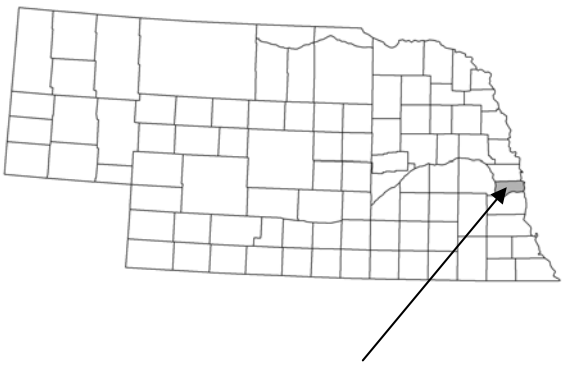
# FLOOD INSURANCE STUDY

**VOLUME 1 OF 2**

# SARPY COUNTY, NEBRASKA

## AND INCORPORATED AREAS

| *Community Name* | *Community Number* |
|---|---|
| BELLEVUE, CITY OF | 310191 |
| GRETNA, CITY OF | 310375 |
| LA VISTA, CITY OF | 310192 |
| PAPILLION, CITY OF | 315275 |
| SARPY COUNTY (UNINCORPORATED AREAS) | 310190 |
| SPRINGFIELD, CITY OF | 310194 |




Effective: May 3, 2010

Federal Emergency Management Agency

**FLOOD INSURANCE STUDY NUMBER**
**31153CV001B**

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

This FIS report was revised on October, 2007. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this report should be aware that the information presented in Section 10.0 is an addendum to information in Sections 1.0 through 9.0 of this FIS report.

Effective Date: January 19, 1995
Revised Dates: December 2, 2005
May 3, 2010

# TABLE OF CONTENTS

VOLUME 1

## TABLE OF CONTENTS *(Continued)*



**VOLUME 1**

**FIGURES**



**TABLES**



**VOLUME 2**

**EXHIBITS**

**FLOOD INSURANCE STUDY**
**SARPY COUNTY, NEBRASKA 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 Sarpy County, Nebraska, including the Cities of Bellevue, Gretna, La Vista, Papillion, and Springfield, and the unincorporated areas of Sarpy County (hereinafter referred to collectively as Sarpy County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

## 1.2. Authority and Acknowledgments

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

The West Papillion Creek watershed and its tributaries were restudied as part of this FIS revision. The restudy was performed by the Papio-Missouri River Natural Resources District (NRD) for FEMA through CTP agreement EMK-2003-CA-3045. The hydrologic and hydraulic analyses for this study were completed in October 2007 and utilized new LiDAR topographic data, collected in 2004 (Reference 1). The following streams were included in the study:

- West Papillion Creek
- Hell Creek
- Midland Creek
- South Papillion Creek
- Unnamed South Papillion Creek Tributary
- Unnamed West Papillion Creek Tributary
- Walnut Creek

Table 1 contains a chronological summary of the most recent analyses of flooding sources studied by detailed methods within Sarpy County, the study contractor, and the communities affected.

Table 1- Summary of Flooding Sources Presented in Current Study

| Flooding Source | Completion Date | Study Contractor | Communities Affected |
|---|---|---|---|
| West Papillion Creek* | October 2007 | Papio-Missouri River NRD | Bellevue, City of<br>Papillion, City of<br>La Vista, City of |
| Hell Creek* | October 2007 | Papio-Missouri River NRD | La Vista, City of |
| Midland Creek* | October 2007<br>December 2005 | Papio-Missouri River NRD<br>USACE – Omaha District | Papillion, City of |
| South Papillion Creek* | October 2007 | Papio-Missouri River NRD | La Vista, City of |
| Unnamed South Papillion Creek Tributary* | October 2007 | Papio-Missouri River NRD | La Vista, City of<br>Papillion, City of |
| Unnamed West Papillion Creek Tributary* | October 2007 | Papio-Missouri River NRD | Papillion, City of |
| Walnut Creek* | October 2007 | Papio-Missouri River NRD | Papillion, City of |
| Platte River | December 2005 | USACE – Omaha District | Sarpy County |
| Elkhorn River | December 2005 | USACE – Omaha District | Sarpy County |
| Papillion Creek/Big Papillion Creek | January 1995 | USACE – Omaha District | Papillion, City of<br>Bellevue, City of<br>La Vista, City of |
| Betz Road Ditch | January 1995 | USACE – Omaha District | Bellevue, City of |
| South Midland Creek | February 1979 | USACE – Omaha District | Papillion, City of |
| West Midland Creek | February 1979 | USACE – Omaha District | Papillion, City of |
| Buffalo Creek | March 1978 | USACE – Omaha District | Sarpy County |
| Squaw Creek | December 1977 | USACE – Omaha District | Bellevue, City of |
| Mud Creek | December 1977 | USACE – Omaha District | Bellevue, City of |
| Missouri River | December 1977 | USACE – Omaha District | Bellevue, City of<br>Sarpy County |
| Springfield Creek | December 1976 | USGS | Springfield, City of |

