected intervals within this zone.

Zone AH

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

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, and to 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 base flood elevations or 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 rate 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 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 1- and 0.2-percent-annual-chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Brown County. Previously, separate Flood Hazard Boundary Maps and/or Flood Boundary and Floodway Maps and/or FIRMs were prepared for each identified flood prone incorporated community and the unincorporated areas of the county. The countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFM), where applicable. Historical data relating to the community maps prepared is presented in Table 11, "Community Map History."

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Adams, Cass, Morgan, Pike, and Schuyler Counties, Illinois (Reference 31).

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, 536 South Clark Street, Sixth Floor, Chicago, Illinois 60605.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATES(S)
Brown County (Unincorporated Areas)	February 9, 1979	N/A	November 1, 1985	
Mound Station, Village of[1 2]	N/A	N/A	N/A	
Mount Sterling, City of[1 2]	N/A	N/A	N/A	
Ripley, Village of[2]	N/A	N/A	N/A	
Versailles, Village of[1 2]	N/A	N/A	N/A	

[1]No Special Flood Hazard Areas Identified
[2]This community does not have map history prior to the first countywide mapping

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

BROWN COUNTY, IL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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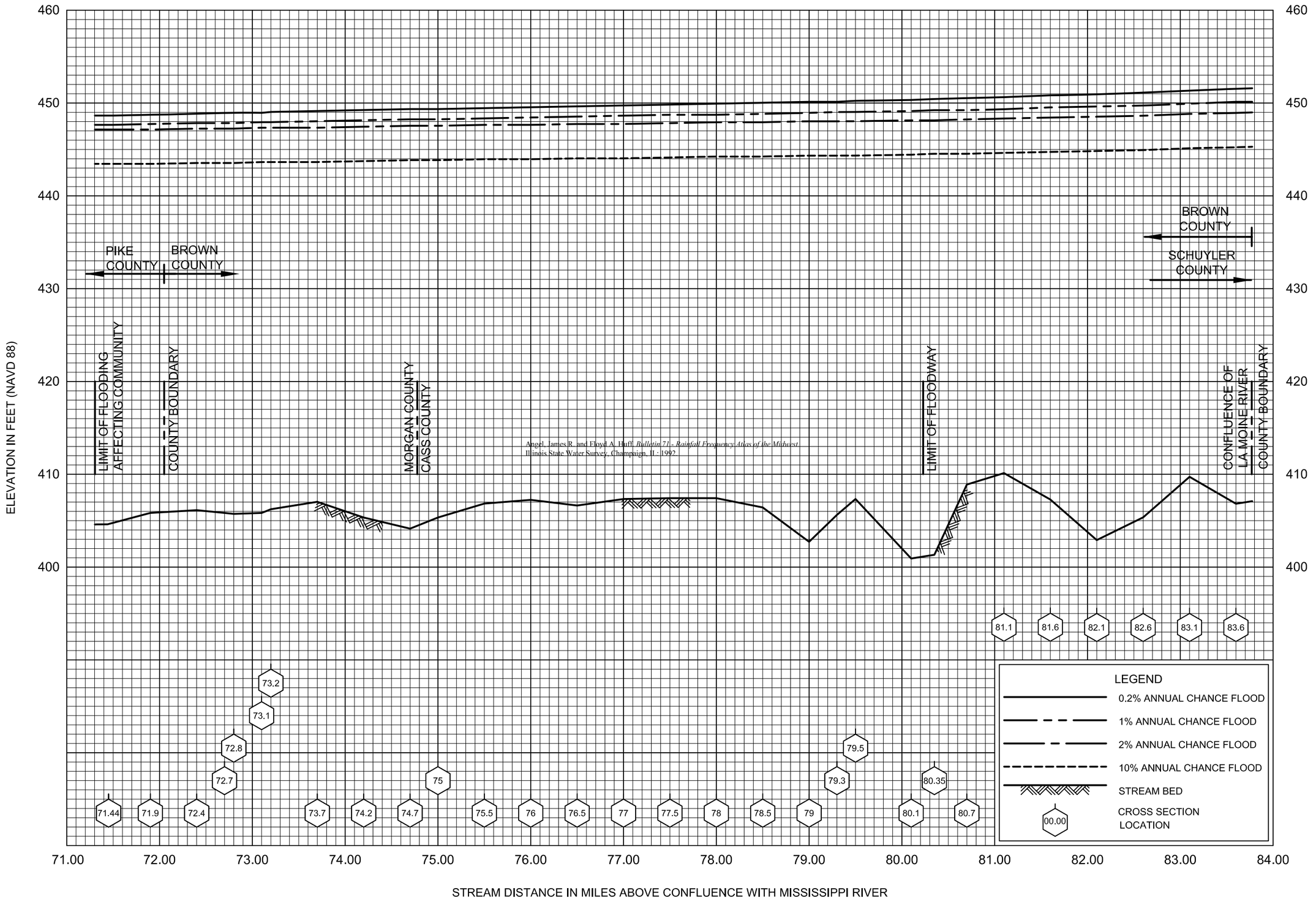

FLOOD PROFILES

ILLINOIS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BROWN COUNTY, IL

AND INCORPORATED AREAS

01P