FLOOD INSURANCE STUDY

FRANKLIN COUNTY, MISSOURI
AND INCORPORATED AREAS
VOLUME 1 of 2

COMMUNITY NAME	COMMUNITY NUMBER
Berger, City of	290132
Franklin County Unincorporated Areas	290493
Gerald, City of*	290734
Leslie, Village of*	290304
Miramiguoa Park, Village of	290992
New Haven, City of	290133
Oak Grove, Village of	290554
Pacific, City of	290134
Parkway, Village of*	290532
St. Clair, City of	290135
Sullivan, City of	290136
Union, City of	290137
Washington, City of	290138

*No Special Flood Hazard Areas Identified

Preliminary
9/2/2016

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

29071CV001B

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 may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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

This FIS report was revised on TBD. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Selected Flood Insurance Rate Map panels for the 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:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Initial Countywide FIS Effective Date: October 18, 2011
Revised Countywide FIS Date: TBD – Revised to change Special Flood Hazard Areas

TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS (continued)

VOLUME I

FIGURES

TABLES

VOLUME II

EXHIBITS

Exhibit 1 - Flood Profiles

TABLE OF CONTENTS (continued)

VOLUME II

FLOOD INSURANCE STUDY
FRANKLIN COUNTY, MISSOURI AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Franklin County, including the Cities of Berger, Gerald, New Haven, Pacific, St. Clair, Sullivan, Union and Washington; the Villages of Leslie, Miramiguoa Park, Oak Grove, Parkway, and the unincorporated areas of Franklin County (referred to collectively herein as Franklin 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.
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.

This information will be used by the communities to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

As part of the October 8, 2011 revision, the format of the map panels has changed. Previously, flood-hazard information was shown on both the Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM). In the new format, all base flood elevations, cross sections, zone designations, floodplain and floodway boundary delineations are show on the FIRM and the FBFM has been eliminated. Some of the flood insurance zone designations were changed to reflect the new format. Areas previously show as numbered Zone A was changed to Zone AE. Areas previously shown as Zone B were changed to Zone X (shaded). Areas previously shown as Zone C were changed to Zone X (unshaded). In addition, all Flood Insurance Zone Data Tables were removed from the FIS report and all zone designations and reach determinations were removed from the profile panels.

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 a local GIS and be accessed more easily by the community.

City of Pacific is geographically located in Franklin County and St. Louis County. City of Sullivan is geographically located in Franklin County and Crawford County. All flood hazard information for City of Pacific and City of Sullivan is published within this FIS report.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.
The initial countywide FIS report incorporates study data within the communities listed in Table 1, which had previously been published as separate community based studies, to create a comprehensive countywide product.

Table 1: Summary of Community Studies Used to Compile Initial Countywide FIS

Community Name	Study Contractor	Contract or Inter-Agency Agreement Number	Completion Date
Union, City of (Reference 1)	USACE – St. Louis	IAA-H-9-79, Project Order No. 36	July 1981
Washington, City of (Reference 2)	USACE – St. Louis	IAA-H-9-79, Project Order No. 36	February 1981
Berger, City of (Reference 3)	USACE – St. Louis	IAA-H-9-79, Project Order No. 36	September 1980
New Haven, City of (Reference 4)	Booker Associates, Inc.	H-4730	September 1979
Sullivan, City of (Reference 5)	Booker Associates, Inc.	H-4370	November 1979
Pacific, City of (Reference 6)	USACE – St. Louis	IAA-H-9-73, Project Order No. 13	December 1975
Pacific, City of (Reference 7)*	USACE – St. Louis	EMW-89-E-2994, Project Order No. 6	**
Franklin County Unincorporated Area (Reference 8)	**	**	**

*Partial revision
** Data not available

For the initial countywide study, the incorporation of detailed studies for the City of Union and the City of Washington were performed by the Missouri State Emergency Management Agency (SEMA), for FEMA under Interagency Agreement No. EMK-2005-CA-5001. The incorporated detailed studies were completed by URS Group, Inc. and were completed on July 31, 2003 under contract No. EMW-200-CO-0247, Task Order No. 029.

The approximate study meets the standards of FEMA under the Cooperating Technical Partners (CTP) Partnership Agreement dated June 17, 1999 between SEMA and FEMA.

1.2.1 Upper Mississippi River System Flood Frequency Study Methodology

The hydrologic and hydraulic analyses for the Missouri River were performed by the US Army Corps of Engineers as part of the Upper Mississippi River System Flow Frequency Study (UMRSFFS). This study was a collaboration of effort between the Rock Island, St. Louis, Kansas City, Omaha, and St. Paul districts and was completed in 2003. The 1-percent-annual-chance flood water surface profile and floodway computations on the Missouri River were performed within HEC-RAS for FEMA under Interagency Agreement No. HSFE07-06-X-0012 by the Kansas City and Omaha districts and were completed in 2007.

The floodplain mapping for the Missouri River was performed by Watershed Concepts for FEMA under Contract No. HSFE07-07-C-0022.

Planimetric base map information shown on all FIRM panels was derived from multiple sources. Base map files were provided in digital format by Missouri Spatial Data Information Service (MSDIS). Additional information was derived from the U.S. Geological Survey. Users of this FIRM should be aware that minor adjustments may have been made to specific base map features.

The coordinate system used for the production of this FIRM is, North American Datum of 1983 (NAD 83) State Plane Missouri East FIPS 2401 feet. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83 Zone 15N.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer (CCO) meeting is to discuss the scope of the FIS. The results of a study are reviewed at the Final CCO meeting. The following tabulation shows the dates of the CCO meetings for each incorporated community within Franklin County.

Table 2: History of CCO Meetings Held for Franklin County FISs

Community Name	Initial CCO Date	Final CCO Date
Berger, City of	November 29, 1978	July 20, 1981
Franklin County Unincorporated Areas	*	*
New Haven, City of	March 1978	February 25, 1980
Pacific, City of	*	December 15, 1975
Sullivan, City of	March 1978	July 23, 1980
Union, City of	May 9, 2001 November 29, 1978	* March 16, 1982
Washington, City of	May 9, 2001 November 29, 1978	* December 1, 1981

*Data not available

For the October 8, 2011 countywide study the initial CCO meeting was held on Friday July 29, 2005 and attended by representatives of FEMA, Missouri State Emergency Management Agency (SEMA), Franklin County, City of Berger, City of New Haven, City of Pacific, City of Sullivan, City of Washington and the USGS.

The results of the study were reviewed at the final CCO meeting held on January 12, 2010, and attended by representatives of FEMA, SEMA, Franklin County, Cities of Berger, New Haven, Pacific, St. Clair, Sullivan, Union, and Washington, and the Village of Parkway. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Franklin County, Missouri including the incorporated communities listed in Section 1.1.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction. Streams studied by detailed methods are presented in Table 3, "Streams Studied by Detailed Methods," with new or revised studies denoted by an asterisk (*).

Flooding sources that are not denoted as new or revised had their effective boundaries redelineated on updated topographic data (Reference 9).

Table 3: Streams Studied by Detailed Methods

Flooding Source	Reach Length (miles)	Study Area
Birch Creek*	3.9	From approximately 0.21 mile downstream of State Highway 50 to Prairie Del Road
Bourbeuse River	96.0	From approximately 0.22 mile downstream of St. Marys Road to the Franklin County boundary
Bourbeuse River Tributary*	2.5	From approximately 0.57 mile downstream of State Highway 50 to approximately 1.1 miles upstream of St. Andrews Drive
Brown's Branch	4.9	From confluence with Dubois Creek to North Goodes Mill Road
Brush Creek	4.9	From confluence with Meramec River to Gray Summit Road
Busch Creek*	4.9	From confluence with Dubois Creek to approximately 1 mile upstream of State Highway 100

Table 3: Streams Studied by Detailed Methods (Continued)

Flooding Source	Reach Length (miles)	Study Area
Calvey Creek	4.7	From confluence with Meramec River to approximately 0.38 mile upstream of Calvey Creek Road
Dubois Creek*	8.0	From approximately 0.27 mile downstream of confluence of Busch Creek to approximately 1.2 miles upstream of State Highway 47
Fenton Creek	1.2	From confluence with Flat Creek to 0.58 mile upstream of Central Avenue
Fiddle Creek	3.8	From 165 feet downstream of Labadie Bottom Road to Fiddle Creek Road
Flat Creek	3.8	From confluence with Bourbeuse River to Judith Springs Road
Flat Creek North Tributary	1.2	From confluence with Flat Creek to approximately 1.09 miles upstream of Park Avenue
Happy Sock Creek	4.2	From confluence with Bourbeuse River to Approximately 0.27 mile upstream of County Highway AB
Labadie Creek	4.3	From confluence with Missouri River to County Highway MM
Labadie Creek Tributary	0.7	From confluence with Labadie Creek to approximately 0.63 mile upstream of County Highway T
Little Calvey Creek	3.0	From confluence with Calvey Creek to approximately 0.86 mile upstream of Finney Road
Little Meramec River	2.8	From confluence of Pierce Creek to approximately 1.25 miles upstream of County Highway FF
Little Tavern Creek	1.5	From Chicago Rock Island Railroad to approximately 0.46 mile upstream of County Highway T
Meramec River	63.6	From approximately 0.85 mile downstream of confluence of Wild Horse Creek to Franklin County boundary
Missouri River*	44.5	From approximately 3.35 miles downstream of the Franklin County boundary to the upstream Franklin County boundary
Monroe Branch	1.2	From confluence with Brush Creek to approximately 0.07 mile upstream of Monroe Street
Pin Oak Creek	1.4	From confluence with Bourbeuse River to County Highway AT
Pin Oak Creek Tributary	0.2	From confluence with Pin Oak Creek to approximately 0.2 mile upstream

Table 3: Streams Studied by Detailed Methods (Continued)

Flooding Source	Reach Length (miles)	Study Area
Possum Creek	1.0	From confluence with Flat Creek to approximately 0.65 mile upstream of Main Street
South Branch Busch Creek*	1.1	From confluence with Busch Creek to approximately 0.85 mile upstream of State Highway 100
Southwest Branch Busch Creek*	4.4	From confluence with Busch Creek to approximately 0.91 mile upstream of Country Club Road
St. John's Creek	3.8	From Missouri Pacific Railroad to approximately 1.25 miles upstream of County Highway 100
Thornton Branch	0.5	From confluence with Brush Creek to approximately 0.17 mile upstream of Osage Street
Unnamed Tributary to Busch Creek*	0.3	From confluence with Busch Creek to approximately 0.3 mile upstream
Wild Horse Creek	1.1	From confluence with Meramec River to approximately 0.08 mile upstream of Park Street
Winch Creek	4.2	From confluence with Meramec River to approximately 1.91 miles upstream of County Highway O
Winsel Creek	7.6	From Bacon Ridge Road to just upstream of Elmont Road

Approximate analyses were used to study those areas having low development potential or minimal flood hazards.

Approximate studies were performed on Airport Tributary, Audrain Branch, Ausbin Creek, Barren Fork, Berger Creek, Big Berger Creek, Big Branch, Big Creek, Bigelow Creek, Binsbacker Creek, Birch Creek, Black Oak Branch, Boehms Creek, Boeuf Creek, Boone Creek, Bourbeuse River, Bourbeuse River Tributary, Brady Creek, Browns Branch, Brush Creek, Brushy Creek, Bucklick Creek, Buescher Creek, Busch Creek, California Branch, Calvey Creek, Cedar Fork, City Park Creek, Clates Creek, Clear Branch, Dierking Branch, Dry Branch, Dry Creek, Dubois Creek, Dunn Spring Creek, Elm Spring Branch, Fenton Creek, Fiddle Creek, Fifth Street Branch, Flat Creek, Flat Creek North Tributary, Fork Creek, Fox Creek, Frolke Branch, Gibson Creek, Girard Branch, Golf Coarse Tributary, Happy Sock Creek, Hecht Creek, High School Creek, Hoosier Creek, Iman Branch, Indian Creek, Johns Branch, Johnson Branch, Jordan Branch, Kriete Creek, Labadie Creek, Labadie Creek Tributary, Little Berger Creek, Little Boeuf Creek, Little Boone Creek, Little Bourbeuse River, Little Calvey Creek, Little Creek, Little Fox Creek, Little Indian Creek, Little Meramec River, Little Spring Creek, Little Tavern Creek, Logan Branch, Lollar

Branch, Long Branch, Martin Branch, Maupin Creek, May Branch, Meramec River, Middle Fork, Missouri River, Monroe Branch, Mud Creek, North Branch Wildcat Creek, Opossum Creek, Pierce Creek, Pin Oak Creek, Pin Oak Creek Tributary, Possum Creek, Prairie Fork, Pryors Branch, Red Oak Creek, Roth Creek, Rye Creek, Saint Johns Creek, Skinner Creek, Slaughter Branch, Smith Creek, South Branch Busch Creek, Southeastern Tributary, Southwest Branch Busch Creek, Southwest Tributary Bush Creek, Southwestern Tributary, Spring Creek, Tavern Creek, Thornton Branch, Threemile Creek, Tyrey Creek, Unnamed Tributary to Brush Creek, Unnamed Tributary to Busch Creek, Voss Creek, Webber Creek, West Fork Brush Creek, Whiskey Creek, Wild Horse Creek Wildcat Creek, Winch Creek, Winsel Creek, Winsel Creek Tributary and Woods Creek.