*flooding source restudied as part of the current revision

The hydrologic and hydraulic analyses for all FIS reports are performed by a Study Contractor for the Federal Emergency Management Agency (FEMA). The hydrologic and hydraulic analyses for the first countywide FIS (Reference 7) were performed by the USACE, Omaha District, under Interagency Agreement No. IAA-EMW-90-3263. That study was completed in October 1992. The initial countywide FIS also incorporated the study data within the communities listed in Table 2, which had previously been published as separate community based studies, to create a comprehensive countywide product.

Table 2 - Summary of Community Studies Used to Compile the Initial Countywide FIS

| Community Name | Study Contractor | Contract or Inter-Agency Agreement No. | Completion Date |
|---|---|---|---|
| Bellevue, City of (Reference 2) | U.S. Army Corps of Engineers (USACE) | IAA-H-7-76 Project Order No. 13 | December 1977 |
| La Vista, City of (Reference 3) | USACE | IAA-H-10-77 Project Order No. 5 | November 1977 |
| Papillion, City of (Reference 4) | USACE | IAA-H-18-78 Project Order No. 12 | February 1979 |
| Sarpy County (Unincorporated Areas) (Reference 5) | USACE | IAA-4-7-76 Project Order No. 13 & IAA-H-10-77 Project Order No. 1 | March 1978 |
| Springfield, City of (Reference 6) | U.S. Geological Survey (USGS) | IAA-H-17-75 Project Order No. 12 | December 1976 |

## 1.3 Coordination

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

Table 3 - History of CCO Meetings Held for Sarpy County FISs

| Community Name / FIS | Initial CCO Date | Final CCO Date |
|---|---|---|
| Bellevue, City of | July 20, 1977 | September 13, 1978 |
| La Vista, City of | November 28, 1977 | February 28, 1979 |
| Papillion, City of | October 20, 1978 | November 6, 1979 |
| Sarpy County (Unincorporated Areas) | None | November 6, 1979 |
| Springfield, City of | September 21, 1976 | February 15, 1977 |
| Sarpy County & Unincorporated Areas (Initial Countywide Study) | August 31, 1989 | October 25, 2004 |
| Sarpy County & Unincorporated Areas* | July 31, 2003 | December 6, 2007 |

*current revision

The initial CCO meetings were held with representatives from FEMA, the communities, and the study contractors to explain the nature and purposes of FIS reports, and to identify the streams to be studied by detailed methods. The final CCO meetings were held with representatives from FEMA, the communities, and the study contractors to review the results of the studies.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

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

Table 4 shows which streams were studied by detailed methods, and their respective study reaches. Of note is that Midland Creek was restudied by the Papio-Missouri River NRD from its confluence to approximately 400 feet upstream of Highway 370 in 2007. The mapped portion of Midland Creek from that point to its upstream limits was studied by the USACE-Omaha district in 1979.

Table 4 - Study Reaches for Detailed Studied Streams

| Stream Name | Limits of Detailed Study |
|---|---|
| Betz Road Ditch | From its confluence with Papillion Creek to a point approximately 250 feet upstream of Lincoln Road |
| Buffalo Creek | From its confluence with the Platte River to a point approximately 2,800 feet upstream of Platteview Road |
| Elkhorn River | From its confluence with the Platte River to the northern county boundary |
| Hell Creek* | From its confluence with West Papillion Creek to Harrison Street |
| Midland Creek*† | From its confluence with West Papillion Creek to approximately 4,853 feet upstream of the confluence with West Midland Creek. |
| Missouri River | From the southern county boundary to approximately 300 feet upstream of the northern county boundary |
| Mud Creek | From its confluence with Papillion Creek to approximately 100 feet upstream of the northern county boundary/Harrison Street |
| Papillion Creek/Big Papillion Creek | From its confluence with the Missouri River to approximately 1,000 feet upstream of the northern county boundary/Harrison Street |
| Platte River | From its confluence with the Missouri River to the northern county boundary |
| Platte River (landside of levee) | From U.S. Highway 6 to approximately 38,780 upstream of U.S. Highway 6 |
| South Midland Creek | For a reach of approximately 1,600 feet starting at its confluence with Midland Creek |

