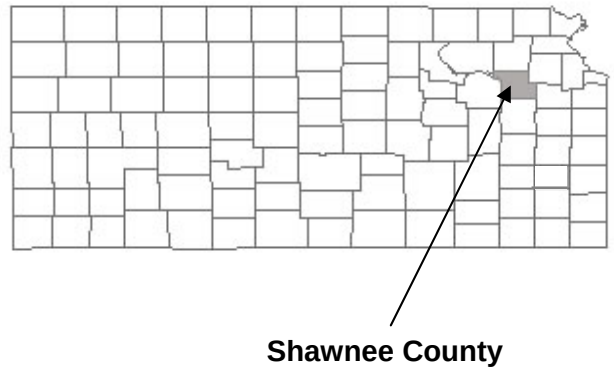
FLOOD INSURANCE STUDY

SHAWNEE COUNTY, KANSAS
AND INCORPORATED AREAS
VOLUME 1 of 2

COMMUNITY NAME	COMMUNITY NUMBER
Auburn, City of	200332
Rossville, City of	200334
Shawnee County, Unincorporated Areas	200331
Silver Lake, City of	200335
Topeka, City of	205187
Willard, City of	200337



EFFECTIVE:
September 29, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
20177CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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

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

Old Zone(s)	New Zone
A1 through A30	AE
VI through V30	VE
B	X
C	X

Countywide FIS Effective Date: September 29, 2011

TABLE OF CONTENTS

VOLUME I

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgements	2
	1.3 Coordination	3
	1.3.1 Pre-Countywide Study	3
	1.3.2 Countywide Study	5
2.0	AREA STUDIED	5
	2.1 Scope of Study	5
	2.1.1 Pre-Countywide Study	5
	2.1.2 Countywide Study	8
	2.2 Community Description	10
	2.3 Principal Flood Problems	11
	2.4 Flood Protection Measures	13
3.0	ENGINEERING METHODS	14
	3.1 Hydrologic Analyses	14
	3.1.1 Pre-Countywide Study	15
	3.1.2 Countywide Study	16
	3.2 Hydraulic Analyses	20
	3.2.1 Pre-Countywide Study	26
	3.2.2 Countywide Study	27
	3.3 Vertical Datum	29
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	30
	4.1 Floodplain Boundaries	31
	4.2 Floodways	31
5.0	INSURANCE APPLICATION	32
6.0	FLOOD INSURANCE RATE MAP	33
7.0	OTHER STUDIES	69
8.0	LOCATION OF DATA	69
9.0	REFERENCE AND BIBLIOGRAPHY	69

TABLE OF CONTENTS (continued)

VOLUME I

Page

FIGURES

Figure 1 - Floodway Schematic 33

TABLES

Table 1 - Streams Studied by Detailed Methods 8

Table 2 - Ratios for R (Connell Wagner (2001)) 19

Table 3 - Rainfall Areal Reductions 19

Table 4 - Summary of Discharges 21

Table 5 - Summary of Manning's "n" Values 28

Table 6 - Shunganunga Creek Levee System 28

Table 7 - Soldier Creek Levee System 28

Table 8 - Floodway Data 34

Table 9 - Community Map History 68

VOLUME II

Flood Profiles

Butcher Creek	Panels 01P-04P
Colly Creek	Panels 05P-07P
Cross Creek	Panels 08P
Deer Creek	Panels 09P-13P
Elevation Tributary/Southwest Branch Elevation Creek	Panels 14P-17P
Halfday Creek	Panels 18P-22P
Indian Creek	Panels 23P-27P
Indian Hills Tributary	Panels 28P-29P
Kansas River	Panels 30P-32P
North Branch Wakarusa River	Panels 33P-34P
Shunganunga Creek	Panels 35P-48P
Sixmile Creek	Panels 49P-53P
Soldier Creek	Panels 54P-55P
South Branch Shunganunga Creek	Panels 56P-59P
Southeast Branch Elevation Creek	Panels 60P-61P
Stinson Creek	Panels 62P-65P
Tecumseh Creek	Panels 66P-68P
Wakarusa River	Panels 69P
Wanamaker Main Branch	Panels 70P-77P
Wanamaker Northeast Branch	Panels 78P-80P
West Fork Butcher Creek	Panels 81P-82P

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
SHAWNEE COUNTY, KANSAS 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 Shawnee County, Kansas, including the Cities of Auburn, Rossville, Silver Lake, Topeka, and Willard, and the Unincorporated Areas of Shawnee County (referred to collectively herein as Shawnee 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 are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This FIS revises and supersedes previous FIS's. 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 this 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, and floodplain and floodway boundary delineations are shown 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 shown as numbered Zone A were 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 (un-shaded). 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.

The City of Willard is geographically located in Wabaunsee and Shawnee Counties. Due to the fact that more than 50% of the City's geographical boundaries are located in Shawnee County, the City of Willard is included in its entirety in this FIS report.

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

1.2 Authority and Acknowledgments

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

The original hydrologic and hydraulic analyses for the Cities of Auburn, Silver Lake, Topeka and Willard were performed by the U.S. Army Corps of Engineers (USACE), Kansas City District, for the Federal Insurance Administration (FIA), under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 29. These studies were completed in May 1979, with the exception of the City of Topeka Study which was completed in October of 1979.

The original hydrologic and hydraulic analyses for the City of Rossville were performed by the U.S. Geological Survey (USGS), Kansas District, for the FIA, under Inter-Agency Agreement No. IAA-H876, Project Order No. 11 (2-9-76). This work, which was completed in February 1978, covered all significant flooding sources affecting the City of Rossville.

The original hydrologic and hydraulic analyses for the unincorporated areas of Shawnee County were performed by the USACE, Kansas City District, for FEMA, under Inter-Agency Agreement No. IAAH-10-77, Project Order No. 29. This study was completed in June 1980.

The original hydrologic and hydraulic analysis for Sixmile Creek in Shawnee County, upstream of the Kansas Turnpike, was performed by Black & Veatch for FEMA as part of the Limited Map Maintenance Program under Contract No. EMW-90-C-3131. FEMA reviewed and approved this analysis.

The original hydrologic and hydraulic analysis for Sixmile Creek, from S.W. 97th Street to the Kansas Turnpike, was taken from a Soil Conservation Service (SCS) watershed report (Reference 1).

All new hydrologic and hydraulic analyses for this FIS were performed by the State of Kansas, a Cooperating Technical Partner (CTP) for FEMA, under Cooperative Agreements EMK-2006-CA-6011 and EMK-2007-CA-7006. AMEC Earth and Environmental, Inc. were retained by the State of Kansas to complete this study. This study was completed in August 2008.

Planimetric base map information shown on all FIRM panels was derived from multiple sources. Base map files were provided in digital format by the Kansas Geospatial Community Commons (DASC), Shawnee County, and the City of Topeka. 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 Kansas North, FIPS 1501 Feet. Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83 Zone 15N.

1.3 Coordination

1.3.1 Pre-Countywide Study:

City of Auburn:

Streams requiring detailed study were identified at a meeting held in January 1977, attended by representative of the FIA and the City of Auburn.

On December 3, 1979, the results of the work by the study contractor were reviewed and accepted at a final coordination meeting attended by representatives of the study contractor and the FIA, and community officials.

City of Rossville:

Coordination for this study included meetings with city officials, personnel of the USGS, the FIA, and the Kansas State Board of Agriculture (KSBA) for the purpose of presenting initial results of the study. A second meeting on November 28, 1977, with city officials and interested citizens of Rossville, and personnel of the FIA, the KSBA, the SCS, and the USGS was held to express a need for more data to be collected for the study. On December 8, 1977, USGS personnel met with the Consultation Coordination Officer (CCO) and the Government Technical Representative to discuss the detailed study of the “overflow channel” area and the need for two separate studies based on the percent

completion of SCS's Cross Creek Watershed Project.

A final meeting to review the draft of this report was held with city officials on October 19, 1978, at which time the study was found to be acceptable to the community.

Shawnee County:

Community base map selection and the identification of streams requiring detailed study were conducted in meetings attended by personnel of the USACE, FEMA, and officials of Shawnee County in January 1977.

During the course of the work by the USACE, flood elevations, flood boundaries and floodway delineations were reviewed with officials of Shawnee County, Topeka, Kansas and the Kansas Department of Agriculture on March 3, 1980.

On June 24, 1981, the results of the work by the study contractor were reviewed and accepted at a final coordination meeting attended by representatives of the study contractor, FEMA, and the community.

Silver Lake:

Streams requiring detailed study were identified at a meeting in January 1977, attended by the study contractor, the FIA, and representatives of the City of Silver Lake. Results of the hydrologic analyses were coordinated with USGS.

On September 13, 1979, the results of the work by the study contractor were reviewed and accepted at a final coordination meeting attended by representatives of the study contractor, the FIA, and the community.

City of Topeka:

Community base map selection and the identification of streams requiring detailed study were conducted in meetings attended by personnel of the USACE, the FIA, and officials of the City of Topeka in October of 1976.

Flood elevations, flood boundaries, and floodway delineations were reviewed with community officials and officials of the Kansas Department of Agriculture on July 9, 1979.

On October 2, 1980, the results of the work by the study contractor were reviewed and accepted at a final coordination meeting attended by representatives of the USACE, the FIA, and the community.

City of Willard:

Streams requiring detailed study were identified at a meeting attended by representatives of the FIA and the city of Willard. Results of the hydrologic analyses were coordinated with USGS.

On August 28, 1979, the results of the work by the study contractor were reviewed and accepted at a final coordination meeting attended by representatives of the USACE, the FIA, and city officials.

1.3.2 Countywide Study:

The initial Consultation Coordination Officer (CCO) meeting was held on February 6, 2007. The meeting was attended by representatives of FEMA, State of Kansas, Shawnee County, City of Topeka, City of Willard, City of Auburn, City of Silver Lake, Shunganunga Drainage District, and AMEC Earth and Environmental Inc.

The results of the study were reviewed at the final CCO meeting held on November 12, 2009, and attended by representatives of the communities, FEMA, and the study contractors. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Shawnee County, Kansas, including the incorporated communities listed in Section 1.1.

2.1.1 Pre-Countywide Study:

City of Auburn:

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 for the next five years, through May 1984. The scope and methods of study were proposed to and agreed upon by the FIA and the City of Auburn.

The flooding sources studied by detailed methods are listed below:

a. the Wakarusa River from the Kansas Turnpike, approximately 0.5 mile southeast of the City of Auburn corporate limits, upstream to approximately 1.0 mile upstream of Auburn Road; and

b. the North Branch Wakarusa River from its confluence with the Wakarusa River to approximately 1.8 miles upstream of 89th Street.

This FIS reports on only those small portions of the streams studied in detail that were found to have flooding that affects Auburn, as follows:

a. the Wakarusa River from approximately 1,310 feet downstream of Auburn Road past the confluence of the North Branch Wakarusa River to approximately 250 feet upstream of Auburn Road; and

b. the North Branch Wakarusa River from its downstream crossing of Auburn's southern corporate limit to a point approximately 550 feet upstream of 91st Street.

City of Rossville:

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and proposed construction until February 1983. The scope and methods of study were proposed to and agreed upon by the Federal Insurance Administration and the community.

Floods caused by overflow of the Kansas River and Cross Creek were studied in detail within the corporate limits of Rossville.

Shawnee County:

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 through June 1985. The scope and methods of study were proposed to and agreed upon by FEMA and Shawnee County.

Detailed studies were made for the Kansas River in unincorporated areas; Halfday Creek from the mouth to the county boundary; Indian Creek from the City of Topeka corporate limits to N.E. 86th Street; Sixmile Creek from the mouth to S.W. 61st Street; Stinson Creek from the mouth to S.E. 29th Street; Tecumseh Creek from the mouth to S.E. 45th Street; and Shunganunga Creek from the mouth to Wanamaker Road.

Silver Lake:

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 through April 1984. The scope and methods of study were proposed to and agreed upon by the FIA and the City of Silver Lake.

Flooding caused by overflow of the Kansas River, within the corporate limits of the City of Silver Lake, was studied in detail.

City of Topeka:

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 through July 1983.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the City of Topeka.

The flooding sources studied by detailed methods in the City of Topeka are listed below:

a. the Kansas River, within the corporate limits, a distance of about 8.7 miles;
b. Shunganunga Creek, within the corporate limits, a distance of 10.9 miles;
c. Deer Creek, from its confluence with Shunganunga Creek to the corporate limits, a distance of 3.4 miles;
d. Butcher Creek, from its confluence with Shunganunga Creek to the Interstate Highway 470, a distance of 3.5 miles;
e. South Branch Shunganunga Creek from its confluence with Shunganunga Creek to 550 feet upstream of West 37th Street, a distance of 1.4 miles;
f. Indian Creek, from 730 feet upstream of its confluence with Soldier Creek to the corporate limits, a distance of 0.5 mile; and
g. West Fork Butcher Creek from 150 feet upstream of its confluence with Butcher Creek to 3,800 feet upstream of the Interstate Highway 470, a distance of 1.0 mile.