2.2 Community Description

Franklin County, located in eastern Missouri, is bounded by Warren and Saint Charles Counties on the north, St. Louis and Jefferson Counties on the east, Gasconade County on the west, and Crawford County on the south. In 2015, the population of Franklin County was reported to be 102,426 (Reference 10).

The mean temperature for the area is 56.3 degrees Fahrenheit (F.) with a record maximum 118 degrees F. in July 1954 and a minimum of -26 degrees F. in January 1977. This area also has an average annual rainfall precipitation of 42.5 inches (Reference 11).

2.3 Principal Flood Problems

Most of the City of Berger in Franklin County is situated in the upland area above the floodplain of the Missouri River. Pryors Branch and its tributaries form the major stream system within the corporate limits. Road and railroad crossings, which constrict the flow during periods of heavy rains, produce flooding at and above the crossings. The area of the city that extends north of the Missouri Pacific Railroad embankment between the Missouri River and the bluff line is vulnerable to floods from the Missouri River. This area is sparsely populated and is used predominantly for agriculture.

Records dating back to 1844 indicate flood heights on the Missouri River at Hermann, Missouri, seven miles upstream, have exceeded flood stage many times. The flood of 1973, which was the highest in the last several years, was considered a 4 percent annual chance event. The flood of 1951 had a peak discharge of 618,000 cubic feet per second (cfs), and was estimated to be approximately the 1 percent annual chance event. In the past 25 years, water levels above flood stage have been recorded in 1951, 1952, 1958, 1960, 1961, 1972 and 1973 (Reference 12) and in 1993 (Reference 13).

The Missouri River is the major source of flooding in Franklin County. In recent times, the elevation of 501.0 feet (approximately 2 percent annual chance event), recorded in 1951, has been the highest stage reached. During this flood, sandbagging prevented the central business district from being inundated but widespread flooding occurred in basements as a result of seepage and backups. In 1973, the river reached an elevation of 499.4 feet (Approximately 4 percent annual chance event), the highest since 1951. The construction of a levee protection system in 1955, which has an elevation of 504.2 feet, protected the

central business district; but due to the prolonged length of time, the river was above flood stage, and seepage into basements and ground settlements caused problems to the city and individuals. The upland streams will experience minor flooding as a result of localized storms. In the midwest, where large masses of cold and warm air collide, intense thunderstorm activity is common. The flash flooding which results from this activity is characterized by a rapid rise in stream levels with durations usually restricted to several hours (Reference 12).

From December 2015 to January 2016 there was excess rainfall in central and southeastern United States; with more than 20 inches of rain falling in a 19 day period from December 12 to December 31, 2015. This resulted in major flooding, with 172 USGS streamgages recording peaks that ranked in the top 5 all time for the period of record. Franklin County, along with 36 other Missouri Counties and the City of St. Louis was declared Federal Disaster Areas (Reference 14).

In 1993, what is known as "The Great Flood of 1993" caused unprecedented widespread flooding throughout the upper Mississippi River watershed. The record breaking flood stages caused an estimated $20 billion worth of damage from the Missouri River and Mississippi River. Franklin County sharing its northern border with the Missouri River did not escape the damage (Reference 13).

Land along the streams within the City of Pacific, Missouri is subject to flooding; and flood damage has occurred on several occasions in the past. The principal flood problems occur along the eastern edge of the corporate limits due to Meramec River flooding and along the entire reach of Brush Creek that is within the corporate limits.

Winsel Creek in Franklin County is another major source of flooding and the floodplains are primarily farmland or undeveloped, therefore, flood problems are limited to the inundation of fields and a few crossroads. The tributaries of Winsel Creek extend into the more urbanized areas of the city and cause minor flooding, generally due to restricted culvert openings. The areas most commonly affected are the intersection of Elmont Road and Springfield Road in the southern end of the city, and at the ends of Grace Avenue and Meramec Drive in the north. Minor flooding also occurs between Clark and Church Streets, northwest of the railroad track in the downtown area. This flooding often extends down Euclid Avenue toward the Elmont Road/Springfield Road area previously mentioned. Flooding in these areas and along Winsel Creek is generally caused by flash flooding from localized storms. Flash flooding results from the intense thunderstorm activity associated with the Midwest where large masses of cold and warm air collide. This type of flooding is characterized by a rapid rise in stream levels with durations usually restricted to several hours. The most recent occurrences of this type occurred on August 26, 1975, and August 10 and 22, 1977. Rainfall amounts for these dates were 3.71, 3.70, and 4.91 inches, respectively (Reference 15).

Much of the City of Washington is situated in the upland area above the floodplain of the Missouri River. Busch Creek, St. Johns Creek, Dubois Creek and their tributaries also have floodplain areas within the corporate limits. The community has experienced flooding from the Missouri River and the tributary streams that flow through the community. Flooding from the Missouri River has already been covered early in this text.

2.4 Flood Protection Measures

An existing levee in the City of New Haven in Franklin County begins at river mile 81.4 continues to river mile 81.7. This levee system does not meet the minimum requirements of Section 65.10 of the NFIP Regulations, and therefore flood hazard boundaries were determined by methods which were coordinated and reviewed with impacted communities and other stakeholders.

Other levees exist within Franklin County. The levee owners have not provided the necessary documentation to show the levee can provide protection from a flood with a 1% chance of annual occurrence.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is 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

3.1.1 Pre-Countywide Analysis

County of Franklin, Missouri Unincorporated Areas:

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

Flood discharge data for the 10-, 2-, 1-percent-annual-chance floods for Happy Sock and Winsel Creeks were determined by empirical formulas presented in the USGS Open-File Report, "Generalized Flood Frequency Estimates for Urban Areas" in Missouri. Discharges for the 0.2-percent-annual-chance flood were determined by straight-line extrapolation of a log-probablility graph of flood discharges computed for frequencies up to 100 years.

Flood discharge data for the 10-, 2-, 1-percent-annual-chance floods for Brown's Branch, Calvey Creek, Dubois Creek (upstream of State Hwy 100), Fiddle Creek, Flat Creek Labadie Creek, Labadie Creek Tributary, Little Calvey Creek, the Little Meramec River, Little Tavern Creek, Pin Oak Creek, Pin Oak Creek

Tributary, St. John's Creek, and Winch Creek were determined by using regional equations presented in the USGS publication, "Techniques for Estimating the Magnitude and Frequency of Missouri Floods" (Reference 16). Discharges for the 0.2-percent-annual-chance flood were determined by straight-line extrapolation of a log-probability graph of flood discharges computed for frequencies up to 100 years.

Flood discharge data for the 10-, 2-, 1-, 0.2-percent-annual-chance floods for Brush Creek were determined through the use of the USACE "HEC-1 Flood Hydrograph Package Computer Program" (Reference 17). The program utilized frequency rainfall amounts obtained from the National Weather Service Technical Paper No. 40 unit hydrographs and storage routing. The rainfall amount for the 0.2-percent-annual-chance flood for the watershed was obtained by straight-line extrapolation of a log probability graph of rainfall amounts published in Technical Paper No. 40 for frequencies up to 100 years (Reference 17).

Flood discharge data for the 10-, 2-, 1-, 0.2-percent-annual-chance floods for the Meramec and Bourbeuse Rivers were taken from an analysis performed by the USACE, St. Louis District. These discharges were determined by statistical analyses of streamflow records from gages supplemented with basin modeling using the USACE HEC-1 computer program.

A decrease in discharge occurs downstream of County Highway AB on Happy Sock Creek due to the restrictive nature of the bridge opening at higher discharges. This anomaly occurs only for the 0.2-percent-annual-chance flood discharge.

A decrease in discharges occurs downstream on the Bourbeuse River due to heavy ground infiltration and overbank storage, causing peak flow attenuation, and the presence of many caverns underground, causing an increase in infiltration.

Peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods of each flooding source studied in detail in the county are shown in Table 4.

City of Pacific, Missouri

Hydrologic analyses were carried out to establish peak discharge-frequency relations for floods of the selected recurrence intervals for each flooding source studied in detail in the community. Meramec River discharges for the 10-, 2-, 1-percent-annual-chance floods were determined from a statistical analysis of data obtained from the staff gage located at river mile 49.0 near Pacific. This gage is maintained by the National Weather Service and has been in operation since 1916. Since only the June 1957 high-water mark in Brush Creek and no official flow records for any of the tributaries were available, the runoff hydrographs were computed with the use of synthetic unit hydrographs (References 18 and 19).

The procedure used to develop the flow frequency data for the Meramec River was to gather the annual peak flows recorded at the Pacific gage and to run an analytical computation frequency analysis. The discharges were determined by stage relationships to the USGS gage at Robertsville, Missouri 11 miles upstream.

City of Sullivan, Missouri

Hydrologic analyses were carried out to establish the peak discharge-frequency

relations for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.Flood-discharge data for the 10-, 2-, 1-percent-annual-chance floods for Winsel Creek were determined by the empirical relations presented in the USGS, Water Resources Division and Open-File Report by E.E. Gann (Reference 20). These relations consisted of USGS regional regression equations determined for Missouri with parameters of drainage area and slope.

Discharges for the 0.2-percent-annual-chance flood was determined by straight line extrapolation of a log-probability graph of flood discharges computed for frequencies up to the 1% chance flood.

Peak discharges were determined for the 10-, 2-, 1-, 0.2-percent-annual-chance floods of each flooding source studied in detail in the community are shown in Table 4.

City of Union, Missouri

Hydrologic analyses were carried out to establish the peak discharge-frequency relations for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods on Flat Creek, Fenton Creek, Possum Creek, and Flat Creek North Tributary were developed using the USACE "HEC-1N, Flood Hydrograph Package" (Reference 21). HEC-1N is a hydrologic model which computes surface runoff from selected rainstorms taking into account conditions affecting runoff such as drainage area, time intervals and basin slope. Peak discharges for the Bourbeuse River were developed from flow records using the Union, Missouri USGS gage No. 07016500 with a period of record from June 1921 to date and computed from a log-Pearson Type III distribution (Reference 22).

Peak discharges were determined for the 10-, 2-, 1-, 0.2-percent-annual-chance floods of each flooding source studied in detail in the community are shown in Table 4.

City of Washington, Missouri

Hydrologic analyses were carried out to establish peak discharge-frequency relations for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

For St. Johns Creek, peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods were determined by using regional equations presented in the USGS publication, "Techniques for Estimating the Magnitude and Frequency of Missouri Floods" (Reference 16). Discharges for the 0.2-percent-annual-chance flood were determined by straight-line extrapolation of a log-probability graph of flood discharges computed for frequencies up to 100 years

The peak discharges computed were used in the USACE HEC-2 Water-Surface Profiles computer program (Reference 23) to develop the necessary frequency profiles.

3.1.2 Countywide Analysis

For this countywide study new and revised detail studies were incorporated from a study completed in July of 2003 by URS Group, Inc. The studies were for flooding sources around the City of Union and the City of Washington.In

addition, new hydrology was performed for previous approximate Zone A studies or those streams with a contributing drainage area of 1 square mile or greater. These studies were performed by AMEC Earth & Environmental.

City of Union

For Birch Creek and Bourbeuse River Tributary, peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods were developed by using the USACE HEC-1 Flood Hydrograph Package computer program (Reference 18). Rainfall values for the 10-, 2-, 1-percent-annual-chance floods were developed by frequency rainfall analysis from the U.S. National Weather Service Technical Paper No. 40 (TP-40) (Reference 18). Rainfall values for the 0.2-percent-annual-chance flood were determined by extrapolating rainfall data from TP-40. Results of the analyses were presented in an Interim Hydrology Report (Reference 24).

Peak discharge-drainage area relationships for the 10-, 2-, 1-, 0.2-percent-annual-chance floods of each flooding source studied in detail in the community are shown in Table 4.

City of Washington

For Busch Creek, Southwest Branch Busch Creek, Unnamed Tributary to Busch Creek, South Branch Busch Creek, and Dubois Creek (downstream of State Hwy 100) peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods were developed by using the USACE HEC-HMS, Hydrologic Modeling System computer program (Reference 25). Rainfall values for the 10-, 2-, 1-percent-annual-chance floods were developed by frequency rainfall analysis from the U.S. National Weather Service Technical Paper No. 40 (TP-40) (Reference 18). Rainfall values for the 0.2-percent-annual-chance flood were determined by extrapolating rainfall data from TP-40. Results of the analyses were presented in a letter dated September 26, 2002 (Reference 24).