| Stream Name | Limits of Detailed Study |
|---|---|
| South Papillion Creek* | From the confluence with West Papillion Creek to approximately 1,320 feet upstream of U.S. Highway 6 (204th Street). |
| Springfield Creek | From its confluence with the Platte River to approximately 2,200 feet upstream of Fairview Road |
| Unnamed Tributary of South Papillion Creek* | From the confluence with South Papillion Creek to approximately 2,900 feet upstream of NE Highway 370. |
| Unnamed Tributary of West Papillion Creek* | From the confluence with West Papillion Creek to approximately 1 mile upstream of NE Highway 370. |
| Walnut Creek* | From the confluence with West Papillion Creek to approximately 410 feet upstream of NE Highway 370. |
| West Midland Creek | For a reach of approximately 2,895 feet starting from the confluence with Midland Creek |
| West Papillion Creek* | From its confluence with Papillion Creek to the Sarpy and Douglas County boundary. |

*New detailed study performed for the current restudy

† Restudy includes the reach from Midland Creek's confluence with West Papillion Creek to 400 feet upstream of Highway 370

The basis for the December 2005 countywide revision was to provide a detailed study with updated hydrologic and hydraulic data along the Platte River in Sarpy County. The data was developed for the detailed restudy of the Platte River from the Missouri River to near Columbus, Nebraska. The study reach includes all of the Platte River within Sarpy County, a stream distance of approximately 37 miles. The study also includes the portion of the Elkhorn River within Sarpy County where the Elkhorn River has a common floodplain with the Platte River.

Approximate analyses were used to study those areas having low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and the incorporated communities.

## 2.2 Community Description

Sarpy County, located in east-central Nebraska just south of Omaha, had a 2000 population of 122,595 (Reference 9), including both incorporated and unincorporated areas. It is a rapidly developing county since it is part of the Omaha metropolitan area. Sarpy County is primarily an agricultural area experiencing rapid urbanization pressures. Many forms of development are present in the county, such as industrial, commercial, residential, and recreational. Sarpy County is served by U.S. Interstate 80; U.S. Highways 73, 75, and 6; State Highways 31, 50, and 370; the Union Pacific Railroad; the Burlington Northern & Santa Fe Railway; and Eppley Airfield. Numerous county roads, highways, and rail lines cross the floodplains in the unincorporated areas of Sarpy County. Continuing economic development within the study area is expected and

pressures leading to intensified floodplain use will undoubtedly accompany such development.

Sarpy County contains Betz Road Ditch, Big Papillion Creek, Buffalo Creek, the Elkhorn River, Hell Creek, Midland Creek, the Missouri River, Mud Creek, Papillion Creek, the Platte River, South Midland Creek, South Branch Papillion Creek, Springfield Creek, Squaw Creek, Walnut Creek, West Midland Creek, West Papillion Creek, and West Walnut Creek. Topography in the area ranges from steep hills to rolling plains to flat valleys.

Cold winters and hot summers characterize the climate in the Sarpy County area. The average annual precipitation is approximately 30 inches with average January and July temperatures of approximately 23 degrees Fahrenheit (°F) and 77°F, respectively (Reference 10). Vegetation in the Sarpy County area ranges from trees to agricultural crops to miscellaneous plants.

Soils located in the basins upstream from Sarpy County vary over an extremely wide range. In general, these soils range from soils associated with mountain terrain to glacial till to sands and gravels to silts and clays. Soils within Sarpy County generally include glacial drift; loess; and clay, silt, and sand alluvium (Reference 11).

The Missouri River begins in southwest Montana east of the Continental Divide near Three Forks, Montana, at the junction of the Jefferson, Madison, and Gallatin Rivers. From this beginning, the river flows generally east and south approximately 1,700 miles to Sarpy County. Elevations in the basin range from approximately 13,000 feet in the upper basin to approximately 960 feet at Sarpy County. The drainage area of the Missouri River at Sarpy County is approximately 322,800 square miles. The Missouri River floodplain within the limits of the Sarpy County unincorporated areas is utilized primarily for agricultural and recreational activities. Some commercial, industrial, and residential uses, however, are present in some areas of the floodplain.