Soldier Creek was studied by approximate methods within the corporate limits. Portions of South Branch Shunganunga Creek, Colly Creek and the

portion of West Fork Butcher Creek above Interstate Highway 470 were also studied by approximate methods.

City of Willard:

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 through April 1984. The scope and methods of study were proposed to and agreed upon by the FIA and the City of Willard.

The Kansas River, from the downstream corporate limit of the City of Willard to the upstream corporate limit, a distance of approximately 0.4 mile, was studied in detail.

2.1.2 Countywide Study:

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 through 2006.

The flooding sources studied by detailed methods for the Shawnee County, Countywide Study are listed in Table 1.

Table 1: Streams Studied by Detailed Methods

Flooding Source	Reach Limits	Approximate Reach Length
Butcher Creek	From confluence with Shunganunga Creek to approximately 2050 feet upstream of SE 45th Street	4.6 mi
Colly Creek	From confluence with South Branch Shunganunga Creek to approximately 300 feet upstream of SW Gage Boulevard	3.5 mi
Cross Creek	From confluence with Kansas River to approximately 3050 feet upstream from NW US Route 24 Bridge.	4.0 mi
Deer Creek	From confluence with Shunganunga Creek to SE 45th Street near Lake Shawnee	5.8 mi
Elevation Tributary	From confluence with Shunganunga Creek to the split confluence of Southwest Branch Elevation Creek and Southeast Branch Elevation Creek	0.7 mi
*Halfday Creek	From confluence with Soldier Creek to approximately 5600 feet upstream from NW 86th Street	11.4 mi
*Indian Creek	From confluence with Soldier Creek to approximately 2600 feet upstream of NW 82nd Street	9.4 mi

Table 1: Streams Studied by Detailed Methods (cont.)		
Flooding Source	**Reach Limits**	**Approximate Reach Length**
Indian Hills Tributary	From confluence with Shunganunga Creek to approximately 580 feet upstream from SW Urish Road	2.0 mi
*Kansas River	Extends approximately 191,500 feet from the Douglas/Shawnee County boundary to the Shawnee/Wabaunsee County boundary	36.3 mi
*North Branch Wakarusa River	From confluence with Wakarusa River to approximately 9300 feet upstream from SW 98th Street	3.5 mi
Shunganunga Creek	From confluence with Kansas River to approximately 280 feet upstream of Indian Hills Road	16.6 mi
*Sixmile Creek	From confluence with Wakarusa River to SW 61st Street	11.6 mi
Soldier Creek	From confluence with Kansas River to approximately 3100 feet upstream of NW Menoken Road	8.0 mi
South Branch Shunganunga Creek	From confluence with Shunganunga Creek to approximately 250 feet upstream of SW Burlingame Road	3.8 mi
Southeast Branch Elevation Tributary	From confluence with Elevation Tributary to approximately 3740 feet upstream of SW Wanamaker Road	0.9 mi
Southwest Branch Elevation Tributary	From confluence with Elevation Tributary to approximately 2801 feet upstream of SW 41st Street	1.3 mi
*Stinson Creek	From confluence with Shunganunga Creek to approximately 250 feet upstream of SE Tecumseh Road	4.0 mi
*Tecumseh Creek	From confluence with Kansas River to just downstream of SE 45th Street	7.0 mi
*Wakarusa River	From I-335 to approximately 3580 feet downstream of SW Hodges Road	1.8 mi
Wanamaker Main Branch	From confluence with Kansas River to approximately 300 feet upstream of SW 17th Street	3.8 mi
Wanamaker Northeast Branch	From confluence with Wanamaker Main Branch to approximately 2239 feet upstream of SW Robinson Avenue	0.7 mi
West Fork Butcher Creek	From confluence with Butcher Creek to approximately 1250 feet upstream of SE 45th Street	1.6 mi
*Streams not restudied as part of this countywide FIS – Redelineation streams.		

New floodway-only analysis was computed for the Kansas River (cross section G through cross section W) and for Sixmile Creek (cross section F

upstream to the limit of detailed study) using the previous effective models.

Areas studied by approximate methods were completed for all streams not studied or previously studied by detailed methods, or those with one square mile of drainage area. Streams that were previously studied by approximate methods, regardless of drainage area, were restudied by approximate methods. However, there are no longer approximate studies for those streams that were originally identified as approximate and currently restudied using detailed methods. Included in these analyses were Armstrong Branch, Blacksmith Creek, Bourbonais Creek, Burys Creek, Butcher Creek, Camp Creek, Colly Creek, Coryell Creek, Cross Creek, Deer Creek, Deer Creek 2, Elevation Tributary, Elm Creek, Ensign Creek, Halfday Creek, Haskell Creek, Indian Creek, Indian Hills Tributary, Little Muddy Creek, Little Soldier Creek, Lynn Creek, Messhoss Creek, Middle Branch Wakarusa River, Mission Creek, Muddy Creek, North Branch Wakarusa River, Peanaz Creek, Post Creek, Shunganunga Creek, Sixmile Creek, Snake Creek, Soldier Creek, South Branch Shunganunga Creek, South Branch Wakarusa River, Southeast Branch Elevation Creek, Southwest Branch Elevation Creek, Stinson Creek, Tecumseh Creek, Towhead Creek, Vassar Creek, Wakarusa River, Walnut Creek, Wanamaker Main Branch, Wanamaker Northeast Branch, Ward Creek, West Fork Butcher Creek, West Fork Muddy Creek, Whetstone Creek and associated tributaries.

The scope and methods of study were proposed to, and agreed upon, by FEMA and the State of Kansas.

2.2 Community Description

Shawnee County is located in northeastern Kansas, bounded by Jackson, Jefferson, Douglas, Osage, and Wabaunsee Counties. The Cities of Topeka, Auburn, Silver Lake and Rossville are incorporated communities within the county. The estimated 2006 population of Shawnee County is about 172,693 (Reference 2). The county is served by Interstate Highway 70 and U.S. Highway 75 and by the Union Pacific; the Missouri Pacific; the Atchison, Topeka and Santa Fe; and the Chicago, Rock Island and Pacific Railroads.

The climate is typical of the Midwest with wide fluctuations in temperature, precipitation and humidity occurring on a day-to-day basis. The mean annual temperature recorded from 1971 through 2000 was 53.5 degrees Fahrenheit and the mean annual rainfall was 36 inches (Reference 3 & 4).

Vegetation in Shawnee County varies from lawns to undeveloped natural fields and timber. Much of the land is covered by grasses and grain crops. Some areas adjacent to the stream channels have no tree growth while others have heavy growth of trees and brush. Soils in Shawnee County are generally deep well drained to moderately well drained that have a

silty clay or clay loam subsoil (Reference 5).

The Kansas River, flowing in an easterly direction, bisects the county from the west to east county lines. The Kansas River drainage area at the Sardou Avenue Bridge is 56,720 square miles (Reference 6). Shunganunga Creek is a right bank tributary to the Kansas River and drains 73.5 square miles of the largely urbanized area of the City of Topeka. Stinson Creek, a right bank tributary to Shunganunga Creek, and Tecumseh Creek, a right bank tributary to the Kansas River, flow northward in adjacent basins. Residential development is progressing in these two basins due to the proximity of the City of Topeka. Indian and Halfday Creeks, left bank tributaries to Soldier Creek, also continue to urbanize. The Kansas River basin drains gently sloping hills and a broad, flat flood plain. The other smaller streams are characterized by steeper hills and narrow flood plains.

Development in the floodplain in unincorporated areas is relatively sparse. There is some industrial development along Tecumseh Creek from quarry operations.

The City of Topeka is located in Shawnee County in northeastern Kansas and is bounded completely by unincorporated areas of the county. The City of Topeka was settled and founded by a group of New England pioneers led by Cyrus K. Holliday. The community was incorporated in 1857. In January 1861, Kansas entered the Union as the 34th state and Topeka became the capital in November. The Capitol Building is located on a 20-acre tract of land donated by Mr. Holliday who later originated the Atchison, Topeka and Santa Fe Railway Company. According to the United States Census Bureau the City of Topeka has 2006 estimated population of 122,113 (Reference 2 & 7).

The Shunganunga Creek basin topography is characterized by steep slopes and narrow floodplains in the headwaters while the lower or northern half of the basin is flatter and has broad floodplains. The headwaters area in the southern part of the City of Topeka is urbanizing rapidly while the lower part of the basin is already highly urbanized. Land surface elevations vary from 1,000 feet near the southern city limits of the City of Topeka on Shunganunga Creek to 900 feet in the common flood plain with the Kansas River.

2.3 Principal Flood Problems

There are no natural obstructions to flood flows in the flood plains. Obstructions have been built by man's continued encroachment on to the flood plains. In the study area, bridges, landfills, and levees are the most prominent manmade obstacles. As an indication of past flooding, the

following composite accounts describe some of these events.

Flood of June 1844 – “It commenced raining . . . (and) rained all day without a moment's cessation,” wrote Oregon-bound James Clyman on June 10, 1844, “Knife River (Cross Creek) . . . rose 15 feet during the day.” Thus grew perhaps the greatest and certainly the most legendary of the Kansas River floods. For several days the rain continued, though briefly, the sun shone on the 13th. Then “we saw the sun and a general shout was raised through all the camp after 80-hours steady rain we saw the Kansas River from the bluffs and it shews 8 or 10 miles wide.” Outside the City of Topeka the flood waters inundated the other valley cities of Rossville, Silver Lake and Tecumseh. At least two men from the City of Rossville, living on a river island south of town, drowned, but most if not all of the City of Silver Lake people got out in time and the water was never exceptionally high in either place (Reference 8).

Flood of May 1903 - May 1903 began quite bright as Topekan’s planned for President Theodore Roosevelt's imminent visit. It ended with enormous destruction and misery. Heavy rains began in mid-month and then on Memorial Day the Kansas River broke out of its banks quickly spreading throughout the low-lying North Topeka residential districts. In a matter of hours water covered North Topeka, the fertile Shawnee County bottoms, and sections of South Topeka and Oakland from five to 25 feet deep. “Secured places became perilous,” noted author Margaret Hill McCarter (“The Overflowing Waters”) in her account of the flood, “lapping inches of quiet water became swiftest currents on which a few lives must have ridden to unrecorded deaths; not a few bodies must have floated to unknown burial.” (Reference 8).

Flood of June 1943 - Heavy rains over the Kansas River basin during the period of June 5-16, 1943 caused damaging floods along the Kansas River from Junction City to the mouth. This flood had two distinct overflows in the City of Topeka with the higher being during June 16-18. This flood has been exceeded nine times (Reference 9).

Flood of April 1945 - The greatest flood recorded on Shunganunga Creek occurred in April 1945 during a time when the Kansas River was at a high stage. Flooding on the larger stream overshadowed the flooding on the creek, and for this reason the Shunganunga Creek flood was not adequately documented, although considerable damage occurred (Reference 10).

Flood of July 1951 - Heavy rainfall in the Kansas River basin began in early May, continued through June and ended in the critical storm of July 9-13, 1951. Precipitation during this storm, which fell on saturated soil, amounted to as much as 18.5 inches and averaged eight inches over the

eastern half of the basin. The runoff during May, June and July was three times the average annual discharge. The flood crested on July 13, 1951 and is the largest of record with a discharge of 469,000 cubic feet per second (cfs) (Reference 9).

The flood of June 1951 began on June 26, when the City of Topeka received 2.7 inches of rain which caused Shunganunga Creek to flood nine square blocks southwest of the fairgrounds. Thirty-five to forty homes and the grocery stores were affected. East of Winter General Hospital, 175 homes and one apartment building were affected. Overflows also occurred in other areas causing damage to commercial and industrial facilities

During July of 1993, similar conditions mimicking the 1951 flooding season lead the Kansas River, near the City of Topeka, to crest nearly 9 feet above normal flood stage. However improved controls such as levees and water control reservoirs withstood higher water levels and limited severity as planned. Despite some local concern and uncertainty, The City of Topeka was left relatively unscathed with minor damages occurring form some negligible levee issues (Reference 3).

2.4 Flood Protection Measures

In 1953, following the 1951 flood on Shunganunga Creek, two detention dams were constructed, one on the main stem (Burnett Dam) and the other on South Branch Shunganunga Creek (Sherwood Dam). These dams, similar in size and design, are detention structures approximately 35 feet high, 1,500 to 1,700 feet long and have controlled outlets 7.5 feet wide by 8 feet high. Lake Sherwood was constructed in 1962, approximately 3,000 feet upstream of Burnett Dam. Flood storage is provided in the lake to partially offset encroachment on the Burnett Lake flood storage. Lake Shawnee on Deer Creek has no flood control storage but does act as a retarding structure (Reference 11).