3.1.3 Upper Mississippi River System Flow Frequency Study Methodology

Major Upper Mississippi River Basin flooding during the 1990s resulted in significant losses, as well as raised questions regarding the frequency of the associated flood events. Reevaluation of the Upper Mississippi River System became necessary to address the questions resulting from the Great Flood of 1993, and was facilitated based on the availability of new topographic data, new computational techniques, and about 20 more years of recorded hydrologic data since the previous study of the Mississippi River had been performed in 1979. This is generally true for the Missouri River as well. The last major effort to comprehensively determine Missouri River flow frequencies was in 1962. The additional record of more than 35 years included the major events of 1993 downstream of Nebraska City and the 1997 large volume flood in the upper reaches of the Missouri River.

The Upper Mississippi River System Flow Frequency Study (UMRSFFS) was undertaken starting in 1998 with the purpose to update the discharge-frequency relationships and associated water-surface profiles for the Mississippi River from St. Paul, Minnesota to the confluence of the Ohio River; for the Illinois River from Lockport, Illinois to its mouth; and for the Missouri River from Gavins

Point Dam to its mouth. Five US Army Corps of Engineers Districts participated in the study: Rock Island, St. Louis, St. Paul, Kansas City, and Omaha. The study was completed in 2003.

The hydrologic analysis for the UMRSFFS utilized a combination of the following methods and approaches to determine discharge-frequency relationships: 100 years of record from 1898 to 1998; the log-Pearson Type III distribution for unregulated flows at gages; main stem flows between gages determined by interpolation of the mean and standard deviation for the annual flow distribution based on drainage area in conjunction with a regional skew; flood control reservoir impacts defined by developing regulated versus non-regulated relationships for discharges; extreme events determined by factoring up major historic events; HEC-HMS and/or HEC-1 models for the main tributaries; and the UNET unsteady flow program to address hydraulic impacts. In situations where historic records were not adequate or appropriate to develop discharge-frequency relationships or to verify the results, hydrologic modeling was used to create synthetic flows based on rainfall. Gage records for all streams were carefully evaluated.

The computation of unregulated flow frequency relationships on the Missouri River upstream of the Kansas River required special consideration due to the combination of the two historic peak flow periods consisting of the plains snowmelt of the early spring and the mountain snowmelt and plains rainfall of the late spring/early summer. An additional concern related to the Missouri River was flow depletion due to irrigation and reservoir evaporation. Historic depletions were added to the observed flow record to help obtain unregulated flows, while historic depletions were adjusted to present level depletions for computation of the regulated flow record.

The result of the hydrologic aspects of the study was a discharge and related frequency of occurrence for stations or given cross section located along each of the principle main stem rivers. For more detailed information on each of the hydrologic methodologies used to determine discharges, the reader is encouraged to consult the report cited as Reference 26 in Section 9.0 of this FIS.

Peak discharges for the 10-, 2-, 1-, 0.2-percent-annual-chance floods of each flooding source studied in detail in the community are shown in Table 4.

Table 4: Summary of Discharges

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
BIRCH CREEK					
At confluence with	12.3	4,409	6,675	7,683	12,715
Bourbeuse River At Prairie Dell Road	5.7	2,155	3,265	3,761	6,246
BOURBEUSE RIVER	846	23,300	33,900	38,900	51,800
At confluence with the Meramec River					
Approximately 3.5 miles upstream of Northbend Road	781	26,900	40,300	46,400	62,500

Table 4: Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
At County Highway CC	608	31,200	51,400	61,800	91,000
Approximately 6.4 miles upstream of County Highway H	471	28,600	46,600	55,400	79,700
Union Gage at U.S. Highway 50	808	23,700	34,500	39,600	52,600
BOURBEUSE RIVER TRIBUTARY					
At confluence with Bourbeuse River	3.0	1,285	1,951	2,248	3,729
BROWN'S BRANCH					
At confluence with Dubois Creek	14.1	3,450	5,300	6,100	8,400
Upstream of tributary, approximately 0.76 mile downstream of Busch Road	7.9	2,450	3,700	4,250	6,100
BROWN'S BRANCH (continued)					
Approximately 0.94 mile upstream of North Goodes Mill Road	2.4	1,200	1,850	2,100	2,900
At North Goodes Mill Road	1.1	750	1,150	1,300	1,800
BRUSH CREEK					
At corporate limits of City of Pacific	5.8	3,990	5,175	5,618	6,800
Approximately 0.65 mile upstream of corporate limits	4.7	3,320	4,320	4,570	5,500
At Missouri Pacific Railroad	3.0	2,010	2,600	2,760	3,320
At Gray Summit Road	2.8	2,000	2,570	2,730	3,200
BUSCH CREEK					
At confluence with Dubois Creek	12.0	6,010	9,930	11,700	20,200
Approximately 800 feet downstream of International Avenue	3.6	4,450	7,290	8,600	14,900
Approximately 300 feet upstream of International Avenue	3.1	3,086	4,601	5,272	8,566
Just downstream of Franklin Street	2.5	2,714	4,032	4,609	7,454
Approximately 400 feet downstream of Jefferson Street	1.7	2,120	3,153	3,605	5,843
Just downstream of State Highway 100	1.3	1,312	1,991	2,293	3,798
Approximately 150 feet upstream of State Highway 100	0.6	476	711	818	1,334
CALVEY CREEK					
At Burlington Northern Railroad	39.8	6,620	10,040	11,540	15,500
At County Highway	37.1	6,420	9,750	11,200	15,100
Upstream of Confluence of Little Calvey Creek	28.0	5,190	7,890	9,070	12,100
Approximately 400 feet downstream of Calvey Creek Road	25.2	5,090	7,750	8,910	11,900
DUBOIS CREEK					
Downstream of confluence with Busch Creek	34.5	13,000	20,400	24,100	42,200
Upstream of confluence with Busch Creek	22.4	7,990	13,100	15,600	27,500
Approximately 0.66 mile downstream of	7.1	2,050	3,100	3,500	4,750

Table 4: Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
N Goodes Mill Rd					
At Bieker Road	4.0	1,600	2,450	2,850	3,800
At State Highway 47	2.4	1,250	1,950	2,250	3,000
Approximately 1.16 miles upstream of State Highway 47	1.1	780	1,200	1,400	1,950
FENTON CREEK					
Confluence with Flat Creek	2.6	1,590	2,400	2,750	3,310
FIDDLE CREEK					
At Chicago, Rock Island & Pacific Railroad	9.4	2,900	4,600	5,300	7,100
Upstream of tributary (near first crossing of Fiddle Creek Road)	5.8	2,400	3,750	4,300	6,000
FIDDLE CREEK (continued)					
At Fiddle Creek Road (second crossing)	3.9	1,800	2,750	3,200	4,400
At Fiddle Creek Road (fourth crossing)	2.4	1,300	2,050	2,400	3,250
FLAT CREEK					
At corporate limits of the City of Union	3.0	1,450	2,200	2,500	3,300
Approximately 0.28 mile upstream of corporate limits of City of Union	2.4	1,190	1,830	2,100	2,890
At Judith Spring Road	0.9	1,110	1,730	1,990	2,700
Confluence with Bourbeuse River	9.7	5,160	7,640	8,760	10,780
Confluence of Fenton Creek	6.4	3,300	4,900	5,630	6,950
Confluence of Possum Creek	5.7	3,040	4,570	5,250	6,400
Confluence of North Tributary	3.7	1,830	2,790	3,220	3,930
FLAT CREEK NORTH TRIBUTARY					
Confluence with Flat Creek	1.9	1,310	1,950	2,230	2,660
HAPPY SOCK CREEK					
At confluence with Bourbeuse River	8.2	3,200	5,500	6,200	9,400
At County Highway AD	6.4	2,800	4,850	5,500	8,200
At Happy Sock Road North Crossing	6.7	2,750	4,700	5,400	7,800
At Happy Sock Road South Crossing	5.2	2,600	4,350	5,100	7,200
At East Happy Sock Road	4.0	2,400	3,850	4,450	5,200
Approximately 1,000 feet upstream of County Highway AB	3.1	2,200	3,550	4,050	5,600
LABADIE CREEK					
At downstream Missouri and Pacific Railroad	15.2	3,500	5,400	6,200	8,900
At Missouri and Pacific Railroad (2000 feet downstream of County Highway MM)	10.5	3,400	5,300	6,100	8,500
At County Highway MM	4.6	1,800	2,700	3,150	4,200
LABADIE CREEK TRIBUTARY					
At confluence with Labadie Creek	1.5	760	1,150	1,300	1,800

Table 4: Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
LITTLE CALVEY CREEK					
Approximately 120 feet downstream of Low Water Bridge on Private Drive	7.6	2,340	3,570	4,090	5,480
Approximately 0.72 mile upstream of Low Water Bridge	6.5	2,160	3,300	3,790	5,100
LITTLE CALVEY CREEK (continued)					
Approximately 300 feet upstream of Wood Land Hills Road	5.2	1,880	2,880	3,300	4,430
At Fenny Road	3.7	1,500	2,290	2,620	3,650
Approximately 0.72 mile upstream of Fenny Road	2.9	1,300	2,000	2,290	3,100
LITTLE MERAMEC RIVER					
Approximately 0.63 mile downstream of State Highway 30	14.4	3,750	5,800	6,700	9,050
Approximately 0.72 mile upstream of State Highway 30	9.3	3,050	4,750	5,400	7,400
LITTLE TAVERN CREEK					
At Chicago Rock Island & Pacific Railroad	1.7	*	*	*	*
Approximately 0.38 mile downstream of County Highway T	1.3	*	*	*	*
At County Highway T	0.9	*	*	*	*
MERAMEC RIVER					
At east county boundary	2,673	61,100	109,000	133,000	197,000
Upstream of confluence of the Bourbeuse River	1,817	44,300	68,300	78,900	104,000
MISSOURI RIVER					
At Creve Coeur Creek	523,969	443,000	606,000	674,000	829,000
At Femme Osage River	523,801	442,000	606,000	674,000	830,000
At Charrette Creek	523,423	441,000	605,000	674,000	831,000
At Lost Creek	523,060	440,000	605,000	673,000	832,000
At Hermann Gage	522,488	439,000	604,000	673,000	833,000
MONROE BRANCH					
At confluence with Brush Creek	1.0	1,200	1,500	1,600	2,800
PIN OAK CREEK					
At confluence with the Bourbeuse River	7.2	2,920	4,600	5,300	7,300
Just downstream of Unnamed Tributary (Approximately 0.95 mile upstream of mouth)	6.1	2,870	4,550	5,300	7,100
Just upstream of Unnamed Tributary	4.0	2,130	3,390	3,920	5,400

Table 4: Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
(Approximately 0.38 mile downstream of County Highway AT)					
At County Highway AT	1.9	1,170	1,830	2,110	2,900
DATA NOT AVAILABLE*					
PIN OAK CREEK TRIBUTARY					
At confluence with Pin Oak Creek	1.9	950	1,560	1,730	2,450
POSSUM CREEK					
At confluence with Flat Creek	0.5	630	920	1,040	1,180
SOUTH BRANCH BUSCH CREEK					
At confluence with Dubois Creek	2.7	1,760	2,800	3,260	5,540
Approximately 370 feet upstream of State Highway 47	2.6	1,193	1,823	2,104	3,512
Approximately 0.53 mile upstream of State Highway 47	1.4	842	1,311	1,521	2,585
SOUTHWEST BRANCH BUSCH CREEK					
At confluence of Busch Creek	5.6	2,170	3,260	4,200	7,670
Just downstream of State Highway 47	4.8	1,855	2,908	3,383	5,785
Approximately 0.61 mile upstream of State Highway 47	4.6	2,487	3,818	4,413	7,407
ST. JOHN'S CREEK					
Chicago-Rock Island and Missouri Pacific railroad bridge	85.4	7,000	10,000	11,500	15,000
At State Highway 100	82.6	7,000	*	*	*
THORNTON BRANCH					
At confluence with Brush Creek	1.5	1,600	1,650	1,900	3,200
UNNAMED TRIBUTARY TO BUSCH CREEK					
At confluence with Busch Creek	1.0	736	1,190	1,400	2,430
WILD HORSE CREEK					
At confluence with Meramec River	0.8	1,000	1,500	1,550	2,500
WINCH CREEK					
At private road (approximately 6,100 feet downstream from County Highway O)	4.3	1,723	2,650	3,043	4,200
At County Highway O	2.9	1,403	2,178	2,504	3,400
At private road (about 3,200 feet upstream of County Highway O)	2.2	1,202	1,874	2,156	2,900
WINSEL CREEK					
At Bacon Ridge Road	8.8	2,790	4,810	5,520	8,200
At Interstate Highway 44	6.8	2,520	4,100	4,830	6,800

Table 4: Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Sq Miles)	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual Chance	0.2-Percent-Annual-Chance
2,200 feet upstream of Springfield Road	5.5	2,350	3,850	4,500	6,500
At Springfield Road	4.3	2,020	3,170	3,870	5,600
At Acid Mine Road	4.0	1,880	3,020	3,630	5,200
Downstream corporate limits	4.0	1,880	3,020	3,630	4,814
DATA NOT AVAILABLE*					
WINSEL CREEK (continued)					
County Highway AF	3.0	1,690	2,720	3,240	4,120
7,200 feet upstream of County Highway AF	2.1	1,650	2,580	3,050	3,700
At Elmont Road	0.6	500	810	940	1,190

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 cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Manning's "n" values used in all hydraulic analyses can be found in Table 5.