The Platte River begins at the confluence of the North Platte River and South Platte River near North Platte, Nebraska. From this location, the river flows in a general easterly direction to the Sarpy County vicinity. The Platte River drains an area of approximately 81,100 square miles at the Sarpy-Douglas County line and approximately 90,000 square miles at the confluence with the Missouri River. This area is comprised of a portion of southeastern Wyoming, northeastern Colorado, and the central three-fourths of Nebraska running in a west to east direction. Elevations in the basin vary greatly, ranging from 13,000 feet in the mountainous area in the western portion of the basin to 5,000 and 6,000 feet on the plains just east of the Rocky Mountains to approximately 1,100 feet at the Sarpy-Douglas County line to approximately 960 feet at the confluence with the Missouri River.

The Platte River in the Sarpy County vicinity is a broad, relatively shallow stream. It has characteristics typical of a braided stream having several channels with intermittent islands. The flow is erratic, varying from a few cubic feet per second (cfs) to several thousand cfs depending upon the time of year and the climatic conditions. Flows of more than 100,000 cfs occur during a large flood. The main channel is continually changing location throughout the overall braid pattern.

The Elkhorn River drains an area of approximately 7,000 square miles in northeastern Nebraska beginning near Bassett, Nebraska. Elevations in the basin generally range from 2,500 feet in the upper basin to approximately 1,080 feet near the confluence with the Platte River. The Elkhorn River, in its natural state, can be classified as a meandering stream with one main, somewhat sinuous channel. The adjacent floodplain is scarred with abandoned channels that, depending upon age, vary from lakes to marshes to lower farmland. These abandoned channels, especially along the lower Elkhorn River, resulted from artificial straightening of the river. The stream banks are usually bordered by stands of timber and associated flora except where this type of vegetation has been removed and replaced by modern agriculture.

Buffalo Creek drains moderately sloping land in south-central Sarpy County. Land use in the basin is almost entirely agricultural, although some urbanization is beginning to take place. Buffalo Creek flows in a general southeasterly direction to the Platte River. Elevations in the basin range from approximately 1,290 feet in the upper basin to approximately 1,010 feet at its confluence with the Platte River.

Springfield Creek drains approximately 16.5 square miles in south-central Sarpy County. Topography in the basin is generally moderately sloping with elevations ranging from approximately 1,250 feet at the headwaters to approximately 1,010 feet on the Platte River floodplain. Land use in the basin is primarily agricultural with the exception of the City of Springfield and scattered residential development.

Papillion Creek drains approximately 402 square miles of moderately to steeply sloping land in eastern Nebraska. It begins at the confluence of Big Papillion Creek and West Papillion Creek approximately eight miles upstream from its confluence with the Missouri River. It follows a general southeastern direction to the Missouri River throughout Sarpy County. Elevations in the basin range between approximately 1,350 feet and 960 feet. Floodplain uses in the unincorporated areas of Sarpy County are primarily agricultural with small amounts of residential, commercial, and recreational uses.

Big Papillion Creek has its source in Washington County, Nebraska, southwest of Blair, Nebraska. It drains approximately 264 square miles of moderate to steep sloping land in eastern Nebraska. It flows in a general southwesterly direction to

its confluence with West Papillion Creek. Elevations in the basin range between approximately 1,350 feet and 980 feet.

West Branch Papillion Creek has its source near Elkhorn, Nebraska. It drains approximately 138 square miles in eastern Nebraska. Elevations in the basin range from approximately 1,300 feet to approximately 980 feet. The basin is predominantly moderately sloping land experiencing rapid urbanization. The floodplain uses in the Bellevue area are primarily agricultural.

Betz Road Ditch begins in the northern portion of Bellevue flowing in a general southwesterly direction to Papillion Creek just west of the Bellevue corporate limits. The drainage area of Betz Road Ditch is approximately 1.8 square miles. The basin is almost entirely urbanized and consists predominantly of residential development. Elevations in the basin range from approximately 1,220 feet to approximately 980 feet.

Mud Creek begins in the southeastern portion of Omaha, Nebraska, draining an area of approximately 10.7 square miles. Flowing in a southerly direction, it joins Papillion Creek west of the Bellevue corporate limits. Land use in the basin is primarily residential, commercial, and industrial. Basin elevations range from approximately 1,250 feet in the upper basin to approximately 980 feet in the Papillion Creek floodplain.