Levees and channel improvements have been used successfully in various parts of the City of Topeka. Shunganunga Creek has been straightened and levees were constructed on the left bank from 11th Street to the mouth, outside the City of Topeka corporate limits, on the Kansas River. The Kansas River has been leveed on the right bank from a point near the mouth of Shunganunga Creek upstream to just west of the City of Topeka municipal water works. The left bank is leveed from the mouth of the Soldier Creek diversion to the City of Topeka corporate limits at the U.S. Highway 75 Bridge. Soldier Creek improvement consisted of realignment and relocation of nine miles of channel and construction of eighteen miles of levees. The old cutoff portion of Soldier Creek is now used to pond interior drainage in both Shawnee County unincorporated areas and the City of Topeka. Approximately eighteen miles of levees and floodwalls have been built along both sides of the Kansas River. The combination of

lakes, levees, and channel improvements generally provide protection in excess of the 1-percent-annual-chance flood in the improved areas. The South Branch Shunganunga Creek channel has been significantly altered to improve flood flow capacity.

In Shawnee County, the Cross Creek Watershed Joint District (WJD) No. 42 and the Wakarusa WJD No. 35 have been formed to provide agricultural flood protection. The primary focus of these districts is to construct floodwater retarding dams or detention dams to reduce flood flows. Numerous dams in each of these districts have been constructed since the early 1970's. The Cross Creek WJD No. 42 has completed 15 floodwater retarding dams, and over 15 additional detention dams, which provide significant flood flow reduction along Cross Creek. However, as with every flood protections structure, there are load and design limits; therefore, the existence of floodwater retarding structures does not protect the downstream population from those storms exceeding the floodwater design capacity.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail 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 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

3.1.1 Pre-Countywide Study:

Peak discharge computations for Indian Creek and Halfday Creek were based on a regionalized hydrologic analysis prepared by the USACE. This analysis followed the standard log-Pearson Type III Method as outlined by the Water Resources Council (Reference 12). The 0.2-percent-annual-chance discharge was determined by extrapolation of a log-probability graph of flood discharge computed for frequencies up to 100 years.

Discharges for Stinson Creek, Tecumseh Creek and Shunganunga Creek were calculated using the Storm Water Management Model (Reference 13). Changes and additions to the model to reflect individual watershed conditions were made by the USACE.

The Storm Water Management Model discharges were determined by developing a runoff hydrograph from rainfall intensity data and parameters for infiltration, surface storage, slope, drainage area and land use characteristics. The results of this model showed a decrease in the flood peak on Tecumseh Creek due to the configuration of the watershed.

Peak discharge-frequencies on the Wakarusa River and North Branch Wakarusa River were taken from the FIS for the City of Auburn (Reference 14). On the Wakarusa River, Kansas Technical Paper No. 11 (Reference 15) for unregulated rural streams was used. On the North Branch Wakarusa River, the Storm Water Management Model was used (Reference 16). Kansas River discharges are based on current regulating criteria applied to the existing reservoir system in the basin.

Peak discharges for the 10-, 2-, 1- and 0.2-percent-annual-chance floods on Cross Creek were developed using the TR-20 hydrologic model (Reference 17) and were taken from the FIS for the City of Rossville (Reference 18). During the 2-, 1- and 0.2-percent-annual-chance floods, part of the flow on Cross Creek is diverted through an overflow channel in Rossville and flows overland along the Union Pacific railroad.

Detailed hydraulic and hydrologic analyses were performed for the reach of the Kansas River south of the City of Rossville. The analyses indicated that flooding of the Kansas River does not affect the City of Rossville.

For the reach of Sixmile Creek upstream of the Kansas Turnpike, Black & Veatch used peak discharges published in the SCS watershed report (Reference 1).

For the reach of Sixmile Creek between S.W. 97th Street and the Kansas Turnpike peak discharges were also taken from the SCS watershed report (Reference 1). The peak discharges were calculated for the 10-, 2-, 1- and

0.2-percent-annual-chance floods using the SCS TR-20 computer program (Reference 19).

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

3.1.2 Countywide Study:

Redelineation Studies – Zone AE Discharges

For this countywide study, AMEC did not perform new detailed studies on all streams that were previously delineated detail studies. These detail-studied streams that were not re-studied as part of this countywide study appear as "profile base lines" on the maps. These "profile base lines" provide 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" fore 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 Areas (SFHA).

For those originally studied by detailed methods and were not restudied as part of this countywide study, no new hydrologic analysis was performed. The streams that fall into this category are Stinson Creek, Tecumseh Creek, Wakarusa River, North Branch Wakarusa River, Halfday Creek, and Indian Creek. For these streams, floodplains were redelineated on new topography.

Approximate Studies – Zone A Discharges

Discharges for approximate hydraulic studies were computed using the rural USGS regression equations specific to the State of Kansas. The USGS report *Estimation of Peak Streamflows for Unregulated Rural Streams in Kansas (2000)* contains the most recent version of statewide regression equations (Reference 20). An average mean annual precipitation of 36 inches was used to compute the regression analysis. This report was developed in cooperation with the Kansas Department of Transportation.

Gage analysis was used to obtain flows for Soldier Creek. An approximate study was completed for a portion of this stream, and detailed study was completed for the other portion. The methodology utilized for computing flows is the same for both the approximate and detailed study

areas, and will be further discussed in the section below.

Ensign Creek and various unnamed approximate streams were affected by the Cross Creek overflow described below. The discharges for the affected approximate streams were adjusted appropriately to reflect this overflow affect from Cross Creek.

New and Revised Detailed Studies – Zone AE Discharges

Gage Analysis: Soldier Creek

Gage analysis was utilized to compute flows for Soldier Creek from the north border of Shawnee County to its confluence with the Kansas River. Methodology utilized in the USGS report titled "Estimates of Median Flows for Streams on the Kansas Surface Water Register"; "Water-Resources Investigations Report 02-4292" was used to determine flows (Reference 4). Equations from Cases 4 and 5, Table 3, page 22 of the report were used to compute flows. Gage stations used in the analysis were: 1. Near St. Clere, KS, 6889180; 2. Near Delia, KS, 6889200; and 3. Near Topeka, KS, 6889500. Case 5 equations were used for the portion of Soldier Creek between gages 6889180 and 6889200, and also between gages 6889200 and 6889500. Case 4 equations were used for the portion of Soldier creek downstream of gage 6889500.

HEC-HMS Analysis

Two basins were studied using the HEC-HMS hydrologic computer model (Reference 21):

1. Wanamaker Basin: Wanamaker and Wanamaker Northeast Branch;
2. Shunganunga Basin: Shunganunga Creek, Southeast Branch Elevation Creek, Elevation Tributary, Indian Hills Tributary, Colly Creek, Southbranch Shunganunga Creek, West Fork Butcher Creek, Butcher Creek, Deer Creek, Stinson Creek.

Three HMS models were created to compute flow, one for the Wanamaker Basin, one for the Shunganunga Basin (used to compute flows for all streams except Shunganunga Creek), and the third for the Shunganunga Basin (used to compute flows for Shunganunga Creek). ArcHydro, an extension of ArcGIS, was utilized to delineate sub-basins. The City of Topeka's storm sewer shape files, high resolution aerial imagery, and field visits were used to further refine basin delineation at several locations. Curve numbers were computed using soils and land use shape files obtained from Shawnee County. Composite curve numbers were then computed for each subbasin for

the AMC II condition (Reference 7). Time of concentration for each basin was computed using the Natural Resources Conservation Service (NRCS) TR-55 3-segment approach (Reference 7). Manning's roughness coefficients for channel reaches were estimated based on field observations and aerial photography. Channel dimensions were estimated based upon the 2 meter cell LIDAR data for Shawnee County.

The NRCS Unit Hydrograph method was used to model subbasin runoff for the Wanamaker Basin model and the Shunganunga Basin model used to compute flows for all streams except for Shunganunga Creek. Channel Routing was performed using NRCS lag methodology. Precipitation data for the 10-, 2- and 1-percent-annual-chance rainfall event was obtained from the report "Rainfall Intensity Tables for Counties in Kansas" developed by the Kansas Department of Transportation and Revised in June, 1997 (Reference 22). The 0.2-percent-annual-chance precipitation amount was then extrapolated from this data using a trend line analysis. Precipitation distribution for the 24-hour storm was based on the NRCS 24-hour type II distribution.

During the analysis of the Shunganunga basin it was determined that the NRCS hydrograph method within the HMS model was predicting the flows for Shunganunga Creek. These results were established to be on the high side of the expected range of flow based upon our review of water surface elevations from previous runoff events. After examination of the modeling, it was determined that the Clark's hydrograph would be more appropriate to compute flows for Shunganunga Creek.

A fourth HEC-HMS model was created for the Shunganunga basin to model flows for Shunganunga Creek. This model is identical to the other HEC-HMS model created for the basin, except that it used Clark's hydrograph methodology instead of NRCS methodology to compute flows for Shunganunga Creek. Ratios were computed for each sub-basin, in order to compute the storage coefficient for each sub-basin. The following table summarizes ratios used to compute the storage coefficients.

Table 2. Ratios for R (Connell Wagner (2001))	
Ratio	**Land Characterization**
0.25	Highly developed industrial commercial catchments
0.30	Most residential catchments
0.35	High storage residential catchments
0.45	Rural steepland catchments
0.60	Rural flatland catchments
*0.60	* Catchments along Shunganunga Creek, where significant floodplain storage exists

* Ratio based upon observed ponding and storage areas observed during major storm events.

The above ratios were then used to compute storage coefficients for the Shunganunga basin. Flows for Shunganunga Creek were then computed in the revised HMS model using the Clark's Hydrograph.

Areal reductions were applied to the 24-hour precipitation value for portions of the basin larger than 30 square miles of drainage. NRCS (SCS) TR-60 methodology was used to apply the areal reductions to the point rainfall amounts (Reference 23). Following is a summary table of the applied flow reductions in the Shunganunga basin.

Table 3. Rainfall Areal Reductions						
HEC-HMS Simulation Runs	P10 (in)	P50 (in)	P100 (in)	P500 (in)	Average Drainage Area (sq. miles)	Red. Factor
1	5.28	6.96	7.68	9.36	< 20	1
2	4.65	6.12	6.53	8.24	38.06	0.88
3	4.49	5.92	6.34	7.96	52.51	0.85
4	4.36	5.74	6.76	7.72	67.99	0.825

Simulation runs apply to the following streams:

1. These runs apply to all streams within the Shunganunga Basin, with the exception of Shunganunga Creek. These runs also apply to Shunganunga Creek upstream of its confluence with South Branch Shunganunga Creek.
2. These runs apply to Shunganunga Creek, between the confluences with South Branch Shunganunga Creek and Butcher Creek.
3. These runs apply to Shunganunga Creek, between the confluences with Butcher Creek and Deer Creek.
4. These runs apply to Shunganunga Creek, between the confluences with Deer Creek and Kansas River.

Reservoirs or detention basins were inserted into the HEC-HMS models at the following locations: Wanamaker Basin: Westridge Detention Basin and Wal-Mart Detention Basin; Shunganunga Basin: Lake Sherwood, Shunganunga Drainage District No. 1- Burnett Dam, Shunganunga Drainage District No. 1 - Southbranch Dam, Lake Shawnee. Storage volumes for the reservoirs or basins were computed using the LIDAR data obtained from Shawnee County and the City of

Topeka, or from information provided by the Kansas Department of Agriculture, Division of Water Resources (DWR). Spillway dimensions and elevations were either provided by DWR or field measured. Top of dam or basin elevation information was either provided by DWR or else derived from the LIDAR dataset.

Cross Creek Flows

A new detailed hydraulic study was completed for Cross Creek as part of this project. However, updated detailed hydrology for Cross Creek was deemed unnecessary by FEMA Region VII. Approximately 50 to 55 percent of the Cross Creek drainage area is controlled by flood water retarding dams or detention dams constructed by the Cross Creek WJD No. 42, and many of these dams provide retention for the 1-percent-annual-chance storm event. The flows in the previous FIS completed in June of 1979 account for 8 of the approximately 30 dams constructed by the district. In addition to the watershed being controlled, another unique feature of Cross Creek is that a portion of flows in excess of the 10-percent-annual-chance storm event are diverted out of Cross Creek into a drainage channel which connects to Ensign Creek. Regression analysis and also calibration of flows computed by regression to a near by gaged watershed were options considered to obtain updated flows. Due to the complexity of the overflow channel and the fact that over 50% of the basin is controlled by dams, it was determined that using the flows computed for the 1979 FIS was the best option at this time. The Cross Creek drainage basin hasn't undergone significant changes over the last 25 years, and is primarily agricultural just as it was in 1979.

Peak discharge-drainage area relationships for this countywide FIS are shown in Table 4, Summary of Discharges.