3.2.1 Pre-Countywide Analysis

<u>County of Franklin, Missouri Unincorporated Areas</u>

Analyses of the hydraulic characteristics of the streams in the county were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Valley and channel cross sections for the backwater analyses were obtained from aerial photogrammetry at selected locations to determine hydraulic characteristics. Topographic maps with a scale of 1:4800, 1:24000, or 1:62500, and 4-, 10-, or 20-foot contours were used to supplement field surveyed cross sections (References 26, 27, and 28). All bridges and culverts were field checked to obtain elevation data and structural geometry.

Starting water-surface elevations for the streams studied by detailed methods were based on normal depth analysis except for Brown's Branch, Pin Oak Creek Tributary, Flat Creek, Meramec River, and Bourbeuse River.

Brown's Branch and Pin Oak Creek Tributary used coincident elevations at the confluence with their respective parent streams. Flat Creek and the Meramec River started profiles from concurrent downstream studies of the City of Union and St. Louis County FIS, respectively. The Bourbeuse River starting water-

surface elevations were determined by rating curves developed at the mouth by the USACE, St. Louis District.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater program (Reference 23). Cross sections for the backwater analyses were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures. Water-surface profiles for the Missouri River were computed by the USACE, Kansas City District, using the HEC-2 computer program.

City of Berger, Missouri

Analyses of the hydraulic characteristics of the streams in the City of Berger were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Water-surface elevations for floods of the selected recurrence intervals on the Missouri River were computed using the USACE HEC-2 step-backwater computer program (Reference 23).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

City of New Haven, Missouri

Analyses of the hydraulic characteristics of the streams in the City of New Haven were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Starting water-surface elevations were obtained from the Franklin County FIS. Water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USACE HEC-2 step-backwater computer program (Reference 23).

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals.

City of Pacific, Missouri

Analyses of the hydraulic characteristics of the streams in the City of Pacific were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail. Peak discharges obtained from the runoff hydrographs were used in the USACE HEC-2 step-backwater program to compute the frequency profiles (Reference 23).

Field work was conducted during the study to help establish the roughness coefficients (Manning's "n") for each stream channel and overbank area. Also, a field check was made to confirm the existence and condition of all culverts and bridges in the study are and to determine where flow would be impeded due to siltation or other blockages. The valley cross sections were obtained by field surveys with distances measured by stadia. The elevations were obtained from

USGS bench marks. All bridges and culverts were surveyed along with road profiles. Valley cross sections were taken where significant changes in topography were determined by the engineer.

City of Sullivan, Missouri

Analyses of the hydraulic characteristics of the streams in the City of Sullivan were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail. Peak discharges obtained from the runoff hydrographs were used in the USACE HEC-2 step-backwater program to compute the frequency profiles (Reference 23).

Valley and channel cross sections were obtained from aerial photogrammetry at selected locations to determine hydraulic characteristics. Topographic maps at a scale of 1:4800 were prepared with four-foot contours and were used to supplement cross sections (Reference 29). All bridges and culverts were field checked to obtain elevation data and structural geometry. For the portion of Winsel Creek under Interstate Highway 44, plans were obtained from the Jefferson City office of the Missouri State Highway Department.

Starting water-surface elevations for Winsel Creek were obtained from the Franklin County, Missouri, FIS. Water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USACE HEC-2 step-backwater computer program (Reference 23). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

City of Union, Missouri

Analyses of the hydraulic characteristics of the streams in the City of Union were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections for the backwater analyses of all streams studied in detail were obtained by field and photogrammetric surveys. The location and extent of the cross sections were determined during field inspections by hydraulic engineers. All bridges and culverts were field checked to obtain elevations data and structural geometry.

Backwater profiles were initiated by three different methods. Starting water-surface elevations for the Bourbeuse River were obtained from the Franklin County FIS. Flat Creek was initiated by the slope-area method. On all other creeks, starting elevations from Flat Creek were used. The discharges on Flat Creek used to obtain the starting elevations on the tributaries were adjusted to correspond with the timing of peak flows of the respective tributaries.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program (Reference 23).

City of Washington, Missouri

Analyses of the hydraulic characteristics of the streams in the City of Washington were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

For Busch Creek and South Branch Busch Creek, the backwater profiles were initiated using the slope-area method in the HEC-2 computer program (Reference 23). Starting water-surface elevations and profiles for the lower portion of Busch Creek, Southwest Branch Busch Creek, Dubois Creek and St. Johns Creek were developed by Booker Associates, Inc. for the Franklin County FIS using normal depth computations.

The hydraulic analyses for these studies are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

3.2.2 Countywide Analysis

For this countywide study new detailed study was incorporated into the Franklin Countywide study for City of Union, the City of Washington, and the Missouri River in its entirety. Hydraulic analyses for approximate streams were also performed.

Input data for hydraulic modeling for seven bridges along Birch Creek and Bourbeuse River Tributary were obtained by land surveying. Cross sections between bridges were also surveyed.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1).

With the exception of Dubois Creek, cross-section profile data was obtained from two-foot contour mapping provided from the City of Washington in electronic format (Reference 30). The two-foot contour mapping was supplemented with channel invert data obtained from USACE HEC-2 input data used in the hydraulic analysis for the previous flood insurance study for the City of Washington (Reference 2). All cross-section data used for Dubois Creek were obtained from the existing HEC-2 input data.

Input data for twelve bridges along Busch Creek, Unnamed Tributary to Busch Creek, Southwest Branch Busch Creek, South Branch Busch Creek, and Dubois Creek were obtained from the existing HEC-2 model (Reference 2). Input data for four bridges along Busch Creek and Southwest Branch Busch Creek obtained from as-built drawings provided by the City of Washington (Reference 30).

Water-surface elevations were computed using the USACE HEC-RAS step-backwater computer program (Reference 32). The backwater profiles were initiated using the normal depth method.

Flood profiles were drawn showing the computed water-surface elevations for floods of the 10%, 2%, 1% and 0.2% recurrence intervals.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Flat Creek, Flat Creek North Tributary, Fenton Creek and Possum Creek in the City of Union and St. John's Creek and Southwest Branch Brush Creek in the City of Washington were redelineated as part of the countywide analysis. These detail-studied streams that were not re-studied as part of this countywide study include a "profile base line" on the maps. This "profile base line" provides a link to the flood profiles included in the FIS report. The detail-studied stream centerline may have been digitized or redelineated as part of this revision. The "profile base lines" for these streams were based on the best available data at the time of their study and are depicted as they were on the previous FIRMs. In some cases, where improved topographical data was used to redelineate floodplain boundaries, the "profile base line" may deviate significantly from the channel centerline or may be outside the Special Flood Hazard Area (SFHA).

For the rest of the streams previously studied using detailed methods, the floodway and 1-, and 0.2-percent-annual-chance floodplain boundaries were digitized and converted to softcopy files. The files were compared to and made consistent with the best available elevation data and Digital Orthophoto Quadrangles (DOQs). All work was accomplished in accordance with the report, FEMA Guidelines and Specifications for study contractors, dated January 1995.

3.2.3 Upper Mississippi River System Flow Frequency Study Methodology

The main hydraulic tool used to determine flood elevations along the Missouri River was the UNET unsteady flow computer modeling program (Reference 33). Included in the UNET model were the main stem of the Mississippi River, several of its main tributaries, navigation dams, and the levees and levee systems. Hydrographic surveys were assembled from navigation channel maintenance surveys, dam periodic inspection surveys, and environment management project surveys. These surveys date from 1997 or later. 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. Bluff-to-bluff digital terrain data collected in 1995 and 1998 were used to supplement the channel survey data (Reference 34). Model development consisted of constructing HEC-RAS models from the original cross-sections, adding in ineffective flow areas or obstructions as necessary, and then converting the models to UNET.

The UNET model was calibrated to reproduce recorded flood hydrographs for a selected period of record. The UNET model was calibrated to both stage and discharge at gaging locations primarily by adjusting roughness coefficients and estimated lateral inflows. Annual peak flows and peak stages from the period of record run of the calibrated UNET model were used to develop rating curves for each cross section location. Using these station rating curves and the station

frequency flows developed during the hydrology phase, frequency elevation points were obtained for each cross section location. Connecting the corresponding points resulted in flood frequency profiles. These profiles were coordinated among the computational teams and appropriate adjustments were made to assure consistency.

Some special considerations and techniques were required to address especially complex flow reaches. The confluences of the Missouri and Illinois Rivers with the Mississippi relied primarily on development of graphical stage-probability relationships for backwater-impacted cross sections. These were created using a graphical Weibull approach. The graphical period-of-record stage-probability curves were combined to blend a consistent and reasonable profile for each probability flood. Confluences of many other smaller streams with the main stem also exhibited backwater effects resulting in discontinuities in the profiles. A computer routine was developed to smooth the profile in these reaches so as to form a consistent, reasonable transition through the zone of backwater.

The 1-percent-annual-chance water surface elevation profile was calculated using HEC-RAS 3.1.3 (Reference 35). Upon completion of the Upper Mississippi River System Flow Frequency Study (UMRSFFS), FEMA funded the Corps of Engineers to compute a floodway for the studied reach of the Missouri River. This floodway determination consisted of converting the hydraulic data from UNET to HEC-RAS, calibrating the HEC-RAS steady-state models to the UMRSFFS results for the 1-percent-annual-chance profile, and performing the floodway computations. The 1-percent-annual-chance elevations from this calibrated HEC-RAS model were used as the basis to delineate the associated 1-percent-annual-chance floodplain and correspond to the base flood elevation shown on the maps. The 10-, 2-, and 0.2-percent-annual-chance elevations shown on the flood profiles were plotted using the original UNET elevations.

The cross section stationing used in the Missouri River model was based on existing USACE River Mile markers of 1960 (Reference 37). The reach length between cross sections is based on a model centerline developed for the HEC-RAS converted model of the UMRSFFS (Reference 38). The distances between cross sections shown in the floodway data table and flood profile were created using the cross section stations based on the 1960 River Miles. While the calculated distance between cross sections using the 1960 River Miles are similar to the measured distance along the model centerline, some differences may occur. This difference in distance does not affect the calculated water surface elevation at each cross section shown on the floodway data table and flood profile, nor does it affect the placement of the BFEs on the map.

For more detailed information on each of the hydraulic methodologies used to calculate flood elevation profiles, the reader is encouraged to consult the report cited as Reference 26 in Section 9.0 of this FIS.

Table 5: Manning's "n" Values for Detailed Study Streams

Flooding Source	Roughness Coefficients	
	Channel	Overbank
Birch Creek	0.02-0.03	0.02-0.09
Bourbeuse River	0.03-0.06	0.035-0.11
Bourbeuse River Tributary	0.02-0.03	0.02-0.09
Brown's Branch	0.03-0.10	0.03-0.18
Brush Creek	*	*
Busch Creek	0.017-0.06	0.02-0.10
Calvey Creek	*	*
Dubois Creek	0.017-0.06	0.02-0.10
Fenton Creek	*	*
Fiddle Creek	*	*
Flat Creek	0.045-0.065	0.06-0.09
Flat Creek North Tributary	*	*
Happy Sock Creek	0.045-0.065	0.06-0.09
Labadie Creek	*	*
Labadie Creek Tributary	*	*
Little Calvey Creek	*	*
Little Meramec River	*	*
Little Tavern Creek	*	*
Meramec River	0.03-0.10	0.03-0.18
Missouri River	0.014-0.0375	0.03-0.2
Monroe Branch	*	*
Pin Oak Creek	0.045-0.065	0.06-0.09
Pin Oak Creek Tributary	0.045-0.065	0.06-0.09
Possum Creek	*	*
South Branch Busch Creek	0.017-0.06	0.02-0.1
Southwest Branch Busch Creek	0.017-0.06	0.02-0.10
St. John's Creek	0.03-0.10	0.03-0.18
Thornton Branch	*	*
Unnamed Tributary to Busch Creek	0.017-0.06	0.02-0.10
Wild Horse Creek	*	*
Winch Creek	*	*
Winsel Creek	0.035-0.075	0.035-0.085

*DATA NOT AVAILABLE

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 used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

To accurately convert flood elevations for Franklin County from the current NGVD29 datum to the newer NAVD88 datum, the following procedure was implemented. The vertical datum shift was calculated for each corner of the USGS 7.5-minute topographic quadrangle maps located inside or within 2.5 miles of the county boundary using the USACE conversion program, Corpscon 6.0.1 (Reference 36). A resulting countywide conversion factor of -0.13 ft was applied to the required components of the FIS that display flood elevations.