Squaw Creek, located approximately two miles west of the Bellevue corporate limits, drains an area of approximately 1.7 square miles. It begins in the extreme northwest corner of the Bellevue zoning jurisdiction area at an elevation of approximately 1,220 feet. The stream flows in a general southerly direction to approximately an elevation of 980 feet at its confluence with Papillion Creek. The basin is approximately 30 percent urbanized with primary uses being agricultural and residential.

Midland Creek has its source approximately three miles south of downtown Papillion. From its source it flows in a northeasterly direction draining an area of approximately 3.6 square miles at its confluence with West Papillion Creek. The basin is experiencing urbanization. Elevations in the basin range from approximately 1,190 feet to approximately 1,000 feet.

Walnut Creek drains an area of approximately 4.2 square miles generally located southwest from downtown Papillion. This stream flows in a general northeasterly direction to West Papillion Creek from its source near Richfield, Nebraska. Elevations in the basin range from approximately 1,200 feet to approximately 1,015 feet. Floodplain use is primarily agricultural. Urbanization is adjacent to the basin.

Hell Creek has its source in Douglas County in the vicinity of Boys Town, Nebraska. From its source, it flows in a southeasterly direction, draining an area

of approximately 5.7 square miles at its confluence with West Papillion Creek. The basin is highly urbanized with residential development continuing. Elevations in the basin range from 1,270 feet to approximately 1,030 feet.

The City of Bellevue is situated in the vicinity of Betz Road Ditch, Big Papillion Creek, the Missouri River, Mud Creek, Papillion Creek, Squaw Creek, and West Branch Papillion Creek. Topography in the area ranges from steep hills to rolling plains to flat valleys. The Kennedy Expressway runs parallel to Papillion Creek in the left overbank and in the floodplain. Numerous city streets, highways, and rail lines cross the floodplain in Bellevue. Continuing economic development within the study area is expected and pressures leading to intensified floodplain use will undoubtedly accompany such development. Like other communities in Sarpy County, the City of Bellevue exercises its territorial jurisdiction approximately two miles beyond its corporate limits.

The City of Papillion is situated in the vicinity of Big Papillion Creek, Midland Creek, South Midland Creek, Walnut Creek, West Midland Creek, and West Papillion Creek as well as other tributary streams. Topography in the area ranges from steep hills to rolling plains to flat valleys. Vegetation in the Papillion area ranges from trees to agricultural crops to miscellaneous plants. Papillion has substantial recreational facilities as well as commercial and agricultural activities.

Surface soils within the West Papillion Creek basin include glacial drift, loess, and clay, silt, and sand alluvium. The-glacial drift is a heterogeneous mixture of grayish boulder clay, sand, pebbles, and cobbles. Loess mantles the hills and upper valley sides to depths ranging up to 80 feet. Its upper 1.5 to 2 feet have been transformed into a highly productive soil by the natural additions of organic matter. The alluvium in the stream valleys is composed of a mixture of all of the above sediments. Near the surface, the alluviums have been enriched by organic matter to form good agricultural soil. At lower depths, silty sand and coarser sand lenses are encountered. The depths to bedrock through this area, as indicated by well-drilling records, vary from 70 feet to more than 100 feet below the present ground surface (References 11 and 12).

La Vista is situated in the vicinity of Big Papillion Creek, Hell Creek, South Papillion Creek, Thompson Creek, and West Papillion Creek, as well as other tributary streams. Topography in the area ranges from steep hills to rolling plains to flat valleys. Surface soils within the Papillion Creek basin include glacial drift, loess, and clay, silt, and sand alluvium similar to the dominant soil types in Sarpy County.

The City of Springfield is drained by Springfield Creek, which flows along the western edge of Springfield. The creek is paralleled on the east by the Missouri Pacific Railroad and on the west by Nebraska State Highway 50. Springfield Creek is a tributary to the Platte River approximately two miles downstream of Springfield.

Springfield Creek flows past Springfield in a deep-cut channel in Kennebec silt loam soil. Small gullied tributaries, ranging in size from approximately 0.1 to 3.1 square miles, join Springfield Creek on both the right and left sides.