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 and their 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 table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to us the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

TABLE 4 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual-Chance	2-Percent Annual-Chance	1-Percent Annual-Chance	0.2-Percent Annual-Chance
BUTCHER CREEK					
Downstream of confluence with West Fork Butcher Creek	3.67	3340	4740	5340	6730
Upstream of confluence with Shunganunga Creek	5.58	5300	7420	8330	10430
COLLY CREEK					
Upstream of Confluence with South Branch Shunganunga Creek	4.5	3120	4580	5210	6700
CROSS CREEK **					
At north end of Rossville Main Channel	***173	11,500	13,000	13,000	13,000
Overflow Channel (Ensign Creek)		0	8,000	12,900	27,200
DEER CREEK					
At outlet of Lake Shawnee	8.92	2880	3450	4090	5680
Upstream of confluence with Shunganunga Creek	14.85	5350	7800	8880	11470
ELEVATION TRIBUTARY					
Downstream of confluence with Southeast Branch Elevation Creek	1.91	2060	3060	3500	4520
Upstream of confluence with Shunganunga Creek	2.02	2100	3130	3570	4620

TABLE 4– SUMMARY OF DISCHARGES - CONTINUED

HALFDAY CREEK ****					
At mouth	23.0	6800	14000	19100	35000
3000 feet upstream of mouth	20.7	6300	13000	17700	32450
4400 feet downstream of Chicago, Rock Island, and Pacific Railroad	16.0	5275	10850	14800	27150
1500 feet upstream of N.W. 66th Street	10.6	3950	8150	11100	20350
Upstream of N.W. 78th Street	5.1	2350	2850	6650	12200
INDIAN CREEK ****					
Topeka city limits	11.8	3850	8600	12000	23000
1700 feet upstream of N.E. 35th Street	10.7	3430	7670	10700	20500
4000 feet downstream of N.E. 50th Street	8.8	2680	6720	9300	17200
800 feet upstream of N.W. 43rd Street	6.7	2400	5500	7700	14800
Upstream of N.E. 62nd Street	4.1	1750	3900	5450	10500
Upstream of N.E. 74th Street	1.5	900	1950	2700	5200
INDIAN HILLS TRIBUTARY					
Upstream of confluence with Shunganunga Creek	2.72	2570	3620	4070	5110
KANSAS RIVER ****					
At Sardou Avenue	56720	80000	160000	205000	350000
NORTH BRANCH WAKARUSA RIVER					
At confluence with Wakarusa River	9.9	1125	1950	2350	3250
SHUNGANUNGA CREEK					
At outlet of Lake Sherwood Dam	7.04	440	1060	1540	2920

TABLE 4– SUMMARY OF DISCHARGES - CONTINUED

SHUNGANUNGA CREEK Cont'd					
Downstream of confluence with Elevation Tributary	9.4	2830	4000	4500	5690
At outlet of Shunganunga DD No. 1 - Burnett Dam	9.64	900	1090	1610	3540
Downstream of confluence with Indian Hills Tributary	12.43	3360	4540	5030	6160
Downstream of confluence with South Branch Shunganunga Creek	33.01	6580	9020	10080	12490
Downstream of confluence with Butcher Creek	43.13	11020	15350	17170	21570
Downstream of confluence with Deer Creek	61.88	15070	21600	24480	31130
Downstream of confluence with Stinson Creek	73.34	17960	25930	29450	37590
Upstream of confluence with Kansas River	73.53	18020	26020	29550	37710
SIXMILE CREEK					
Just downstream of Kansas Turnpike	9.3	2280	4190	5130	7910
Just upstream of Kansas Turnpike	9.1	2280	4190	5130	7900
Just downstream of Urish Road	8.7	2280	4190	5120	7880
About 0.8 mile downstream of S.W. 69th Street	7.7	2280	4170	5090	7830
SOLDIER CREEK *					
At intersection with US Highway 75	295.72	16,501	29,147	35,356	45,750
At intersection with US Highway 24	337.55	17,181	30,113	36,356	45,750

TABLE 4– SUMMARY OF DISCHARGES - CONTINUED

SOUTH BRANCH					
SHUNGANUNGA CREEK					
Downstream of confluence with Colly Creek	13.65	7080	10260	11630	14830
At outlet of Shunganunga DD No. 1 - Southbranch Dam	13.77	2040	4530	5610	8200
Downstream of confluence with Shunganugna Creek (downstream)	15.51	2850	4720	5820	8490
SOUTHEAST BRANCH					
ELEVATION CREEK					
Upstream of confluence with Elevation Tributary	0.85	1200	1740	1980	2530
STINSON CREEK					
At mouth	4.9	2500	3700	4250	5600
Interstate Highway 70	3.8	2350	3500	4000	5300
TECUMSEH CREEK					
At mouth	10.2	3250	5200	6100	8400
At S.E. 29th Street	6.9	3600	5500	6400	8600
At S.E. 37th Street	6.0	3400	5300	6200	8400
WAKARUSA RIVER					
At Kansas Turnpike	76.9	9200	16500	20000	30000
WANAMAKER MAIN BRANCH					
Downstream of confluence with Wanamaker Northeast Branch	2.39	4530	6220	6920	8530
Upstream of confluence with Kansas River	7.25	9620	13620	15320	19290

TABLE 4– SUMMARY OF DISCHARGES - CONTINUED

WANAMAKER					
NORTHEAST BRANCH					
Upstream of confluence with Wanamaker	0.56	1430	1990	2230	2780
WEST FORK BUTCHER CREEK					
Upstream of confluence with Butcher Creek	1.2	1440	2020	2260	2840

* Flows computed by Gage Analysis

** Flows brought forward from 1979 – No hydrologic analysis completed

*** Drainage area is the combined drainage area for Cross Creek and the Overflow Channel as stated in the 1979 FIS

**** Discharges brought forward from effective FIS – No hydrologic analysis completed

3.2.1 Pre-Countywide Study:

Cross sectional data for streams in the area were obtained from field surveys and topographic maps (Reference 24). All bridges were surveyed to obtain elevation data and structural geometry. 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.

For Sixmile Creek, cross sectional data were obtained from the SCS watershed report (Reference 1), field surveys, and Kansas Turnpike culvert plans.

The hydraulic characteristics for West Fork Butcher Creek were taken directly from the previous Type 15 study (Reference 22).

Channel roughness factors (Manning's "n") for use in hydraulic computations were assigned on the basis of field inspection of flood plain areas and on previous studies by the USACE (References 9, 10, 25, 26, 27 and 28). Roughness factors for the streams studied in detail were approximately as follows:

Kansas River - 0.06 for overbank and 0.035 for the channel in natural stream areas and 0.035 for overbank and 0.025 for the channel in leveed areas

Shunganunga Creek, Butcher Creek, West Fork Butcher Creek, South Branch Shunganunga Creek, and Deer Creek - 0.06 for overbanks and 0.04 for the channels

Indian Creek and Halfday Creek - 0.08 for overbank and 0.06 for channel

Wakarusa River and North Branch Wakarusa River - 0.09 for overbank and 0.07 for the channels

Cross Creek - 0.06 to 0.05 for the channel and 0.04 to 0.055 for the overbank

Sixmile Creek - 0.015 to 0.07 for the channel and 0.045 to 0.09 for the overbank areas.

Stinson Creek - 0.029 to 0.055 for the channel and 0.035 to 0.085 for the overbank

Tecumseh Creek - 0.025 to 0.063 for the channel and 0.025 to 0.085 for the overbank

Starting water-surface elevations were determined by normal depth analysis for all streams except the Kansas River which used the upstream water surface elevation from the Douglas County FIS (Reference 29). Water-surface elevations of floods of selected recurrence intervals were computed through use of the HEC-2 water-surface backwater computer program (Reference 30). Water-surface elevations for Cross Creek were developed using the USGS E-431 stepbackwater program (Reference 31). The water-surface profiles were taken from the FIS for the City of Rossville (Reference 18).

3.2.2 Countywide Study:

The extent of the hydraulic analysis for detailed Zone AE analyses can be found in Table 1. For those streams designated as redelineation no new hydrology or hydraulic analysis was performed. Redelineation areas have been developed in accordance with FEMA Guidelines and Specifications; therefore, no additional discussion of the redelineation process will be addressed in this countywide report.

Detail-studied streams that were not re-studied as part of this map update may 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 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 SFHA.

All hydraulic modeling designated as detailed study was performed using HEC-RAS, version 3.1.2 from the U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) (Reference 32). Basic modeling data for the detailed hydraulic analysis was performed using HEC-GeoRAS, a GIS interface developed by HEC for the preparation of hydraulic models. Peak flow values were obtained from the corresponding HEC-HMS discussed in the hydrology report (Reference 21). For detailed analyses, flood profiles were computed for the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence interval flood events. In addition, the floodway was determined using equal reduction of conveyance on opposite sides of the stream while allowing a maximum surcharge of 1.0 ft.

For new detailed analyses, cross section data for over bank areas was compiled from topographical data consisting of LIDAR data as well as field survey data. Channel data was developed based on field survey data.

Stream crossing information was taken from field survey points. Field

notes consisting of structure dimensions and channel geometry, as well as structure material (i.e. corrugated metal pipe), were used in conjunction with survey data to most accurately represent the structures. Roughness coefficients were assigned based on aerial photography and field reconnaissance. Starting water surface elevations were computed using normal depth calculations. Manning's "n" values are summarized in Table 2 and were chosen based on engineering judgment using field surveys and 2006 aerial imagery.

TABLE 5: SUMMARY OF MANNING'S "n" VALUES

	Left Overbank		Channel		Right Overbank	
Stream Name	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Butcher Creek	0.045	0.12	0.045	0.06	0.025	0.12
Colly Creek	0.05	0.2	0.045	0.15	0.05	0.15
Cross Creek	0.045	0.2	0.045	0.045	0.045	0.2
Deer Creek	0.06	0.17	0.03	0.12	0.045	0.17
Elevation Tributary	0.08	0.12	0.045	0.045	0.05	0.12
Shunganunga Creek	0.055	0.2	0.045	0.12	0.045	0.25
Soldier Creek	0.04	0.2	0.04	0.045	0.045	0.2
South Branch Shunganunga Creek	0.045	0.15	0.035	0.15	0.015	0.15
Southeast Branch Elevation Creek	0.05	0.2	0.045	0.045	0.035	0.2
Wanamaker	0.08	0.2	0.045	0.045	0.05	0.15
Wanamaker Northeast Branch	0.01	0.13	0.045	0.12	0.05	0.13
West Fork Butcher Creek	0.05	0.12	0.045	0.1	0.05	0.12

The levee system on Shunganunga Creek and Soldier Creek stated in Table 6 and Table 7 was modeled as providing protection for the 1-percent-annual-chance flow event, since it is currently defined by FEMA as a Provisionally Accredited Levee (PAL) Scenario B.

TABLE 6: SHUNGANUNGA CREEK LEVEE SYSTEM

HEC-RAS Location	Starting Upstream Cross Section	Ending Downstream Cross Section
Left Side	26959.1	4913.9

TABLE 7: SOLDIER CREEK LEVEE SYSTEM

HEC-RAS Location	Starting Upstream Cross Section	Ending Downstream Cross Section
Left Side	42125.1	29348.3
Left Side	16391	10091.2
Left Side	2990.9	2124.7
Right Side	42125.1	2124.7

The resulting 1- and 0.2- percent-annual-chance floodplain elevations produced by the HEC-RAS models were plotted on the digital terrain models produced from the 2 meter-USGS 2006 data. The floodway was plotted in accordance with FEMA Guidelines and Specifications using the encroachments stations developed from the HEC-RAS models assuming a surcharge between 0 and 1 foot. A floodway data table was created for each stream and contains the floodway data taken from the HEC-RAS models in Table 8. A profile was created for each stream using data developed in the HEC-RAS models.

Locations of selected cross sections used in the hydraulic analyses are shown on the flood profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM.

The extent of the hydraulic analysis for approximate Zone A analysis is defined as the streams previously designated by FEMA as a non-detailed stream (Zone A), plus the clearly defined conveyances with drainage areas equal to or greater than 1-square mile of drainage area. In general, the upstream limits of the study reaches extend to include the entire Zone A stream or extend to the 1-square mile drainage. In some instances, short streams that were previously included as Zone A areas were determined to be primarily influenced by backwater from downstream flooding sources. A new hydraulic analysis was not conducted for these backwater streams since floodplain mapping would sufficiently designate the approximate flood hazard boundary.

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.

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 Shawnee County from the current NGVD datum to the newer NAVD 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 National Geodetic Survey conversion program, VertCon 2.1 (Reference 33). A resulting average conversion factor of 0.38 ft was applied to all components of the FIS that display flood elevations (documented as part of the TSDN).

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. 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. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including flood profiles and floodway data tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with 10-foot contour intervals (Reference 24). Flood boundaries for Cross Creek including shallow flooding area were taken from the City of Rossville FIS (Reference 18), where they were delineated using topographic maps prepared from aerial photography with a scale of 1:4800 and a contour interval of five feet (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 and AE) and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance 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 Flood Hazard Boundary Map for Shawnee County, Kansas (Reference 16).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards

limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adapted directly or that can be used as a basis for additional floodway studies.