3.3.1 Methods for Missouri River

The studied reach of Missouri River spans multiple counties in multiple states, and the river forms the actual border between adjacent counties. The Upper Mississippi River System Flow Frequency Study (UMRSFFS) was originally performed using the NGVD29 vertical datum. Applying an average countywide datum shift to convert to NAVD88 would have resulted in a mismatch of elevations between counties. Therefore, in order to perform the most accurate vertical datum conversion possible, and to maintain consistency in approach across county lines, the datum conversion for the Missouri River was performed on a cross-section by cross-section basis, rather than by applying an average county-wide or stream-wide value.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242
(301) 713-4172 (fax)

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.

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Discharge tables. Users should reference the data presented in the FIS report 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 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. For this countywide study, between cross sections, the redelineated and approximate boundaries were interpolated and delineated using the USGS 10-meter DEMs (Reference 9).

The elevations between cross sections for the new and/or revised detailed studies for Busch Creek, Dubois Creek (lower reaches), South Branch Busch Creek, Southwest Branch Busch Creek, and Unnamed Tributary to Busch Creek were interpolated and delineated using topographic maps at a scale of 1:4800 with a two foot contour interval (Reference 39).

The elevations between cross sections for the revised detailed study for Dubois Creek (upper reaches) were interpolated and delineated using topographic maps at a scale of 1:24000 with a twenty foot contour interval (Reference 40).

The elevations between cross sections for the new detailed studies for Birch Creek and Bourbeuse River Tributary were interpolated and delineated using topographic maps at a scale of 1:24000 with a twenty foot contour interval (Reference 41).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards zones A, 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, 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.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the FHBM for Franklin County, Missouri (Reference 8).

4.1.1 Methods for the Missouri River

Between cross sections along the Missouri River, the boundaries were interpolated using a digital terrain model (DTM) created from photogrammetric-derived mass points and break lines, with a post spacing of 15 feet and vertically accurate enough to support the creation of 4 foot contours (Reference 34).

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

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 base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 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 floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 6, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either very close together or collinear, only the floodway boundary is shown.

Along streams where floodways have not been cited, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

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 (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

4.2.1 Methods for the Missouri River

Upon completion of the UMRSFFS, FEMA funded the Corps of Engineers to compute a floodway for the studied reach of the Missouri River. This floodway determination consisted of converting the hydraulic data from UNET to HEC-RAS, calibrating the HEC-RAS steady-state models to the UMRSFFS results, and performing the floodway computations.

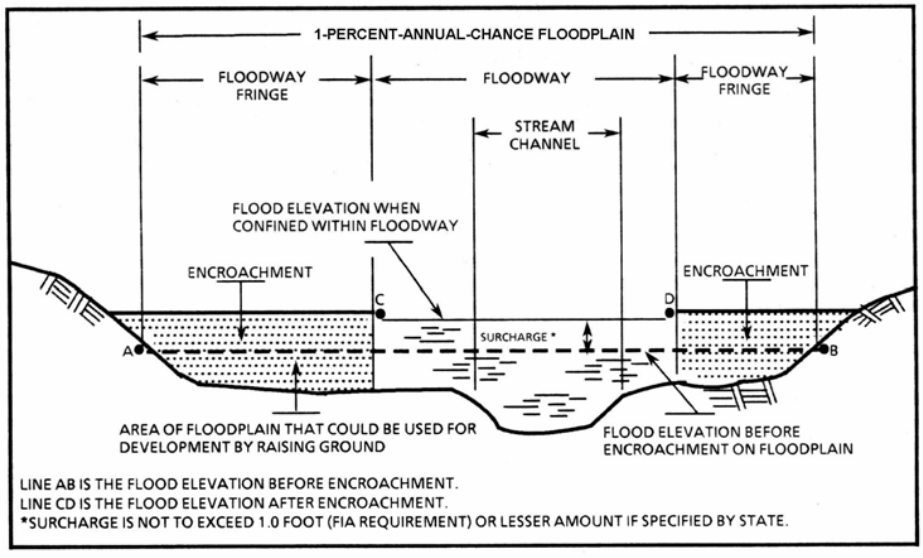

Figure 1. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Birch Creek								
A	3,750	288	1315	5.8	499.0	490.7[2]	491.7	1.0
B	5,086	120	938	8.2	499.0	494.9[2]	494.9	0.0
C	8,000	310	1203	6.4	500.1	500.1	500.4	0.3
D	9,565	115	959	8.0	503.7	503.7	504.6	0.9
E	12,620	127	585	13.1	510.7	510.7	510.7	0.0
F	13,930	160	1198	6.4	515.6	515.6	516.6	1.0
G	15,930	95	723	10.6	519.6	519.6	519.7	0.1
H	17,700	63	521	7.2	524.3	524.3	525.0	0.7
I	20,030	61	435	8.6	528.6	528.6	529.5	0.9
J	24,164	42	349	10.8	543.3	543.3	543.8	0.5

[1] Feet above confluence with Bourbeuse River

[2] Elevations without considering backwater effect from Bourbeuse River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

BIRCH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River								
A	1,584	810	10,220	3.8	489.9	489.9	490.8	0.9
B	11,933	1,701	26,032	1.5	492.7	492.7	493.7	1.0
C	20,064	543	9,519	4.1	494.1	494.1	495.0	0.9
D	29,462	1,480	22,123	1.8	495.9	495.9	496.8	0.9
E	34,003	681	9,874	3.9	496.8	496.8	497.7	0.9
F	44,352	1,386	16,246	2.4	499.7	499.7	500.6	0.9
G	45,698	433	7,092	5.5	500.3	500.3	501.2	0.9
H	48,628	959	14,564	2.7	502.0	502.0	502.8	0.8
I	53,539	415	6,476	6.0	503.4	503.4	504.3	0.9
J	60,720	1,195	19,039	2.0	507.3	507.3	508.2	0.9
K	67,003	405	6,937	5.6	509.4	509.4	510.3	0.9
L	78,672	1,380	22,980	1.7	514.0	514.0	514.9	0.9
M	83,213	475	8,293	4.8	515.5	515.5	516.1	0.6
N	89,180	1,430	23,392	1.7	519.5	519.5	520.1	0.6

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River (cont'd)								
O	95,410	812	14,597	2.7	521.5	521.5	522.3	0.8
P	99,686	2,006	27,744	1.4	523.2	523.2	524.1	0.9
Q	106,181	1,031	15,490	2.8	526.4	526.4	527.3	0.9
R	113,520	352	8,580	5.0	532.6	532.6	533.6	1.0
S	122,126	1,094	17,230	2.5	536.4	536.4	537.4	1.0
T	132,000	620	11,925	3.9	540.3	540.3	541.3	1.0
U	136,752	1,400	25,718	1.8	542.2	542.2	543.1	0.9
V	149,424	408	9,413	4.9	548.5	548.5	549.5	1.0
W	166,267	1,222	23,363	2.0	554.9	554.9	555.9	1.0
X	173,237	400	8,092	5.7	558.5	558.5	559.2	0.7
Y	181,738	1,100	17,042	2.7	563.2	563.2	564.0	0.8
Z	195,360	785	17,878	2.6	569.5	569.5	570.4	0.9
AA	205,920	498	11,359	4.1	571.7	571.7	572.7	1.0

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River(cont'd)								
AB	216,480	500	9,771	4.7	577.1	577.1	578.0	0.9
AC	227,040	1,050	17,125	2.7	582.4	582.4	583.2	0.8
AD	232,320	450	10,079	4.6	584.1	584.1	585.0	0.9
AE	237,600	935	14,491	3.2	586.9	586.9	587.7	0.8
AF	242,880	475	9,016	6.2	589.9	589.9	590.6	0.7
AG	253,440	990	22,005	2.6	593.4	593.4	594.4	1.0
AH	258,720	275	6,259	9.0	594.6	594.6	595.5	0.9
AI	269,280	1,365	23,285	2.4	602.1	602.1	603.0	0.9
AJ	285,120	765	13,129	4.3	606.0	606.0	606.9	0.9
AK	290,400	1,415	21,415	2.6	608.3	608.3	609.1	0.8
AL	300,960	669	12,807	4.4	611.4	611.4	612.1	0.7
AM	306,240	1,625	24,122	2.3	612.9	612.9	613.7	0.8
AN	316,800	785	11,666	4.8	618.3	618.3	619.0	0.7

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River(cont'd)								
AO	322,080	1,320	22,849	2.5	620.7	620.7	621.5	0.8
AP	337,920	960	17,695	3.3	626.4	626.4	627.1	0.7
AQ	348,480	1,710	22,275	2.6	629.6	629.6	630.4	0.8
AR	353,760	810	10,390	5.7	632.3	632.3	632.9	0.6
AS	364,320	1,410	28,379	2.1	637.9	637.9	638.7	0.8
AT	369,600	823	13,589	4.3	639.0	639.0	639.7	0.7
AU	380,160	1,450	25,162	2.3	644.3	644.3	645.1	0.8
AV	390,720	848	17,695	3.3	647.8	647.8	648.6	0.8
AW	396,000	1,100	11,557	5.1	650.3	650.3	651.2	0.9
AX	406,560	478	9,367	6.3	657.1	657.1	657.9	0.8
AY	416,592	950	14,928	3.9	662.8	662.8	663.7	0.9
AZ	421,872	738	12,549	4.9	667.0	667.0	667.6	0.6
BA	430,320	1,409	25,174	2.5	669.8	669.8	670.6	0.8

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River (cont'd)								
BB	441,672	1,029	17,839	3.5	673.0	673.0	673.8	0.8
BC	451,176	977	11,691	5.3	675.7	675.7	676.5	0.8
BD	459,466	1,563	25,996	2.4	679.9	679.9	680.8	0.9
BE	475,200	1,041	15,831	3.6	685.3	685.3	686.0	0.7
BF	481,272	1,748	24,713	2.3	687.8	687.8	688.7	0.9
BG	489,456	900	9,449	6.0	690.4	690.4	691.3	0.9
BH	500,544	1,903	21,228	2.6	696.7	696.7	697.4	0.7
BI	506,299	776	12,261	4.5	700.9	700.9	701.6	0.7

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Bourbeuse River Tributary								
A	3,050	94	318	7.1	499.5	494.4[2]	494.4[2]	0.0
B	5,980	170	1,063	2.1	510.6	510.6	510.6	0.0
C	8,250	61	213	10.5	517.6	517.6	517.6	0.0
D	9,860	65	370	6.1	526.7	526.7	526.7	0.0
E	10,600	34	248	9.1	528.4	528.4	529.2	0.8
F	10,860	60	385	5.8	531.2	531.2	531.9	0.7
G	13,100	60	277	8.1	535.8	535.8	536.4	0.6
H	14,660	99	374	6.0	541.4	541.4	541.9	0.5
I	15,229	35	174	12.9	544.6	544.6	545.0	0.4
J	15,910	39	184	12.2	549.9	549.9	549.9	0.0

[1] Feet above confluence with Bourbeuse River

[2] Without consideration of backwater effects from Bourbeuse River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

BOURBEUSE RIVER TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Brown's Branch								
A	2,531	200	1437	4.2	491.4	491.4	492.4	1.0
B	6,291	73	993	6.1	496.2	496.2	496.6	0.4
C	8,351	204	1815	3.4	499.6	499.6	500.6	1.0
D	10,501	137	1441	2.9	503.4	503.4	504.3	0.9
E	13,171	478	1958	2.2	506.3	506.3	507.2	0.9
F	15,868	166	651	4.3	512.7	512.7	513.0	0.3
G	19,566	270	636	4.4	521.1	521.1	521.7	0.6
H	21,400	120	502	4.2	527.3	527.3	528.3	1.0
I	24,798	48	296	4.4	549.1	549.1	549.8	0.7
J	25,822	55	192	6.8	556.2	556.2	556.5	0.3

[1] Feet above confluence with Dubois Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Brush Creek								
A	6,178	586	4200	2.5	464.7	460.7[2]	461.6	0.9
B	8,501	300	1145	6.7	466.6	466.6	467.4	0.8
C	10,666	220	1760	5.9	475.3	475.3	475.8	0.5
D	11,405	130	1017	7.0	477.7	477.7	478.4	0.7
E	11,722	480	2620	3.5	480.2	480.2	480.6	0.4
F	12,302	292	2257	2.5	480.9	480.9	481.9	1.0
G	14,837	150	1055	5.3	484.2	484.2	485.1	0.9
H	15,787	165	1147	4.9	488.4	488.4	488.8	0.4
I	16,632	190	1249	4.5	492.0	492.0	492.8	0.8
J	17,688	280	1660	3.4	496.3	496.3	497.1	0.8
K	18,058	310	1812	3.1	497.5	497.5	498.4	0.9

[1] Feet above confluence with Meramec River

[2] Elevations without considering backwater effect from Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Brush Creek (cont'd)								
L	18,480	240	1,428	3.9	499.1	499.1	500.0	0.9
M	19,320	140	1,005	4.8	502.1	502.1	502.8	0.7
N	19,325	140	1,005	4.8	502.1	502.1	502.8	0.7
O	20,810	150	1,094	4.4	511.1	511.1	511.5	0.4
P	21,600	95	978	3.8	513.5	513.5	514.3	0.8
Q	22,260	160	1,293	2.1	515.5	515.5	516.2	0.7
R	23,430	240	1,199	2.3	517.2	517.2	518.0	0.8
S	24,925	100	697	4.0	524.7	524.7	524.9	0.2
T	25,575	100	583	4.7	526.8	526.8	527.3	0.5

[1] Feet above confluence with Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Busch Creek								
A	140	244	1,958	6.0	491.3	479.7[2]	480.5	0.8
B	930	243	2,130	5.5	491.3	480.7[2]	481.6	0.9
C	2,750	137	1,910	6.1	491.3	487.2[2]	487.5	0.3
D	3,450	199	2,570	4.6	491.3	488.1[2]	488.6	0.5
E	3,950	362	1,470	8.0	491.3	488.3[2]	488.6	0.3
F	4,400	167	1,750	6.7	491.3	489.2[2]	490.0	0.8
G	5,060	340	3,222	2.7	491.3	490.3[2]	491.3	1.0
H	5,320	397	3,201	2.7	492.6	492.6	493.3	0.7
I	6,070	271	2,059	2.6	492.7	492.7	493.5	0.7
J	6,820	79	1,024	5.2	492.8	492.8	493.6	0.8
K	7,780	65	862	6.1	493.6	493.6	494.3	0.7
L	8,850	87	808	6.5	494.9	494.9	495.6	0.7
M	10,120	90	766	6.9	497.6	497.6	498.5	0.9

[1] Feet above Dubois Creek

[2] Elevations without considering backwater from Missouri River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Busch Creek (cont'd)								
N	11,090	76	566	9.3	500.2	500.2	500.9	0.7
O	11,620	174	1,324	4.0	506.2	506.2	506.6	0.4
P	12,000	91	977	5.4	506.4	506.4	506.7	0.3
Q	12,214	93	1,299	3.6	510.4	510.4	510.6	0.2
R	12,850	146	1,544	3.0	510.6	510.6	511.1	0.5
S	13,960	208	1,415	3.3	513.1	513.1	513.6	0.5
T	14,500	117	708	6.5	513.2	513.2	513.8	0.6
U	14,672	115	583	7.9	513.4	513.4	514.1	0.7
V	14,753	131	994	4.6	516.5	516.5	517.1	0.6
W	15,010	197	1,650	2.8	516.7	516.7	517.5	0.8
X	15,424	123	824	4.4	518.6	518.6	518.9	0.4
Y	15,990	75	426	8.5	518.6	518.6	519.1	0.5
Z	17,190	75	613	5.9	522.4	522.4	522.8	0.3

[1] Feet above Dubois Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Busch Creek (cont'd)								
AA	17,920	61	534	6.8	523.8	523.8	524.1	0.3
AB	18,500	216	979	3.7	526.6	526.6	526.8	0.2
AC	19,062	148	428	8.4	528.4	528.4	528.5	0.1
AD	19,520	204	1,438	2.5	535.2	535.2	535.3	0.1
AE	19,980	158	1,021	3.5	535.4	535.4	535.5	0.1
AF	20,645	131	714	5.1	536.1	536.1	536.5	0.5
AG	20,935	372	5,067	0.5	552.5	552.5	552.5	0.0
AH	21,640	73	728	1.1	552.5	552.5	552.5	0.0
AI	23,290	51	106	7.7	554.5	554.5	554.6	0.2
AJ	26,000	116	223	3.7	581.8	581.8	582.4	0.6

[1] Feet above Dubois Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Calvey Creek								
A	9,835	265	3,405	3.4	480.6	475.8[2]	476.5	0.7
B	10,989	515	3,800	3.0	480.6	476.5[2]	477.3	0.8
C	12,380	179	2,335	4.8	480.6	477.1[2]	478.0	0.9
D	13,975	440	3,055	3.0	480.6	480.5[2]	481.5	1.0
E	16,402	350	2,137	4.3	483.0	483.0	483.9	0.9
F	18,060	350	3,041	3.0	488.1	488.1	488.7	0.6
G	20,533	510	5,188	1.7	493.3	493.3	493.8	0.5
H	21,888	352	2,099	4.3	494.3	494.3	494.7	0.4
I	23,031	393	2,019	4.4	497.3	497.3	497.8	0.5

[1] Feet above confluence with Meramec River

[2] Elevation without considering backwater effect from Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Dubois Creek								
A	4,770	233	2065	5.3	491.3	482.1[2]	479.3	1.0
B	5,570	123	2063	5.3	491.3	485.1[2]	480.6	1.0
C	7,424	202	2353	3.8	491.3	486.1[2]	482.0	1.0
D	11,745	88	1145	7.8	491.3	48[2]	483.4	0.9
E	14,390	342	2032	4.4	491.3	485.5[2]	486.3	0.8
F	19,055	418	2959	1.2	491.3	491.3	491.9	0.6
G	22,495	173	1538	2.3	496.7	496.7	497.3	0.6
H	25,751	73	680	5.1	501.7	501.7	502.4	0.7
I	27,704	221	1022	3.4	504.3	504.3	504.9	0.6
J	32,581	124	515	5.5	513.8	513.8	514.3	0.5
K	35,870	62	400	7.1	530.6	530.6	530.7	0.1
L	39,299	84	492	5.8	546.1	546.1	546.7	0.6
M	43,163	59	359	6.3	564.5	564.5	565.4	0.9
N	46,863	59	247	5.7	594.7	594.7	595.4	0.7

[1] Feet above confluence with Missouri River

[2] Elevations without considering backwater effect from Missouri River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fenton Creek								
A	1,331	59	252	10.9	514.5	514.5	514.6	0.1
B	1,969	50	485	5.7	522.8	522.8	523.3	0.5
C	3,992	68	372	6.5	534.3	534.3	534.7	0.4
D	4,921	55	292	8.3	544.2	544.2	544.5	0.3

[1] Feet above confluence with Flat Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fiddle Creek								
A	615	95	838	6.3	479.1	473.9[2]	474.8	0.9
B	1,490	163	1,733	3.1	479.1	477.1[2]	477.9	0.8
C	2,215	389	3,622	1.4	479.1	478.4[2]	479.1	0.7
D	3,570	95	1,241	4.3	479.7	479.7	480.6	0.9
E	4,980	300	3,383	1.6	481.1	481.1	482.0	0.9
F	6,950	135	1,268	4.2	483.6	483.6	484.3	0.7
G	9,750	130	1,680	3.2	488.0	488.0	488.7	0.7
H	12,030	80	850	6.2	491.2	491.2	491.9	0.7
I	13,930	205	1,532	2.8	497.5	497.5	498.0	0.5
J	16,065	176	921	4.7	503.2	503.2	503.7	0.5
K	16,670	62	709	4.5	508.3	508.3	509.3	1.0
L	17,380	175	1,281	2.5	523.0	523.0	523.9	0.9
M	18,230	271	1,282	2.5	524.3	524.3	524.8	0.5
N	18,845	300	1,685	1.9	525.6	525.6	526.0	0.4
O	19,970	200	765	4.2	530.4	530.4	531.2	0.8

[1] Feet above Limit of Floodway 165 feet downstream from Labadie Bottom Road

[2] Elevation without considering backwater effect from Missouri River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

FIDDLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Flat Creek								
A	1,610	150	1,605	5.5	514.5	505.4[2]	506.3[2]	0.9
B	3,902	65	718	7.8	515.3	515.3	515.8	0.5
C	6,299	155	1,249	4.2	531.0	531.0	531.7	0.7
D	7,450	120	577	5.6	535.9	535.9	536.7	0.8
E	8,817	113	313	10.3	544.4	544.4	545.2	0.8
F	11,030	132	439	7.3	565.7	565.7	565.9	0.2
G	12,471	149	892	3.6	575.6	575.6	576.3	0.7
H	14,900	183	716	3.5	588.7	588.7	589.6	0.9
I	12,235	116	731	2.9	610.2	610.2	611.2	1.0
J	18,545	150	450	4.7	615.7	615.7	616.2	0.5
K	19,960	150	413	5.1	624.2	624.2	624.8	0.6

[1] Feet above confluence with Bourbeuse River

[2] Elevations Without Considering Backwater Effect From Bourbeuse River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Flat Creek North Tributary								
A	882	55	241	9.2	536.9	536.9	536.9	0.0
B	2,392	65	266	8.4	551.3	551.3	551.7	0.4
C	3,348	65	444	5.0	558.8	558.8	559.7	0.9

[1] Feet above confluence with Flat Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Happy Sock Creek								
A	1,230	190	1,371	4.5	523.6	516.5[2]	517.5	1.0
B	3,100	305	1,827	3.4	523.6	522.7[2]	523.5	0.8
C	4,575	189	953	5.8	527.4	527.4	528.2	0.8
D	6,005	192	991	5.5	534.1	534.1	534.9	0.8
E	6,405	66	584	9.4	535.7	535.7	536.1	0.4
F	6,960	200	1,312	4.1	538.6	538.6	539.5	0.9
G	8,400	351	2,403	2.2	543.9	543.9	544.9	1.0
H	8,945	166	852	6.3	546.9	546.9	547.8	0.9
I	10,570	106	527	9.7	556.4	556.4	556.8	0.4
J	12,300	94	458	11.1	566.0	566.0	566.2	0.2
K	12,990	151	593	8.6	570.1	570.1	570.8	0.7
L	14,900	181	818	5.4	585.0	585.0	585.9	0.9
M	16,675	101	590	7.5	595.2	595.2	596.0	0.8
N	19,875	113	566	7.2	615.4	615.4	616.3	0.9
O	21,030	244	1,506	2.7	625.9	625.9	625.9	0.0

[1] Feet above confluence with Bourbeuse River

[2] Elevations without considering backwater effect from Bourbeuse River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

HAPPY SOCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Labadie Creek								
A	3,720	200[2]	2,432	2.5	484.8	473.7[3]	474.5	0.8
B	5,390	200[2]	2,013	3.1	484.9	474.2[3]	475.1	0.9
C	8,025	210	1,663	3.7	485.1	476.1[3]	476.9	0.8
D	10,375	180	1,310	4.7	485.4	478.9[3]	479.4	0.5
E	11,245	102	1,161	5.3	485.4	481.2[3]	481.7	0.5
F	12,185	106	998	6.2	485.4	483.6[3]	483.9	0.3
G	13,695	140	1,576	3.9	487.1	487.1	487.3	0.2
H	14,745	160	2,030	3.1	489.0	489.0	489.1	0.1
I	18,705	335	3,586	1.7	495.4	495.4	495.7	0.3
J	19,725	254	2,338	2.7	495.6	495.6	495.9	0.3
K	21,265	325	2,103	2.9	498.8	498.8	499.3	0.5
L	22,455	140	1,017	3.1	499.8	499.8	500.3	0.5

[1] Feet above confluence with Missouri River
[2] Width without considering influence from Missouri River floodway
[3] Elevation without considering flooding controlled by Missouri River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

LABADIE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Labadie Creek Tributary								
A	645	34	401	3.2	488.9	486.2[2]	486.2	0.0
B	2,455	60	319	4.1	490.7	490.7	491.0	0.3
C	3,745	59	290	4.5	497.3	497.3	497.8	0.5

[1] Feet above confluence with Labadie Creek

[2] Elevations without considering backwater effect from Labadie Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

LABADIE CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Calvey Creek								
A	560	82	522	7.8	515.0	515.0	515.5	0.5
B	1,940	91	753	5.4	521.2	521.2	521.7	0.5
C	3,460	97	699	5.8	528.3	528.3	528.6	0.3
D	4,210	130	938	4.0	531.2	531.2	531.8	0.6
E	5,600	140	604	5.6	534.8	534.8	535.5	0.7
F	7,600	135	585	5.1	543.7	543.7	544.3	0.6
G	9,100	160	772	4.3	551.9	551.9	552.2	0.3
H	10,110	159	741	3.9	557.1	557.1	557.7	0.6
I	11,200	145	704	4.1	562.4	562.4	562.7	0.3
J	11,500	70	622	4.2	565.4	565.4	565.6	0.2
K	13,420	158	614	4.3	576.4	576.4	577.2	0.8
L	14,120	156	631	4.2	580.6	580.6	581.4	0.8
M	16,000	198	730	3.1	589.7	589.7	590.6	0.9