The floodways for 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 citations are tabulated for selected cross sections and are shown in Table 8, Floodway Data. The computed floodways are shown on the FIRM. In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and the 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

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 Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

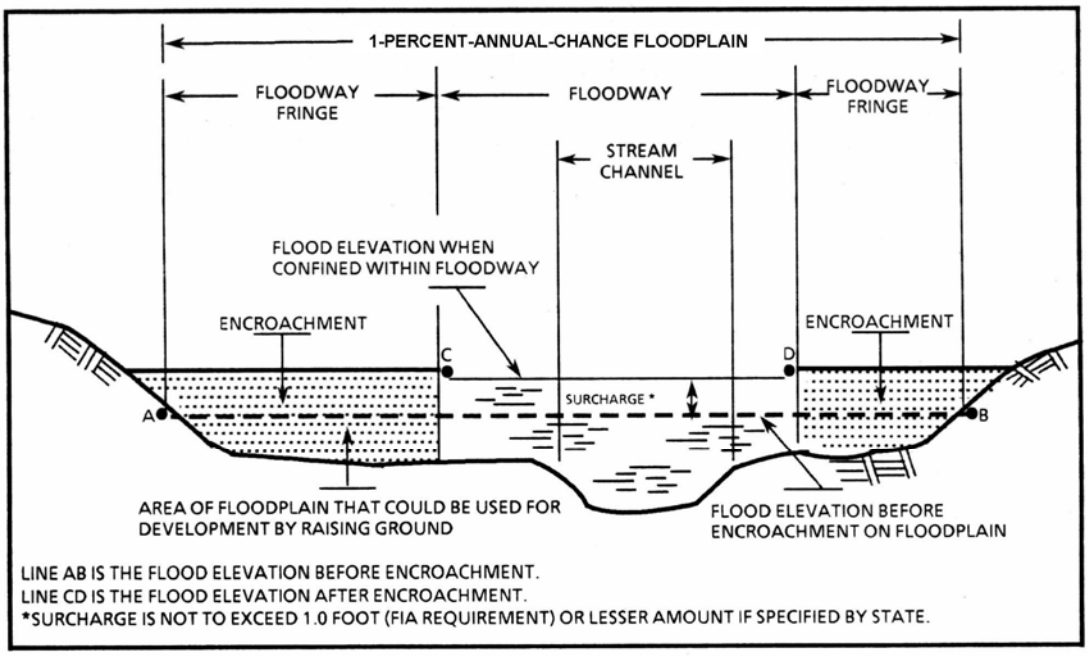


Figure 1 – Floodway Schematic

Zone X

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

6.0 FLOOD INSURANCE RATE MAP

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

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

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

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Butcher Creek								
A	1416	86	885	9.4	900.9	900.7[2]	900.9	0.2
B	1934	281	1677	5.0	902.1	902.1	902.9	0.8
C	2244	90	754	11.0	902.7	902.7	903.0	0.3
D	2568	146	1417	5.9	904.9	904.9	905.2	0.3
E	2960	223	2047	4.1	905.9	905.9	906.0	0.1
F	3190	460	4598	1.8	906.2	906.2	906.9	0.7
G	3542	327	3100	2.7	906.5	906.5	907.2	0.7
H	3898	580	3858	2.2	906.7	906.7	907.6	0.9
I	4188	311	2477	3.4	906.7	906.7	907.6	0.9
J	4628	257	1600	5.2	907.3	907.3	908.0	0.7
K	4991	384	2112	3.8	908.3	908.3	908.9	0.6
L	5158	138	1353	5.9	908.6	908.6	909.1	0.5
M	5269	141	1492	5.4	909.5	909.5	909.6	0.1
N	5643	446	2080	3.9	911.2	911.2	911.4	0.2
O	5868	433	2225	3.6	912.0	912.0	912.2	0.2
P	6146	259	2336	3.4	912.7	912.7	912.8	0.1
Q	6732	254	1555	5.2	914.3	914.3	914.6	0.3
R	6845	283	2196	3.7	915.4	915.4	915.6	0.2
S	6972	247	1653	4.9	915.5	915.5	915.7	0.2
T	7101	250	1462	5.5	915.8	915.8	916.1	0.3
U	7445	253	1592	5.1	916.7	916.7	917.0	0.3
V	7675	278	1454	5.5	917.1	917.1	917.3	0.2
W	7968	170	753	10.7	920.2	920.2	920.2	0.0
X	8120	134	1543	5.2	923.2	923.2	923.3	0.1

[1]Feet above confluence with Shunganunga Creek

[2]Elevation computed without consideration of backwater effects from Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

BUTCHER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Butcher Creek (cont.)								
Y	8365	77	898	9.0	923.4	923.4	923.4	0.0
Z	8590	51	747	10.8	923.9	923.9	923.9	0.0
AA	8903	287	2815	2.9	925.9	925.9	926.0	0.1
AB	9171	262	2174	3.7	926.0	926.0	926.1	0.1
AC	9396	205	2140	3.8	926.2	926.2	926.3	0.1
AD	9713	200	1861	4.3	926.3	926.3	926.5	0.2
AE	10070	171	1823	4.4	926.7	926.7	926.9	0.2
AF	10397	175	1306	6.2	927.0	927.0	927.1	0.1
AG	10702	74	632	12.7	927.7	927.7	928.0	0.3
AH	11070	181	2207	3.6	932.1	932.1	932.3	0.2
AI	11420	186	1788	4.5	932.4	932.4	932.7	0.3
AJ	11715	93	893	3.5	933.3	933.3	933.6	0.3
AK	11947	90	718	4.3	933.5	933.5	933.7	0.2
AL	12379	85	462	6.7	934.0	934.0	934.2	0.2
AM	12694	58	378	8.1	935.1	935.1	935.2	0.1
AN	13054	88	439	7.0	937.5	937.5	937.5	0.0
AO	13358	120	423	7.3	940.3	940.3	940.3	0.0
AP	13986	75	334	9.2	944.2	944.2	944.3	0.1
AQ	14371	109	428	7.2	947.9	947.9	947.9	0.0
AR	14754	115	607	5.1	950.3	950.3	950.3	0.0
AS	14910	300	578	5.3	950.7	950.7	950.8	0.1
AT	14983	332	996	3.1	951.8	951.8	951.8	0.0
AU	15081	324	988	3.1	952.0	952.0	952.0	0.0
AV	15344	287	959	3.2	952.7	952.7	952.7	0.0

[1]Feet above confluence with Shunganunga Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Butcher Creek (cont.)								
AW	15586	207	566	5.4	953.2	953.2	953.2	0.0
AX	15886	225	635	4.8	956.8	956.8	956.8	0.0
AY	16093	325	589	5.2	958.3	958.3	958.5	0.2
AZ	16176	39	266	11.6	958.9	958.9	958.9	0.0
BA	16279	34	344	9.0	960.4	960.4	961.0	0.6
BB	16365	52	288	10.7	960.8	960.8	961.4	0.6
BC	16712	143	735	4.2	964.2	964.2	964.3	0.1
BD	17201	414	1427	2.2	964.9	964.9	965.2	0.3
BE	17456	312	1026	3.0	965.2	965.2	965.4	0.2
BF	17770	234	499	6.2	968.0	968.0	968.0	0.0
BG	18114	364	848	3.6	970.5	970.5	970.5	0.0
BH	18326	259	468	6.6	972.9	972.9	973.1	0.2
BI	18604	431	3345	0.9	977.0	977.0	977.2	0.2
BJ	18693	181	1723	1.8	977.0	977.0	977.2	0.2
BK	19008	133	1029	3.0	977.0	977.0	977.2	0.2
BL	19255	234	1636	1.9	977.0	977.0	977.4	0.4
BM	19526	139	787	3.9	977.2	977.2	977.5	0.3
BN	19783	139	678	4.5	977.3	977.3	978.1	0.8
BO	20109	103	561	5.5	979.0	979.0	979.3	0.3
BP	20284	187	854	3.6	979.7	979.7	980.7	1.0
BQ	20374	189	1101	2.8	980.0	980.0	980.9	0.9
BR	20682	190	1145	2.7	980.7	980.7	981.3	0.6
BS	20891	164	674	2.6	980.9	980.9	981.5	0.6
BT	21161	174	830	2.1	981.3	981.3	981.8	0.5

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

BUTCHER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Butcher Creek (cont.)								
BU	21439	98	199	8.7	981.8	981.8	982.0	0.2
BV	21846	176	734	2.4	984.3	984.3	985.0	0.7
BW	22111	68	255	6.8	984.3	984.3	985.1	0.8
BX	22388	123	457	3.8	987.2	987.2	987.2	0.0
BY	22500	42	239	7.3	987.5	987.5	987.5	0.0
BZ	22583	58	575	3.0	993.6	993.6	993.6	0.0
CA	22664	245	1939	0.9	993.8	993.8	993.8	0.0
CB	22798	181	1243	1.4	993.8	993.8	993.8	0.0
CC	23102	142	1032	1.7	993.9	993.9	993.9	0.0
CD	23474	234	1243	1.4	994.0	994.0	994.1	0.1
CE	23829	112	647	2.7	994.1	994.1	994.1	0.0
CF	24111	106	468	3.7	994.4	994.4	994.4	0.0

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

BUTCHER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Colly Creek								
A	3544	651	3024	1.7	952.2	947.9[2]	948.0	0.1
B	5340	469	2363	2.2	952.2	950.3[2]	950.4	0.1
C	6390	315	2045	2.5	952.6	952.6	953.4	0.8
D	7311	416	2331	2.2	955.1	955.1	955.5	0.4
E	7808	271	1724	3.0	956.3	956.3	956.5	0.2
F	8374	311	1383	3.7	958.2	958.2	958.3	0.1
G	9384	259	1598	3.2	962.2	962.2	962.8	0.6
H	9987	606	2581	2.0	963.4	963.4	964.1	0.7
I	11821	385	1259	4.1	966.7	966.7	966.9	0.2
J	12370	282	1226	4.2	969.1	969.1	969.8	0.7
K	12983	322	1293	4.0	972.0	972.0	972.3	0.3
L	13578	306	1847	2.8	973.4	973.4	974.3	0.9
M	14869	499	2608	1.7	978.3	978.3	979.2	0.9
N	15556	409	1418	3.1	979.0	979.0	979.8	0.8
O	17536	340	1288	3.4	984.6	984.6	985.5	0.9
P	17833	342	1353	3.2	986.3	986.3	986.6	0.3
Q	18141	311	1385	3.1	987.4	987.4	988.1	0.7
R	18424	371	1460	3.0	988.4	988.4	989.0	0.6

[1]Feet above confluence with South Branch Shunganunga Creek

[2]Elevation computed without consideration of backwater effects from South Branch Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

COLLY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cross Creek								
A	8117	138	2144	6.1	921.4	921.4	921.5	0.1
B	11419	444	2923	4.5	924.6	924.6	925.0	0.4
C	13025	175	2782	4.7	925.9	925.9	926.2	0.3
D	16456	342	3104	4.2	928.5	928.5	928.6	0.1
E	18003	165	2492	5.2	929.5	929.5	929.7	0.2
F	18449	175	2770	4.7	930.9	930.9	931.0	0.1
G	21105	509	4364	5.9	932.2	932.2	932.3	0.1

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

CROSS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deer Creek								
A	3756	267	2400	6.3	884.8	884.8	885.0	0.2
B	4313	106	1180	8.2	885.7	885.7	886.5	0.8
C	5200	136	1623	8.3	888.3	888.3	888.7	0.4
D	6936	118	1855	6.6	890.9	890.9	891.2	0.3
E	7167	187	1982	9.8	891.0	891.0	891.7	0.7
F	8845	244	2646	5.9	894.0	894.0	894.3	0.3
G	8993	162	1487	8.3	894.0	894.0	894.6	0.6
H	9667	95	1258	8.7	894.8	894.8	895.4	0.6
I	10045	776	4042	3.5	899.6	899.6	899.8	0.2
J	12084	309	3143	4.3	900.0	900.0	900.9	0.9
K	12235	246	2077	5.1	901.1	901.1	901.9	0.8
L	12479	224	1408	8.8	901.1	901.1	902.0	0.9
M	14041	511	3581	4.8	906.3	906.3	906.8	0.5
N	14765	500	1683	6.5	906.5	906.5	907.2	0.7
O	15191	235	1222	7.1	907.6	907.6	908.0	0.4
P	15920	280	1336	6.7	909.9	909.9	910.0	0.1
Q	16313	307	1595	6.2	910.5	910.5	910.8	0.3
R	16496	328	1925	5.0	911.3	911.3	911.6	0.3
S	16980	544	3861	2.5	911.9	911.9	912.2	0.3
T	17292	505	3896	2.8	916.5	916.5	916.7	0.2
U	18144	322	1496	6.8	916.8	916.8	917.1	0.3
V	19092	175	1177	4.9	919.3	919.3	919.4	0.1
W	19283	79	366	11.9	919.6	919.6	919.6	0.0
X	19672	72	414	10.0	926.9	926.9	926.9	0.0

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

DEER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deer Creek (cont.)								
Y	20228	214	7815	0.5	963.2	963.2	963.2	0.0
Z	29510	244	959	12.8	963.2	963.2	963.2	0.0
AA	30541	302	2032	3.9	967.3	967.3	968.2	0.9

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

DEER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Elevation Tributary								
A	2060	121	481	7.4	975.7	975.4[2]	976.0	0.6
B	2481	78	445	7.9	978.8	978.8	979.5	0.7
C	2792	84	704	5.0	981.6	981.6	982.6	1.0
D	3260	94	866	4.0	983.4	983.4	984.3	0.9
E	3371	130	932	3.8	985.7	985.7	986.3	0.6

[1]Feet above confluence with Shunganunga Creek

[2]Elevation computed without consideration of backwater effects from Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

ELEVATION TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Halfday Creek								
A	3023	164	2159	8.2	891.0	891.0	891.8	0.8
B	8035	545	3508	5.0	897.9	897.9	898.7	0.8
C	10568	606	4750	3.7	901.7	901.7	902.6	0.9
D	15110	297	3267	5.4	909.6	909.6	910.6	1.0
E	21690	421	4048	4.4	921.6	921.6	922.4	0.8
F	27049	739	7206	2.1	928.0	928.0	928.7	0.7
G	31253	859	8695	1.7	931.4	931.4	932.2	0.8
H	32411	510	5109	2.9	940.9	940.9	941.1	0.2
I	36617	157	2087	7.1	946.0	946.0	946.7	0.7
J	41031	106	1146	9.7	954.8	954.8	955.5	0.7
K	47428	173	1260	8.8	975.1	975.1	975.8	0.7
L	54700	614	2840	2.3	1004.3	1004.3	1004.7	0.4
M	60300	257	1361	4.9	1045.5	1045.5	1045.9	0.4

[1]Feet above confluence with Soldier Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

HALFDAY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Indian Creek								
A	1325	232	3203	2.8	880.1	880.1	881.0	0.9
B	2325	353	3137	2.8	881.5	881.5	882.4	0.9
C	6011	442	3206	3.7	891.9	891.9	892.6	0.7
D	9728	164	1253	8.5	900.4	900.4	900.9	0.5
E	14013	363	1255	8.5	910.8	910.8	911.7	0.9
F	15038	436	3520	2.7	916.3	916.3	917.1	0.8
G	20440	250	2151	4.4	928.8	928.8	929.6	0.8
H	24136	100	1095	8.6	938.0	938.0	938.6	0.6
I	26902	284	2730	3.4	949.9	949.9	950.6	0.7
J	30667	366	2523	3.7	959.5	959.5	960.0	0.5
K	34212	88	1034	5.3	969.2	969.2	969.9	0.7
L	36380	76	456	11.9	978.3	978.3	978.3	0.0
M	40759	103	888	6.1	1006.4	1006.4	1007.4	1.0
N	44398	50	222	12.2	1020.9	1020.9	1020.9	0.0
O	46908	83	529	5.1	1044.7	1044.7	1045.1	0.4

[1]Feet above confluence with Soldier Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

INDIAN CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Indian Hills Tributary								
A	4004	120	984	4.1	967.3	967.3	967.8	0.5
B	5245	151	668	6.1	971.2	971.2	971.3	0.1
C	5739	138	877	3.9	975.1	975.1	975.1	0.0
D	6110	374	1625	2.1	975.7	975.7	976.3	0.6
E	6745	63	382	9.0	975.7	975.7	976.5	0.8
F	6995	274	1800	1.9	980.1	980.1	980.6	0.5
G	7294	181	1340	2.6	980.4	980.4	980.8	0.4
H	7639	149	1020	3.4	980.7	980.7	981.2	0.5
I	8242	103	683	5.0	982.2	982.2	982.5	0.3
J	8917	149	797	4.3	985.4	985.4	986.1	0.7
K	9270	108	743	4.6	987.5	987.5	987.6	0.1
L	9797	102	383	7.3	988.3	988.3	989.0	0.7
M	10330	227	2077	1.3	998.0	998.0	998.5	0.5

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

INDIAN HILLS TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kansas River								
A	7309	1745 /1192[2]	26085	7.9	866.2	866.2	866.5	0.3
B	15095	4612 /2335[2]	75632	2.9	870.1	870.1	870.8	0.7
C	20124	4783 /1308[2]	70585	3.1	870.9	870.9	871.8	0.9
D	24889	6176 /583[2]	56379	3.9	871.5	871.5	872.3	0.8
E	30593	7189 /1388[2]	62266	3.6	873.4	873.4	874.1	0.7
F	34576	6605 /1485[2]	71064	3.1	874.2	874.2	875.0	0.8
G	38195	7391 /3182[2]	57150	3.9	874.7	874.7	875.6	0.9
H	50391	3681[3]	60789	3.6	878.9	878.9	879.5	0.6
I	55188	2351[3]	42142	5.2	880.1	880.1	881.0	0.9
J	58820	2354[3]	36100	6.0	881.0	881.0	881.9	0.9
K	62517	1780[3]	37509	5.8	882.7	882.7	883.7	1.0
L	66208	1478[3]	31878	6.8	883.6	883.6	884.5	0.9
M	68311	796[3]	22340	9.7	883.9	883.9	884.8	0.9
N	69726	802[3]	22291	9.7	884.1	884.1	885.1	1.0
O	71563	842[3]	25764	8.4	885.4	885.4	886.4	1.0
P	72947	683[3]	22667	9.6	885.8	885.8	886.7	0.9
Q	76456	1168[3]	31601	6.9	886.9	886.9	887.9	1.0
R	78375	1688[3]	39257	5.5	887.4	887.4	888.3	0.9
S	81513	2342[3]	39475	5.5	888.0	888.0	889.0	1.0
T	83666	909[3]	28283	7.7	888.5	888.5	889.4	0.9
U	87114	952[3]	28973	7.5	889.7	889.7	890.5	0.8
V	90751	1206[3]	32901	6.6	891.1	891.1	891.9	0.8
W	93778	1076[3]	30137	7.2	892.2	892.2	893.2	1.0
X	98059	1555	31196	7.0	893.4	893.4	894.3	0.9

[1]Feet above county boundary

[2]Total width/width within county boundary

[3]Width does not match mapped width due to adjustments made for current levee conditions

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

KANSAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Kansas River (cont.)								
Y	102206	1839	41010	5.3	894.9	894.9	895.7	0.8
Z	109369	855	22534	9.6	896.6	896.6	897.4	0.8
AA	116923	786	21715	10.0	900.7	900.7	901.3	0.6
AB	121550	893	23871	9.1	903.3	903.3	903.8	0.5
AC	141636	5000	70924	2.9	910.4	910.4	911.3	0.9
AD	146177	5000	44546	4.6	910.9	910.9	911.9	1.0
AE	153569	4233	60453	3.4	914.7	914.7	915.5	0.8
AF	160697	4334	53718	3.8	916.5	916.5	917.2	0.7
AG	171204	3822 /1900[2]	32563	6.3	919.5	919.5	920.2	0.7

[1]Feet above county boundary

[2]Total width/width within county boundary

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

KANSAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Branch Wakarusa River								
A	2000	882	3485	0.7	1017.8	1013.2[2]	1014.0	0.8
B	4000	938	4544	0.5	1017.8	1013.3[2]	1014.1	0.8
C	6644	160	1018	2.3	1017.8	1016.2[2]	1017.0	0.8
D	8000	153	1147	2.0	1017.9	1017.9	1018.7	0.8
E	9074	56	464	5.1	1019.4	1019.4	1020.2	0.8
F	10000	198	589	4.0	1023.7	1023.7	1024.2	0.5
G	12070	137	868	2.7	1026.2	1026.2	1027.0	0.8
H	14090	97	549	4.3	1028.6	1028.6	1029.5	0.9
I	15805	94	696	3.4	1034.2	1034.2	1035.1	0.9
J	18000	100	458	5.1	1041.0	1041.0	1041.9	0.9

[1]Feet above confluence with Wakarusa River

[2]Elevation computed without consideration of backwater effects from Wakarusa River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

NORTH BRANCH WAKARUSA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek								
A	1096	346	4175	7.1	873.2	867.7[2]	867.7	0.0
B	3012	298	4260	6.3	873.2	870.6[2]	870.6	0.0
C	3605	486	6171	4.4	873.2	871.8[2]	871.9	0.1
D	4181	578	6828	4.0	873.2	872.5[2]	872.6	0.1
E	4548	512	6214	4.3	873.2	872.5[2]	872.7	0.2
F	4914	558	6651	4.1	873.2	872.7[2]	872.9	0.2
G	5638	532	6720	4.0	873.2	873.1[2]	873.4	0.3
H	6167	504	6368	4.2	873.4	873.4	873.7	0.3
I	6730	527	6198	4.4	873.7	873.7	874.0	0.3
J	7226	645	4772	5.2	873.7	873.7	874.0	0.3
K	7633	938	7416	3.3	875.4	875.4	875.8	0.4
L	8190	663	6352	3.9	875.6	875.6	875.9	0.3
M	8353	665	6515	3.8	875.7	875.7	876.1	0.4
N	8704	354	4997	5.0	875.8	875.8	876.2	0.4
O	9072	247	4065	6.1	875.9	875.9	876.2	0.3
P	9541	204	3538	7.0	876.0	876.0	876.4	0.4
Q	9736	196	3627	6.8	876.3	876.3	876.7	0.4
R	9993	195	3209	7.7	876.5	876.5	876.9	0.4
S	10181	193	3503	7.1	878.3	878.3	878.3	0.0
T	10338	261	4089	6.1	878.6	878.6	878.6	0.0
U	11148	354	5247	4.7	879.4	879.4	879.4	0.0
V	11774	256	4462	5.6	879.7	879.7	879.7	0.0
W	12389	201	3839	6.5	880.0	880.0	880.0	0.0
X	12674	212	3996	6.2	880.1	880.1	880.2	0.1

[1]Feet above confluence with Kansas River

[2]Elevation computed without consideration of overflow effects from Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
Y	13038	195	3561	7.0	880.4	880.4	880.5	0.1
Z	13393	195	3573	6.9	880.7	880.7	880.8	0.1
AA	13952	285	4450	5.6	881.5	881.5	881.5	0.0
AB	17404	238	3388	5.4	883.2	883.2	883.5	0.3
AC	17824	232	3308	5.6	883.4	883.4	883.6	0.2
AD	18283	232	3258	5.6	883.6	883.6	883.8	0.2
AE	18653	345	3826	4.8	884.0	884.0	884.3	0.3
AF	19558	258	3308	5.6	885.2	885.2	885.3	0.1
AG	19957	573	3536	5.2	885.3	885.3	885.3	0.0
AH	20251	494	3272	5.6	885.9	885.9	885.9	0.0
AI	20484	371	3693	5.0	886.3	886.3	886.6	0.3
AJ	20786	458	4384	4.2	886.6	886.6	887.0	0.4
AK	21233	386	3756	4.9	886.7	886.7	887.2	0.5
AL	21887	456	3911	4.7	887.2	887.2	887.7	0.5
AM	22642	488	3163	5.8	887.7	887.7	888.3	0.6
AN	23709	424	3329	5.4	889.0	889.0	889.9	0.9
AO	24288	457	2814	6.4	889.5	889.5	890.3	0.8
AP	24707	427	2830	6.4	890.2	890.2	890.8	0.6
AQ	25517	492	3126	5.8	891.5	891.5	892.0	0.5
AR	25972	664	4141	4.3	892.5	892.5	893.2	0.7
AS	26959	966	5967	3.0	894.1	894.1	894.9	0.8
AT	27600	767	5763	3.1	894.3	894.3	895.1	0.8
AU	27881	621	4925	3.7	894.3	894.3	895.1	0.8
AV	28448	262	3602	5.0	894.7	894.7	895.5	0.8

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
AW	28978	331	3790	4.8	895.4	895.4	896.2	0.8
AX	29342	248	2802	6.4	895.7	895.7	896.4	0.7
AY	29696	331	2987	6.0	896.0	896.0	896.7	0.7
AZ	31330	180	3054	5.9	900.5	900.5	900.5	0.0
BA	32015	607	3818	4.7	901.0	901.0	901.0	0.0
BB	32930	899	4450	2.9	902.2	902.2	902.7	0.5
BC	33446	901	5143	0.0	902.8	902.8	903.5	0.7
BD	33828	735	5490	2.4	903.0	903.0	903.7	0.7
BE	34292	906	7045	1.9	903.2	903.2	904.1	0.9
BF	34630	991	5582	2.3	903.2	903.2	904.1	0.9
BG	35182	590	3460	3.8	903.6	903.6	904.4	0.8
BH	35677	148	2071	6.3	903.8	903.8	904.6	0.8
BI	36424	663	2960	4.4	905.8	905.8	905.8	0.0
BJ	36818	689	3745	3.5	906.4	906.4	906.7	0.3
BK	37018	484	4153	3.1	906.8	906.8	907.5	0.7
BL	37660	356	3891	3.4	907.3	907.3	908.1	0.8
BM	38371	401	3155	4.1	908.4	908.4	908.5	0.1
BN	38944	623	3531	3.7	908.9	908.9	909.2	0.3
BO	39967	975	5728	2.3	909.4	909.4	909.9	0.5
BP	40716	840	5333	2.5	910.0	910.0	910.7	0.7
BQ	40942	868	5199	2.5	910.6	910.6	911.4	0.8
BR	41185	930	6486	2.0	911.1	911.1	911.9	0.8
BS	41451	887	5769	2.3	911.2	911.2	912.0	0.8
BT	41918	993	8849	1.5	911.5	911.5	912.3	0.8