[1] Feet above confluence with Calvey Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Meramec River								
A	1,390	306	1,793	3.7	533.4	533.4	534.3	0.9
B	4,050	138	1,176	5.7	541.7	541.7	542.4	0.7
C	5,195	288	2,373	2.8	544.1	544.1	545.1	1.0
D	6,620	171	1,259	5.3	549.2	549.2	550.2	1.0
E	7,410	115	998	6.7	553.6	553.6	554.6	1.0
F	9,900	195	1,628	4.1	562.5	562.5	563.4	0.9
G	11,055	217	1,568	4.3	565.9	565.9	566.9	1.0
H	12,395	347	1,879	2.9	569.6	569.6	570.4	0.8
I	14,845	152	1,018	5.3	579.0	579.0	580.0	1.0

[1] Feet above confluence of Pierce Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Tavern Creek								
A	820	35	309	5.2	477.9	471.0[2]	471.5	0.5
B	1480	86	527	3.1	477.9	473.4[2]	474.4	1.0
C	2730	58	376	4.3	480.7	480.7	481.1	0.4
D	3810	82	446	3.1	488.7	488.7	489.6	0.9
E	4790	61	331	4.2	496.3	496.3	497.3	1.0
F	5690	55	275	4.2	501.6	501.6	501.8	0.2
G	6890	67	295	3.9	510.2	510.2	510.3	0.1
H	7680	44	179	6.4	517.7	517.7	518.2	0.5

[1] Feet above Chicago Rock Island and Pacific Railroad
[2] Elevations without considering backwater effect from Missouri River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meramec River								
A	264,000	3210/1910[2]	44,728	3.0	464.3	464.3	465.3	1.0
B	265,690	2795/2284[2]	36,121	3.7	464.8	464.8	465.8	1.0
C	266,587	2783/2411[2]	37,863	3.5	465.2	465.2	466.1	0.9
D	266,693	2782/2459[2]	33,561	4.0	465.2	465.2	466.1	0.9
E	273,240	3045/2497[2]	48,998	2.7	466.5	466.5	467.4	0.9
F	280,210	4002	75,635	1.8	469.1	469.1	470.0	0.9
G	292,248	2154	38,943	3.4	471.2	471.2	472.1	0.9
H	304,128	1175	20,524	6.5	474.4	474.4	475.3	0.9
I	315,322	2790	35,324	3.8	479.7	479.7	480.5	0.8
J	331,584	1397	25,391	5.2	485.6	485.6	486.5	0.9
K	343,728	2166	53,199	2.5	488.4	488.4	489.4	1.0
L	347,160	1299	32,962	4.0	488.9	488.9	489.8	0.9
M	357,034	2100	40,600	1.9	491.2	491.2	492.1	0.9

[1] Feet above confluence with Mississippi River

[2] Total width/width within County Boundary

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

MERAMEC RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meramec River (cont'd)								
N	366,432	1,669	26,324	3.0	492.7	492.7	493.7	1.0
O	373,190	1,979	31,833	2.5	494.4	494.4	495.4	1.0
P	377,414	1,281	18,053	4.4	495.7	495.7	496.6	0.9
Q	380,424	2,264	32,830	2.4	497.5	497.5	498.3	0.8
R	388,608	525	7,860	10.0	503.1	503.1	503.4	0.3
S	400,646	1,717	24,360	3.2	512.3	512.3	513.2	0.9
T	410,784	743	14,802	5.3	514.3	514.3	515.3	1.0
U	415,536	2,230	43,760	1.8	516.1	516.1	517.1	1.0
V	430,848	927	16,025	4.9	519.4	519.4	520.3	0.9
W	434,174	1,681	26,609	3.0	520.9	520.9	521.6	0.7
X	436,603	943	14,227	5.5	521.3	521.3	522.0	0.7
Y	440,827	1,370	11,848	6.7	521.6	521.6	522.4	0.8
Z	453,552	1,852	26,067	3.0	531.1	531.1	531.5	0.4

[1] Feet above confluence with Mississippi River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meramec River (cont'd)								
AA	459,360	1,218	19,228	4.1	532.8	532.8	533.1	0.3
AB	463,056	2,000	18,454	4.3	534.3	534.3	534.6	0.3
AC	472,296	950	17,441	4.5	538.6	538.6	539.1	0.5
AD	486,288	1,778	26,828	2.9	545.2	545.2	546.1	0.9
AE	495,792	2,544	30,042	2.6	548.1	548.1	549.0	0.9
AF	503,184	1,201	17,888	4.4	552.0	552.0	552.9	0.9
AG	506,880	1,773	27,760	2.8	553.6	553.6	554.5	0.9
AH	516,912	595	9,778	8.1	559.9	559.9	560.4	0.5
AI	526,680	1,270	16,997	4.6	566.0	566.0	566.6	0.6
AJ	537,504	500	7,606	10.4	571.9	571.9	572.9	1.0
AK	547,008	1,754	26,308	3.0	577.7	577.7	578.3	0.6
AL	559,152	597	11,519	6.8	584.6	584.6	585.4	0.8

[1] Feet above confluence with Mississippi River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meramec River (cont'd)								
AM	562,848	936	13,377	5.9	586.8	586.8	587.6	0.8
AN	567,600	395	8,416	9.4	588.4	588.4	589.3	0.9
AO	573,936	1,056	19,484	4.0	593.8	593.8	594.7	0.9
AP	578,688	651	13,603	5.8	595.4	595.4	596.3	0.9
AQ	581,328	1,006	20,237	3.9	596.8	596.8	597.7	0.9
AR	588,720	677	12,413	6.4	598.9	598.9	599.8	0.9
AS	590,832	968	21,390	3.7	601.6	601.6	602.3	0.7

[1] Feet above confluence with Mississippi River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1, 2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	DIFFERENCE
Missouri River								
A	50.02	8,495/810[3]	155,566	4.3	476.1	476.1	476.9	0.8
B	51.13	8,159/750[3]	152,832	4.4	476.9	476.9	477.9	1.0
C	52.48	8,234/870[3]	155,541	4.3	478.4	478.4	479.3	0.9
D	54.03	10,073/560[3]	224,377	3.0	480.1	480.1	481.1	1.0
E	55.03	9,741/300[3]	180,522	3.7	480.6	480.6	481.5	0.9
F	56.15	10,729/10,030[3]	216,049	3.1	481.9	481.9	482.8	0.9
G	58.98	10,629/7,325[3]	215,529	3.1	485.4	485.4	486.4	1.0
H	60.40	11,202/4,500[3]	220,082	3.1	486.3	486.3	487.3	1.0
I	62.12	10,307/835[3]	198,569	3.4	487.5	487.5	488.5	1.0
J	63.56	9,467/585[3]	173,886	3.9	488.6	488.6	489.6	1.0
K	64.86	8,052/865[3]	179,402	3.8	490.5	490.5	491.5	1.0
L	66.85	7,849/950[3]	179,919	3.8	492.7	492.7	493.7	1.0
M	68.26	9,458/1,160[3]	184,095	3.7	493.5	493.5	494.5	1.0
N	69.21	10,564/820[3]	211,231	3.2	494.3	494.3	495.2	0.9
O	70.65	12,036/4,286[3]	229,928	2.9	495.1	495.1	496.0	0.9
P	71.96	9,225/4,337[3]	181,661	3.7	496.0	496.0	496.9	0.9
Q	73.18	8,263/2,130[3]	160,999	4.2	496.7	496.7	497.7	1.0
R	74.39	9,028/895[3]	181,751	3.7	497.9	497.9	498.8	0.9
S	75.60	10,973/780[3]	218,551	3.1	498.9	498.9	499.9	1.0
T	76.42	12,196/1,185[3]	221,616	3.0	499.5	499.5	500.5	1.0
U	77.76	11,748/1,215[3]	186,634	3.6	500.3	500.3	501.3	1.0
V	79.13	10,201/730[3]	172,346	3.9	501.7	501.7	502.6	0.9
W	80.42	10,323/730[3]	169,978	4.0	502.9	502.9	503.9	1.0
X	81.73	9,798/740[3]	164,354	4.1	504.6	504.6	505.5	0.9
Y	82.71	10,286/1,800[3]	165,578	4.1	505.5	505.5	506.3	0.8

[1] Miles above confluence with Mississippi River

[2] Distance based on the 1960 River Mile stationing, which may not match the measured distance along the profile baseline shown on the maps

[3] Total width/width within county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO

AND INCORPORATED AREAS

FLOODWAY DATA

MISSOURI RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1, 2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	DIFFERENCE
Missouri River (Continued)								
Z	83.89	9,994/8,259[3]	194,792	3.5	506.7	506.7	507.5	0.8
AA	85.00	9,534/8,834[3]	183,966	3.7	507.3	507.3	508.2	0.9
AB	86.11	9,805/9,043[3]	181,011	3.7	508.2	508.2	509.1	0.9
AC	87.64	10,172/9,618[3]	175,833	3.8	509.4	509.4	510.3	0.9
AD	88.92	9,931/9,115[3]	179,355	3.8	510.9	510.9	511.8	0.9
AE	90.18	10,823/10,111[3]	187,020	3.6	512.6	512.6	513.5	0.9
AF	90.94	11,965/10,575[3]	204,099	3.3	513.5	513.5	514.4	0.9
AG	92.54	11,658/3,217[3]	242,219	2.8	515.1	515.1	516.1	1.0
AH	93.85	10,517/700[3]	196,289	3.4	515.6	515.6	516.5	0.9

[1] Miles above confluence with Mississippi River

[2] Distance based on the 1960 River Mile stationing, which may not match the measured distance along the profile baseline shown on the maps

[3] Total width/width within county boundary

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Pin Oak Creek								
A	80	82	711	7.5	496.7	483.9[2]	484.7	0.8
B	600	74	664	8.0	496.7	486.8[2]	487.1	0.3
C	1,250	76	925	5.7	496.7	490.4[2]	490.7	0.3
D	1,780	133	1,210	4.4	496.7	492.0[2]	492.3	0.3
E	2,315	265	2,042	2.6	496.7	493.0[2]	493.5	0.5
F	3,505	260	1,539	3.4	496.7	495.5[2]	496.3	0.8
G	4,565	215	1,139	4.6	500.3	500.3	500.7	0.4
H	6,420	185	997	3.9	511.0	511.0	511.4	0.4

[1] Feet above confluence with Bourbeuse River

[2] Elevation without considering backwater effect from Bourbeuse River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

PIN OAK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Pin Oak Creek Tributary A	820	141	281	6.2	518.9	518.9	518.9	0

[1] Feet above confluence with Pin Oak Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

PIN OAK CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Possum Creek								
A	1,299	80	244	4.3	536.8	536.8	537.5	0.7
B	2,598	54	211	4.9	559.7	559.7	560.0	0.3

[1] Feet above confluence with Flat Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Branch Busch Creek								
A	0	43[2]	387	8.4	491.3	480.6[3]	481.3	0.7
B	400	42	233	14.0	491.3	484.4[3]	484.4	0.0
C	730	44	407	8.0	491.3	488.4[3]	488.5	0.1
D	940	44	430	7.6	491.3	489.1[3]	489.3	0.2
E	1,180	50	643	5.1	492.1	492.1	492.2	0.2
F	1,550	72	746	4.4	492.4	492.4	492.7	0.3
G	2,980	244	1,242	1.7	493.2	493.2	493.8	0.6
H	3,960	103	544	3.9	493.5	493.5	494.2	0.7
I	4,700	53	303	5.0	494.8	494.8	495.4	0.6
J	5,520	75	313	4.9	497.0	497.0	497.3	0.3

[1] Feet above confluence with Busch Creek

[2] Width without considering influence from Busch Creek floodway

[3] Elevations without considering backwater effect from Missouri River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH BRANCH BUSCH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Southwest Branch Busch Creek								
A	100	50	559	7.7	492.6	485.3[2]	485.4[2]	0.1
B	500	50	576	7.5	492.6	486.1[2]	486.4[2]	0.3
C	1,163	192	1,839	2.3	492.6	491.5[2]	491.5[2]	0.0
D	1,750	231	1,752	2.5	492.6	491.7[2]	491.7[2]	0.0
E	2,400	90	783	5.5	492.6	491.9[2]	491.9[2]	0.0
F	3,300	140	1,053	4.2	493.1	493.1	493.3	0.1
G	4,752	71	713	6.2	494.5	494.5	495.2	0.7
H	4,883	111	1,174	3.8	500.0	500.0	500.0	0.0
I	6,170	130	849	5.2	500.8	500.8	500.8	0.1
J	7,230	94	770	5.7	502.0	502.0	502.5	0.5
K	7,494	103	761	5.8	502.5	502.5	503.0	0.4
L	8,151	220	1,225	3.6	506.9	506.9	506.9	0.0
M	8,319	162	1,895	2.4	509.0	509.0	509.0	0.0

[1] Feet above confluence with Busch Creek

[2] Elevations Without Considering Backwater Effect From Busch Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