[1]Feet above confluence with Kansas River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
BU	42191	1179	7591	1.7	911.7	911.7	912.6	0.9
BV	42416	1047	6174	2.1	911.9	911.9	912.7	0.8
BW	42791	1083	6445	2.0	912.3	912.3	913.1	0.8
BX	43163	1163	5744	2.3	912.5	912.5	913.3	0.8
BY	43725	1097	5042	2.6	913.0	913.0	913.9	0.9
BZ	44141	773	4473	2.6	914.1	914.1	914.6	0.5
CA	44833	1124	5751	2.0	914.8	914.8	915.3	0.5
CB	45651	1127	5948	1.9	915.6	915.6	916.1	0.5
CC	46047	1223	8013	1.4	915.8	915.8	916.4	0.6
CD	46463	1283	6223	1.9	916.0	916.0	916.6	0.6
CE	47301	1257	6795	1.7	916.4	916.4	917.1	0.7
CF	47806	1117	5736	2.0	916.5	916.5	917.2	0.7
CG	47926	1103	6138	1.9	916.7	916.7	917.4	0.7
CH	49806	826	3513	2.2	917.5	917.5	918.3	0.8
CI	50299	548	2090	3.7	917.8	917.8	918.6	0.8
CJ	51008	222	2000	3.9	918.2	918.2	919.1	0.9
CK	51210	145	1767	4.4	918.5	918.5	919.4	0.9
CL	51761	137	1701	4.6	918.8	918.8	919.7	0.9
CM	52081	144	1134	6.8	918.8	918.8	919.7	0.9
CN	53249	153	1269	6.1	921.1	921.1	921.8	0.7
CO	53630	214	1648	4.7	921.9	921.9	922.5	0.6
CP	54961	306	1486	5.2	923.4	923.4	923.7	0.3
CQ	55161	253	1821	4.3	924.2	924.2	924.7	0.5
CR	55551	193	1333	5.8	925.6	925.6	926.0	0.4

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
CS	55849	164	1470	5.3	926.4	926.4	927.0	0.6
CT	56360	114	1067	7.3	926.9	926.9	927.5	0.6
CU	56670	189	1836	4.2	928.0	928.0	928.5	0.5
CV	57041	206	1854	3.8	928.4	928.4	928.9	0.5
CW	57352	290	1987	3.5	928.9	928.9	929.2	0.3
CX	57844	235	2181	3.2	929.4	929.4	930.0	0.6
CY	58081	279	2100	3.3	929.6	929.6	930.1	0.5
CZ	58224	711	3098	2.3	930.0	930.0	930.7	0.7
DA	59409	592	1992	3.5	932.7	932.7	932.8	0.1
DB	59686	537	1854	3.8	933.4	933.4	933.5	0.1
DC	60066	427	2015	3.5	934.4	934.4	934.5	0.1
DD	60717	464	2384	2.9	935.1	935.1	935.2	0.1
DE	61421	481	2316	3.0	936.3	936.3	936.3	0.0
DF	61912	394	2036	3.5	937.2	937.2	937.2	0.0
DG	62163	142	1188	5.9	937.8	937.8	937.8	0.0
DH	62414	162	1435	4.9	939.4	939.4	939.4	0.0
DI	62910	179	1283	5.5	939.7	939.7	939.7	0.0
DJ	63250	219	1376	5.1	941.1	941.1	941.1	0.0
DK	63555	185	1496	4.4	941.4	941.4	941.4	0.0
DL	63916	121	1154	5.7	946.1	946.1	946.1	0.0
DM	64095	276	1664	3.9	946.4	946.4	946.4	0.0
DN	64264	282	2526	2.6	946.9	946.9	946.9	0.0
DO	64347	302	2867	2.3	947.0	947.0	947.0	0.0
DP	64642	373	3197	2.1	947.3	947.3	947.3	0.0

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
DQ	64866	188	2407	2.7	947.5	947.5	947.8	0.3
DR	65386	333	2806	2.3	947.7	947.7	948.1	0.4
DS	66420	510	2457	2.7	948.2	948.2	948.6	0.4
DT	66972	139	898	7.3	948.8	948.8	949.7	0.9
DU	67263	117	1136	5.8	949.6	949.6	950.2	0.6
DV	67730	91	1036	6.3	950.7	950.7	951.1	0.4
DW	68142	129	1308	5.0	951.5	951.5	952.0	0.5
DX	69033	98	1126	5.8	953.1	953.1	953.6	0.5
DY	70086	305	2595	2.5	954.4	954.4	955.0	0.6
DZ	70267	169	1677	3.9	954.5	954.5	955.1	0.6
EA	70799	182	2059	3.2	955.0	955.0	955.7	0.7
EB	71270	116	1431	4.6	955.3	955.3	956.0	0.7
EC	71912	354	3259	2.0	955.9	955.9	956.6	0.7
ED	72164	272	1527	4.3	955.9	955.9	956.5	0.6
EE	72359	125	1129	5.8	956.1	956.1	957.0	0.9
EF	72472	126	1206	5.4	958.1	958.1	958.1	0.0
EG	74256	2115	23147	0.2	975.6	975.6	975.6	0.0
EH	74891	2151	16954	0.3	975.6	975.6	975.6	0.0
EI	75211	1968	12628	0.4	975.6	975.6	975.6	0.0
EJ	77102	1571	12027	0.1	975.7	975.7	975.7	0.0
EK	77946	879	8562	0.2	975.7	975.7	975.7	0.0
EL	79057	755	3246	0.4	975.7	975.7	975.7	0.0
EM	79842	2483	61331	0.0	1006.0	1006.0	1006.0	0.0
EN	81297	2483	57255	0.1	1006.0	1006.0	1006.0	0.0

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Shunganunga Creek (cont.)								
EO	81930	1747	36691	0.2	1006.0	1006.0	1006.0	0.0
EP	82876	1803	30882	0.2	1006.0	1006.0	1006.0	0.0
EQ	83671	1302	19405	0.4	1006.0	1006.0	1006.0	0.0
ER	84430	1015	13466	0.5	1006.0	1006.0	1006.0	0.0
ES	84988	994	10689	0.7	1006.0	1006.0	1006.0	0.0
ET	86628	255	1266	5.6	1007.0	1007.0	1007.0	0.0
EU	86952	252	1099	6.4	1008.7	1008.7	1008.7	0.0
EV	87493	223	1232	3.9	1012.6	1012.6	1012.6	0.0

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Sixmile Creek								
H	34820	66	666	7.7	1012.3	1012.3	1012.4	0.1
I	35910	347	2603	2.0	1014.2	1014.2	1014.4	0.2
J	39710	180	935	5.5	1018.1	1018.1	1018.5	0.4
K	40130	150	1257	4.1	1025.0	1025.0	1025.0	0.0
L	42470	303	1681	3.0	1026.2	1026.2	1026.3	0.1
M	44440	194	1431	3.6	1030.4	1030.4	1031.1	0.7
N	45190	455	2834	1.8	1034.5	1034.5	1034.8	0.3
O	47230	215	820	6.2	1036.3	1036.3	1036.8	0.5
P	48650	304	1912	2.7	1050.1	1050.1	1050.2	0.1
Q	52440	317	1769	2.9	1051.2	1051.2	1051.4	0.2
R	55980	208	1021	5.0	1061.5	1061.5	1062.1	0.6
S	59710	224	1044	4.9	1074.0	1074.0	1074.7	0.7
T	61410	336	3526	1.4	1081.1	1081.1	1081.2	0.1

[1]Feet above confluence with Wakarusa River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SIXMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Soldier Creek								
A	2125	180	3340	10.9	880.0	866.9[2]	866.9	0.0
B	4682	248	3653	10.0	880.0	873.2[2]	873.2	0.0
C	6684	239	3537	10.3	880.0	875.9[2]	875.9	0.0
D	7776	222	4046	9.0	880.0	877.9[2]	878.4	0.5
E	11308	209	4050	9.0	881.4	881.4	881.7	0.3
F	13460	212	4410	8.2	883.6	883.6	883.8	0.2
G	14604	224	4820	7.5	884.8	884.8	885.0	0.2
H	16023	290	4770	7.6	885.6	885.6	885.8	0.2
I	18370	632	7423	4.9	887.4	887.4	887.5	0.1
J	20527	405	5639	6.5	888.2	888.2	888.4	0.2
K	25627	417	5507	6.3	891.1	891.1	891.2	0.1
L	27006	287	5506	6.3	892.2	892.2	892.4	0.2
M	30573	350	5043	6.9	894.0	894.0	894.1	0.1
N	31189	353	5344	6.5	894.6	894.6	894.7	0.1
O	33860	322	5156	6.8	896.2	896.2	896.3	0.1
P	35848	361	4694	7.4	897.2	897.2	897.2	0.0
Q	38692	351	5158	6.8	898.8	898.8	898.9	0.1
R	40510	410	4889	7.2	899.9	899.9	900.0	0.1
S	42125	378	5173	6.8	900.8	900.8	900.8	0.0

[1]Feet above confluence with Kansas River

[2]Elevation computed without consideration of backwater effects from Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SOLDIER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Branch Shunganunga Creek								
A	1380	75	1014	5.7	917.7	917.7	917.8	0.1
B	2279	74	891	6.5	919.1	919.1	919.7	0.6
C	3341	365	2213	2.6	922.9	922.9	923.6	0.7
D	3725	184	1268	4.6	922.9	922.9	923.8	0.9
E	4387	76	849	6.8	924.1	924.1	924.8	0.7
F	5966	73	761	7.5	928.0	928.0	928.4	0.4
G	6237	78	773	7.4	929.2	929.2	929.3	0.1
H	6646	309	1190	4.8	929.9	929.9	930.1	0.2
I	6869	280	1504	3.8	930.9	930.9	931.2	0.3
J	6930	110	960	6.0	930.9	930.9	931.2	0.3
K	7166	381	2254	2.5	932.1	932.1	933.0	0.9
L	7599	376	2957	1.9	933.0	933.0	933.8	0.8
M	7843	2026	31184	2.3	951.9	951.9	951.9	0.0
N	12214	1383	14865	0.5	952.2	952.2	952.2	0.0
O	13140	1376	13578	0.5	952.2	952.2	952.2	0.0
P	14717	1237	16012	0.4	952.3	952.3	952.3	0.0
Q	17593	1288	9545	0.7	952.3	952.3	952.3	0.0
R	19700	1106	6007	1.0	952.7	952.7	952.7	0.0
S	20000	945	5301	1.0	952.9	952.9	952.9	0.0

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH BRANCH SHUNGANUNGA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Southeast Branch Elevation Creek								
A	428	53	409	4.8	987.5	987.5	987.5	0.0
B	840	97	552	3.6	989.0	989.0	989.4	0.4
C	1553	52	443	4.5	994.9	994.9	995.4	0.5
D	1671	76	788	2.5	997.2	997.2	998.0	0.8
E	2050	104	640	3.1	997.9	997.9	998.9	1.0
F	2569	89	561	3.5	1000.6	1000.6	1001.5	0.9
G	2767	29	295	6.7	1003.7	1003.7	1004.1	0.4
H	3098	96	347	5.7	1005.9	1005.9	1006.0	0.1
I	3419	71	360	4.4	1008.5	1008.5	1008.5	0.0
J	3842	149	1846	0.9	1019.9	1019.9	1020.8	0.9
K	3998	244	3156	0.5	1020.0	1020.0	1020.9	0.9
L	4262	230	2561	0.6	1020.0	1020.0	1020.9	0.9
M	4580	112	677	2.4	1020.1	1020.1	1021.0	0.9

[1]Feet above confluence with Elevation Tributary

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTHEAST BRANCH ELEVATION CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Southwest Branch Elevation Creek								
F	3673	82	632	3.1	986.3	986.3	987.2	0.9
G	4095	37	269	7.2	987.0	987.0	987.9	0.9
H	4725	60	338	5.8	991.5	991.5	991.9	0.4
I	4988	37	277	7.0	992.8	992.8	993.0	0.2
J	5431	35	217	9.0	995.7	995.7	996.0	0.3
K	5841	146	465	4.2	999.9	999.9	1000.3	0.4
L	6202	95	414	4.7	1003.2	1003.2	1003.4	0.2
M	6497	97	539	3.6	1004.6	1004.6	1005.3	0.7
N	6692	126	422	4.6	1005.3	1005.3	1006.0	0.7
O	7061	104	445	4.4	1008.6	1008.6	1009.4	0.8
P	7468	194	1057	1.8	1014.6	1014.6	1014.8	0.2
Q	7913	125	479	4.1	1015.5	1015.5	1015.6	0.1
R	8380	61	335	5.8	1018.8	1018.8	1019.0	0.2
S	8816	98	492	4.0	1023.5	1023.5	1023.6	0.1
T	9208	44	279	7.0	1025.6	1025.6	1025.8	0.2
U	9508	25	169	6.5	1027.5	1027.5	1028.0	0.5
V	9962	62	371	3.0	1030.2	1030.2	1030.4	0.2
W	10269	34	162	6.8	1031.3	1031.3	1031.4	0.1

[1]Feet above confluence with Shunganunga Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTHWEST BRANCH ELEVATION CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stinson Creek								
A	0	147[3]	1056	4.0	874.1	862.7[2]	863.5	0.8
B	2465	84	805	5.3	874.1	867.8[2]	868.6	0.8
C	5087	201	1179	3.6	874.8	874.8	875.8	1.0
D	10330	70	650	6.5	898.5	898.5	899.3	0.8
E	13008	168	1129	3.5	908.8	908.8	909.7	0.9
F	16397	306	1404	2.8	937.2	937.2	938.1	0.9
G	21392	143	556	7.2	960.3	960.3	960.8	0.5

[1]Feet above confluence with Shunganunga Creek

[2]Elevation computed without consideration of backwater effects from Kansas River

[3]Width does not match mapped floodway width due to Shunganunga Creek floodway

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

STINSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tecumseh Creek								
A	109	170	1080	5.6	872.6	869.6[2]	869.6	0.0
B	1499	326	2898	2.1	872.6	872.2[2]	872.2	0.0
C	5107	338	1696	3.6	873.4	873.4	873.6	0.2
D	6744	889	6092	1.0	879.8	879.8	879.8	0.0
E	10100	169	1094	5.6	887.8	887.8	888.4	0.6
F	16000	332	1356	4.5	899.4	899.4	900.0	0.6
G	21248	142	1054	5.8	913.5	913.5	914.0	0.5
H	24457	273	1392	4.6	928.2	928.2	928.8	0.6
I	27592	160	593	10.8	941.6	941.6	941.6	0.0
J	30286	306	1704	3.6	966.7	966.7	966.7	0.0
K	33276	275	1060	5.8	978.7	978.7	979.3	0.6
L	36869	196	1109	5.6	988.9	988.9	989.5	0.6

[1]Feet above confluence with Kansas River

[2]Elevation computed without consideration of backwater effects from Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

TECUMSEH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wakarusa River								
A	2000	1282	10172	2.0	1017.2	1017.2	1017.5	0.3
B	6160	1400	12455	1.0	1018.4	1018.4	1019.2	0.8
C	8000	562	5095	2.5	1018.6	1018.6	1019.6	1.0
D	9414	300	2545	5.0	1020.7	1020.7	1021.7	1.0

[1]Feet above I-335

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WAKARUSA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wanamaker Main Branch								
A	2349	842	7056	2.2	896.1	896.1	896.8	0.7
B	2887	487	4596	3.4	896.4	896.4	897.1	0.7
C	3441	372	2180	7.1	896.7	896.7	897.3	0.6
D	3914	570	4476	3.4	899.1	899.1	899.8	0.7
E	4266	608	4855	3.2	899.4	899.4	900.2	0.8
F	4523	671	5450	2.8	899.6	899.6	900.5	0.9
G	4849	666	4502	3.4	899.7	899.7	900.7	1.0
H	5222	434	2846	5.4	899.8	899.8	900.6	0.8
I	5400	412	2830	5.4	900.6	900.6	901.4	0.8
J	5767	370	2845	5.4	901.3	901.3	902.2	0.9
K	6813	500	3727	3.9	904.7	904.7	905.3	0.6
L	7989	531	4955	3.0	907.4	907.4	907.7	0.3
M	8813	664	5401	2.7	908.2	908.2	908.7	0.5
N	9004	637	4668	3.1	908.4	908.4	908.9	0.5
O	9237	594	4361	3.4	908.5	908.5	909.1	0.6
P	9802	756	5092	2.9	909.7	909.7	910.3	0.6
Q	10628	598	3510	4.2	911.7	911.7	912.2	0.5
R	10834	466	6114	2.4	916.3	916.3	916.5	0.2
S	11274	189	1867	4.9	916.8	916.8	917.1	0.3
T	12042	351	2828	3.2	917.8	917.8	918.1	0.3
U	12340	229	2145	3.7	917.9	917.9	918.3	0.4
V	12778	316	1762	4.5	918.4	918.4	918.7	0.3
W	12934	405	2682	2.6	918.8	918.8	919.3	0.5
X	13028	429	2771	2.5	918.8	918.8	919.4	0.6

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WANAMAKER MAIN BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wanamaker Main Branch (cont.)								
Y	13223	369	2606	2.7	918.8	918.8	919.4	0.6
Z	13466	267	2026	3.5	918.9	918.9	919.6	0.7
AA	14333	219	1284	5.5	920.2	920.2	920.9	0.7
AB	14574	174	968	7.2	920.7	920.7	921.2	0.5
AC	14827	176	988	7.1	922.6	922.6	922.7	0.1
AD	14964	163	1133	6.2	923.4	923.4	923.7	0.3
AE	15056	151	1206	2.0	924.1	924.1	924.7	0.6
AF	15600	237	652	3.7	926.9	926.9	927.2	0.3
AG	15940	117	435	5.5	928.1	928.1	928.6	0.5
AH	16338	205	609	3.9	930.0	930.0	930.7	0.7
AI	16582	187	345	6.9	932.2	932.2	932.3	0.1
AJ	16703	173	429	5.6	933.9	933.9	934.2	0.3
AK	16842	161	875	4.8	934.0	934.0	934.5	0.5
AL	17197	330	1060	4.0	934.9	934.9	935.4	0.5
AM	17733	318	2919	1.4	945.1	945.1	945.1	0.0
AN	17824	267	2514	0.9	945.1	945.1	945.2	0.1
AO	18025	310	2276	1.0	945.1	945.1	945.2	0.1
AP	18200	278	1944	1.1	945.1	945.1	945.2	0.1
AQ	18394	95	957	2.3	945.1	945.1	945.1	0.0
AR	18474	83	871	2.6	945.2	945.2	945.2	0.0
AS	18569	79	856	2.6	945.2	945.2	945.3	0.1
AT	18976	119	242	8.1	953.1	953.1	953.6	0.5
AU	19121	92	482	4.1	954.4	954.4	955.2	0.8

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WANAMAKER MAIN BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wanamaker Main Branch (cont.)								
AV	19359	121	499	4.0	955.0	955.0	955.8	0.8
AW	19553	177	709	2.8	955.6	955.6	956.3	0.7
AX	19629	184	909	2.2	955.7	955.7	956.4	0.7
AY	19733	581	7498	0.3	955.8	955.8	956.6	0.8
AZ	19818	571	8586	0.2	955.8	955.8	956.6	0.8

[1]Feet above confluence with Kansas River

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WANAMAKER MAIN BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wanamaker Northeast Branch								
A	273	71	229	10.8	920.0	919.5[2]	919.6	0.1
B	411	55	416	5.9	922.9	922.9	923.8	0.9
C	599	76	493	5.0	923.6	923.6	924.4	0.8
D	787	83	497	5.0	924.5	924.5	925.0	0.5
E	968	119	881	2.8	927.1	927.1	927.9	0.8
F	1053	55	356	6.9	927.1	927.1	928.1	1.0
G	1195	66	395	6.3	927.9	927.9	928.5	0.6
H	1362	75	443	5.6	929.1	929.1	929.4	0.3
I	1465	90	520	4.8	929.4	929.4	929.7	0.3
J	1540	104	746	3.3	931.8	931.8	932.7	0.9
K	1668	53	452	5.5	931.9	931.9	932.8	0.9
L	1871	55	356	5.1	932.5	932.5	933.3	0.8
M	2140	55	265	6.9	933.3	933.3	933.9	0.6
N	2445	50	221	8.2	935.7	935.7	935.8	0.1
O	2650	82	251	7.3	937.5	937.5	937.5	0.0
P	2837	58	245	7.4	939.2	939.2	939.2	0.0
Q	2960	33	148	12.3	940.0	940.0	940.0	0.0
R	3113	43	191	9.6	942.9	942.9	942.9	0.0
S	3251	51	245	7.4	944.5	944.5	944.5	0.0
T	3389	53	241	7.6	945.2	945.2	945.2	0.0
U	3617	81	299	6.1	946.6	946.6	946.6	0.0
V	3779	52	192	9.5	947.1	947.1	947.1	0.0

[1]Feet above confluence with Wanamaker Main Branch

[2]Elevation computed without consideration of backwater effects from Wanamaker Main Branch

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WANAMAKER NORTHEAST BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Fork Butcher Creek								
A	387	43	208	10.9	944.7	944.7	944.8	0.1
B	564	46	290	7.8	947.0	947.0	948.0	1.0
C	846	35	283	8.0	949.3	949.3	950.2	0.9
D	1030	85	422	5.4	953.8	953.8	954.4	0.6
E	1170	85	540	4.2	954.6	954.6	954.9	0.3
F	1470	104	796	2.8	955.3	955.3	955.6	0.3
G	1730	69	348	6.5	955.3	955.3	955.6	0.3
H	1976	89	401	5.7	956.5	956.5	956.6	0.1
I	2233	85	347	5.8	957.9	957.9	958.0	0.1
J	2418	69	239	8.4	959.0	959.0	959.1	0.1
K	2631	172	650	3.1	961.6	961.6	961.6	0.0
L	2789	235	681	3.0	962.5	962.5	962.6	0.1
M	2988	71	218	9.2	964.5	964.5	964.5	0.0
N	3242	87	341	5.9	967.0	967.0	967.6	0.6
O	3485	98	363	5.5	969.1	969.1	969.1	0.0
P	3720	87	417	4.8	970.1	970.1	970.4	0.3
Q	3985	92	434	4.6	971.4	971.4	971.6	0.2
R	4248	96	374	5.4	972.2	972.2	972.3	0.1
S	4508	116	296	6.8	974.4	974.4	974.9	0.5
T	4663	125	639	3.1	975.8	975.8	976.6	0.8
U	4754	75	421	4.8	976.0	976.0	976.6	0.6
V	4896	76	466	4.3	976.5	976.5	977.1	0.6
W	5199	49	239	8.4	977.1	977.1	977.7	0.6
X	5347	93	464	4.3	978.6	978.6	979.5	0.9

[1]Feet above confluence with Butcher Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WEST FORK BUTCHER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
West Fork Butcher Creek (cont.)								
Y	5509	105	735	2.7	979.1	979.1	980.0	0.9
Z	5669	59	386	5.2	979.2	979.2	980.0	0.8
AA	5819	97	747	2.7	979.7	979.7	980.6	0.9
AB	6252	56	424	4.7	980.9	980.9	981.6	0.7
AC	6374	91	531	3.8	981.3	981.3	982.2	0.9
AD	6469	33	189	10.6	985.2	985.2	985.3	0.1
AE	6762	37	324	6.2	989.4	989.4	989.4	0.0
AF	7131	38	254	3.0	990.5	990.5	990.6	0.1
AG	7288	50	247	3.1	990.7	990.7	990.8	0.1
AH	7449	76	280	2.7	996.4	996.4	996.4	0.0
AI	7629	107	554	1.4	996.6	996.6	996.6	0.0
AJ	7792	51	241	3.1	996.6	996.6	996.6	0.0
AK	7927	52	216	3.5	996.7	996.7	996.7	0.0
AL	8117	79	175	4.3	997.3	997.3	997.3	0.0
AM	8298	102	179	4.2	998.5	998.5	998.5	0.0
AN	8543	88	161	4.7	1000.2	1000.2	1000.2	0.0

[1]Feet above confluence with Butcher Creek

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KS
AND INCORPORATED AREAS

FLOODWAY DATA

WEST FORK BUTCHER CREEK

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Auburn, City of	October 25, 1974	November 7, 1975	January 16, 1981	None
Rossville, City of	January 9, 1974	June 4, 1976	December 18, 1979	None
Shawnee, County Unincorporated Areas	February 21, 1978	December 19, 1978	June 1, 1982	May 17, 1993
Silver Lake, City of	May 31, 1974	October 24, 1975	October 15, 1980	None
Topeka, City of	August 12, 1970	None	August 12, 1970	October 10, 1975 December 1, 1981
Willard, City of	August 16, 1974	June 18, 1976	October 15, 1980	None

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SHAWNEE COUNTY, KANSAS AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

The countywide FIRM presents flooding information for the entire geographic area of Shawnee 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 all the 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 9, "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 the NFIP.

8.0 LOCATION OF DATA

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

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