SOUTHWEST BRANCH BUSCH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Southwest Branch Busch Creek (cont'd)								
N	9,130	120	621	5.5	509.2	509.2	509.2	0.0
O	9,600	210	804	4.2	510.4	510.4	510.4	0.0
P	9,800	484	1,712	2.0	510.8	510.8	510.8	0.03
Q	10,290	152	647	5.2	510.9	510.9	511.1	0.17
R	11,555	223	820	4.1	514.1	514.1	514.4	0.4
S	12,500	80	478	6.6	515.9	515.9	516.6	0.8
T	13,730	177	985	2.9	519.5	519.5	520.2	0.7
U	14,960	91	456	6.3	521.9	521.9	522.6	0.7
V	16,535	70	518	5.5	525.6	525.6	526.4	0.8
W	19,520	89	504	5.7	537.5	537.5	537.8	0.3
X	21,385	39	184	8.2	552.6	552.6	552.6	0.0

[1] Feet above confluence with Busch Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
St. John's Creek								
A	2,210	130	1,680	6.8	495.1	483.7[2]	484.3	0.6
B	3,685	159	1,519	7.6	495.1	484.6[2]	485.2	0.6
C	4,620	161	1,940	5.9	495.1	486.0[2]	486.9	0.9
D	6,020	132	1,532	7.5	495.1	487.7[2]	488.5	0.8
E	7,370	196	2,088	5.5	495.1	490.2[2]	490.5	0.3
F	10,755	183	2,146	5.4	495.1	493.3[2]	493.7	0.4
G	12,045	271	2,952	3.9	495.1	494.3[2]	494.8	0.5
H	13,910	373	4,667	2.5	495.4	495.4	495.8	0.4
I	17,165	419	3,900	2.9	496.1	496.1	496.7	0.6
J	19,435	373	3,604	3.2	497.0	497.0	497.7	0.7

[1] Feet above Missouri Pacific Railroad

[2] Elevation without considering backwater effect from Missouri River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Unnamed Tributary to Busch Creek								
A	90	99[3]	424	3.3	536.9	534.5[2]	535.5	1.0
B	390	204[3]	2,720	0.5	551.5	551.5	551.5	0.0
C	700	197	2,901	0.5	551.5	551.5	551.5	0.0
D	1,260	139	1,514	0.9	551.5	551.5	551.5	0.0
E	1,810	117	1,195	1.2	551.5	551.5	551.5	0.0

[1] Feet above confluence with Busch Creek

[2] Elevations without considering backwater effect from Busch Creek

[3] Width does not match mapped width due to floodway width extending into Busch Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED TRIBUTARY TO BUSCH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Winch Creek								
A	6,139	310	1,362	2.2	467.9	462.7[2]	463.6	0.9
B	7,320	117	720	4.2	467.9	467.1[2]	468.0	0.9
C	9,015	150	763	4.0	475.7	475.7	476.6	0.9
D	11,050	88	541	5.6	488.4	488.4	489.0	0.6
E	11,970	88	604	5.0	494.0	494.0	494.9	0.9
F	12,235	154	1,043	2.4	497.4	497.4	497.9	0.5
G	12,815	82	505	5.0	498.7	498.7	499.4	0.7
H	14,460	83	453	5.5	510.6	510.6	511.6	1.0
I	16,330	111	416	5.2	525.8	525.8	526.8	1.0
J	19,065	73	364	5.9	546.8	546.8	547.0	0.2
K	21,170	75	414	5.2	565.8	565.8	566.6	0.8

[1] Feet above confluence with Meramec River

[2] Elevation without considering backwater effect from Meramec River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Winsel Creek								
A	1,335	248	1,557	3.5	820.0	820.0	820.9	0.9
B	2,635	345	1,837	3.0	826.2	826.2	827.2	1.0
C	3,455	134	893	6.2	829.2	829.2	830.2	1.0
D	4,445	257	1,838	3.0	833.3	833.3	834.3	1.0
E	5,605	123	981	5.6	838.3	838.3	839.2	0.9
F	7,205	134	1,205	4.6	842.8	842.8	843.8	1.0
G	8,365	391	2,326	2.4	844.9	844.9	845.9	1.0
H	8,995	151	1,084	5.1	845.7	845.7	846.7	1.0
I	10,257	342	2,163	2.6	849.3	849.3	849.9	0.6
J	11,402	263	1,502	3.2	850.5	850.5	851.4	0.9
K	12,372	193	934	5.2	853.3	853.3	854.2	0.9

[1] Feet above confluence with Bacon Ridge Road

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Winsel Creek (cont'd)								
L	14,847	150	1,053	4.6	858.6	858.6	859.5	0.9
M	16,062	174	1,256	3.8	861.0	861.0	862.0	1.0
N	17,782	238	1,204	4.0	865.2	865.2	865.7	0.5
O	19,852	266	1,012	4.4	872.4	872.4	873.0	0.6
P	21,112	104	820	5.5	877.2	877.2	877.5	0.3
Q	22,072	257/65[2]	2,078	1.9	884.6	884.6	884.8	0.2
R	24,167	236/220[2]	1,290	3.0	889.0	889.0	890.0	1.0
S	24,616	319	1,513	2.4	891.3	891.3	892.2	0.9
T	26,096	263	1,426	2.5	893.9	893.9	894.9	1.0
U	27,522	234	1,046	3.5	898.3	898.3	899.3	1.0
V	29,106	384	1,749	2.1	903.7	903.7	904.4	0.7
W	29,836	153/125[2]	804	4.5	905.0	905.0	905.8	0.8

[1] Feet above confluence with Bacon Ridge Road

[2] Total Width/Width Within County Boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

FLOODWAY DATA

WINSEL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Winsel Creek (cont'd)								
X	31,470	90	683	4.7	912.7	912.7	913.6	0.9
Y	32,875	225	1,000	3.2	916.8	916.8	917.8	1.0
Z	34,160	210	1,049	3.1	921.0	921.0	921.9	0.9
AA	36,170	313	1,443	2.2	925.6	925.6	926.5	0.9
AB	37,295	345	1,264	2.4	929.7	929.7	930.7	1.0
AC	39,645	75	173	5.4	938.0	938.0	938.8	0.8

[1] Feet above confluence with Bacon Ridge Road

5.0 INSURANCE APPLICATION

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 rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) 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 report by detailed methods. 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 rate 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 (sq. mi.) or that are not otherwise mapped as Zone A, and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

Zone D

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

6.0 FLOOD INSURANCE RATE MAP

The FIRM for Franklin County is, for insurance purposes, the principal result of the FIS. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base Flood Elevation (BFE) lines show the locations of the expected whole-foot water-surface elevations of the base (1-percent-annual-chance) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

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 BFEs or average depths. Insurance agents use 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 countywide FIRM presents flooding information for the entire geographic area of Franklin County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the county identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 7, "Community Map History."

7.0 OTHER STUDIES

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

For consideration FIS reports have been prepared for several contiguous communities of Franklin County, including Crawford County (Reference 42), Gasconade County (Reference 43), Jefferson County (Reference 44), St. Charles (Reference 45), St. Louis County (Reference 46), Warren County (Reference 47), and Washington County (Reference 48) all of which falls within the state of Missouri.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region VII, 9221 Ward Parkway, Suite 300, Kansas City, Missouri 64114-3372.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. Federal Emergency Management Agency. Flood Insurance Study, City of Washington, Franklin County, Missouri. Washington, D.C., May 3, 1982.

3. Federal Emergency Management Agency. Flood Insurance Study, City of Berger, Franklin County, Missouri. Washington, D.C., December 15, 1981.

4. Federal Emergency Management Agency. Flood Insurance Study, City of New Haven, Franklin County, Missouri. Washington, D.C., 1992.

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COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Berger, City of	August 30, 1974	January 16, 1979	June 15, 1982	None
Franklin County Unincorporated Areas	January 17, 1978	None	October 16, 1984	None
*Gerald, City of	N/A	N/A	N/A	N/A
*Leslie, Village of	N/A	N/A	N/A	N/A
Miramiguoa Park, Village of	October 18, 2011	None	October 18, 2011	None
New Haven, City of	March 5, 1976	None	February 18, 1981	None
Oak Grove, Village of	June 3, 1977	None	August 19, 1986	None
Pacific, City of	October 26, 1973	None	March 15, 1977	August 15, 1983 February 19, 1992
*Parkway, Village of	N/A	N/A	N/A	N/A
St. Clair, City of	October 18, 2011	None	October 18, 2011	None
Sullivan, City of	March 29, 1974	November 14, 1975	June 15, 1981	None
Union, City of	March 8, 1974	July 23, 1976	March 2, 1983	None
Washington, City of	January 9, 1974	October 15, 1976	November 3 1982	None

*No Special Flood Hazard Areas Identified

FEDERAL EMERGENCY MANAGEMENT AGENCY

FRANKLIN COUNTY, MO AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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13. U.S. Geological Survey, The Great Flood of 1993 on the Upper Mississippi River – 10 Years Later, Gary P. Johnson, Robert R. Holmes, Jr., and Loyd A. White. Urbana, Illinois, 2003.

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15. Unpublished Records of the Missouri Conservation Department, Meramec Fire Protection District, Sullivan, Missouri (Station Number 2345010).

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25. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-HMS, Hydrologic Modeling System, (Version 2.1.2), Davis, California, 2001.

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47. Federal Emergency Management Agency. Flood Insurance Study, St. Louis County and Incorporated Areas, Missouri. Washington, D.C., August 23, 2000.

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10.0 REVISIONS AND DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS report and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report. All users are advised to contact the Community Map Repository at the address below to obtain the most up-to-date flood hazard data provided in Table 8.

Table 8: Map Repositories

Community	Address	City	State	Zip Code
City of Berger	City Hall 405 Rosalie Avenue	Berger	MO	63014
Franklin County	County Offices 8 North Church Street, Suite B	Union	MO	63084
City of Gerald	City Hall 430 West Fitzgerald Avenue	Gerald	MO	63037
Village of Leslie	County Offices 8 North Church Street, Suite B	Union	MO	63084
Village of Miramiguoa Park	County Offices 8 North Church Street, Suite B	Union	MO	63084
City of New Haven	City Hall 101 Front Street	New Haven	MO	63068
Village of Oak Grove Village	Village Hall 260 James Street	Sullivan	MO	63080
City of Pacific	City Hall 301 Hoven Drive	Pacific	MO	63069
Village of Parkway	County Offices 8 North Church Street, Suite B	Union	MO	63084
City of St. Clair	City Hall #1 Paul Parks Drive	St. Clair	MO	63077
City of Sullivan	City Hall 209 West Washington Street	Sullivan	Mo	63080
City of Union	City Hall 500 East Locust Street	Union	MO	63084
City of Washington	City Hall 405 Jefferson Street	Washington	MO	63090

10.1 First Revision (TBD)

a. Acknowledgements

The hydraulic analyses for this revision were completed by STARR under contract with FEMA Contact HSFEHQ-09-D-0370. This work was completed in August 2016.

b. Coordination

FEMA engaged the City of New Haven in March 2011 to discuss the expiring PAL and the City's progress towards the submitting data to comply with 44 CFR 65.10. At that time, the City was actively pursuing accreditation to 44 CFR 65.10.

In October 2013, FEMA initiated a levee analysis and mapping procedure (LAMP) project to further engage the City with new approaches for mapping flood hazards behind levees. The new approach included the formation of the Local Levee Partnership Team (LLPT) and production of a LAMP Plan dated May 4, 2014 which identifies the procedure to appropriately map the flood hazards landward of the levee (Reference 50). The LLPT concluded the Freeboard Deficient procedure was most applicable.

The City of New Haven provided documentation of data certified to portions of 44 CFR 65.10 with the exception of freeboard per the Freeboard Deficient procedure on December 17, 2015 and additional information on February 10, 2016.

On May 17, 2016, FEMA accepted the New Haven Levee as meeting the requirements of the Freeboard Deficient procedure under the Analysis and Mapping Procedure for non-accredited levees.

c. Scope

The flood hazard area landward of the New Haven Levee was revised to a Zone D per the Freeboard Deficient procedure as described in the Analysis and Mapping of Non-accredited Levees approach (Reference 51). The UMRSFFS of the Missouri River was used to determine the natural valley floodplain used to define the Zone D flood hazard area.

d. Hydraulic Analysis

The detailed analysis of the Missouri River natural valley was performed using the same hydraulic model of the UMRSFFS as documented in Section 3.1.3 of this FIS.

The interior drainage analysis was performed by the City of New Haven as part of their certification of data to 44 CFR 65.10 documentation. The joint probability analysis resulted in small areas of shallow flooding. The

contributing drainage area is less than 1 square mile thus these areas were determined to be localized flooding and not shown on the FIRM.

e. Other Studies

This revision is in agreement with the published FIS for Franklin County, Missouri and Incorporated Areas (Reference 52). This revision does not reflect information from any other contiguous community.

f. References and Bibliography

50. Federal Emergency Management Agency. Analysis and Mapping Plan, New Haven Levee, Franklin County, Missouri. May 14, 2014.
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