## 2.3 Principal Flood Problems

Flooding due to the Missouri River, the Platte River, and the Elkhorn River can occur in Sarpy County as a result of heavy rainfall, snowmelt, or combinations thereof. Ice conditions can also aggravate the flood situation. Flooding on these streams without ice-affected conditions would normally be of relatively long duration with ample warning prior to the peak. Flooding along Big Papillion Creek, Buffalo Creek, Papillion Creek, South Branch Papillion Creek, Springfield Creek, and West Papillion Creek normally occurs from heavy rainfall. Flooding due to Big Papillion Creek and Papillion Creek would normally allow warning prior to the peak. Flooding due to South Branch Papillion Creek, Buffalo Creek, and Springfield Creek could result from heavy rainfall on a relatively local basis, creating short duration flooding with little warning prior to the peak. With this variation in peaking time and flood duration within the unincorporated areas of Sarpy County, depending upon the particular stream flooding, flood fighting and evacuation procedures must also be varied in Sarpy County during flood periods.

The Missouri River historically was a major flood problem for Sarpy County. This, however, has changed considerably since the construction of six dams and reservoirs on the Missouri River in the Dakotas and Montana. The completion of Missouri River Levee Unit R-616 in May 1979 (Reference 13) protects from flooding that part of Sarpy County located downstream from the City of Bellevue extraterritorial zoning limits to Papillion Creek. Missouri River Levee Unit R-613 is located between Papillion Creek and the Platte River (Reference 14). These flood control structures eliminated the threat of a 0.2-percent-annual-chance flood from the Missouri River for those areas of Sarpy County and the City of Bellevue landward of these levee systems. However, due mainly to tributary inflow downstream from the main stem dams and ice conditions, those areas of Sarpy County and Bellevue riverward of the levee system are subject to flooding. These areas include agricultural areas, recreational areas, residential areas, and barge terminals. The largest flood of record on the Missouri River at Sarpy County occurred on April 16, 1952, having a discharge of 396,000 cfs.

The Platte River has also historically been a major flood problem for Sarpy County. Unfortunately, unlike the Missouri River, few flood control measures exist along the Platte River that reduce flood damages.

Flooding in the Sarpy County area due to the Platte River has occurred since 1940 in 1944, 1947, 1948, 1949, 1950, 1960, 1962, 1966, 1967, 1971, 1978, and 1993. The majority of these floods occurred in February and March as a result of rapid snowmelt and ice jams. The 1971 flood also occurred in February but resulted from rainfall over frozen ground. The largest flood of record occurred in July 1993, having a discharge at the USGS gaging station at Nebraska Highway 50 (Louisville) of 160,000 cfs. Two other floods of record occurred in 1960 and 1978 - having a discharge at the USGS stream gaging station at South Bend of 124,000 cfs and 110,000 cfs, respectively. The recurrence interval of the 1960 flood at South Bend was approximately 25 years. Both of these floods were a result of record cold temperatures followed by above freezing temperatures, which caused rapid snowmelt. Ice jams aggravated the flood situation considerably. Resultant flood damages varied considerably depending upon the location and severity of the ice jams.

The Elkhorn River, like the Platte River, has historically been a flood problem for Sarpy County. Since 1940, flooding along the Elkhorn River in Sarpy County has occurred in 1944, 1947, 1948, 1949, 1950, 1951, 1960, 1962, 1966, 1967, 1971, 1978, and 1993. Approximately half of these floods were due to rapid snowmelt augmented by ice jams with the remaining half resulting from heavy rainfall. The 1944 flood was the largest of record, having an approximate recurrence interval of approximately 160 years, based on the discharge at Waterloo, Nebraska.

Ice conditions on the Missouri River, Platte River, and Elkhorn River can have a significant effect on both the degree of flooding and frequency of flooding in Sarpy County. Ice formation in these streams occurs during periods of cold weather when finely divided colloidal particles called "frazil ice" form throughout the river. These particles in the Platte and Elkhorn Rivers combine to form what is commonly known as “sheet ice.” This type of ice covers the entire river. The thickness of this ice sheet depends upon the degree and duration of cold weather in the area. On the Platte River, especially, this ice sheet can freeze to the bottom of the channel in places. During spring ice breakup, the Platte and Elkhorn Rivers frequently become clogged with this winter accumulation of ice. Because of relatively low stream banks and channels blocked with ice, these rivers abandon existing channels and flow overland. Ice formation in the Missouri River is somewhat different from that in the Platte and Elkhorn Rivers. In the Missouri River, because of relatively fast velocities, "frazil ice" is not able to form "sheet ice.” Instead, the "frazil ice" particles gradually enlarge and combine forming pads of ice commonly known as "pad ice.” As this ice floats downstream, snags, bridge piers, or other obstructions or constrictions create conditions where ice pads may "hang up" or stop flowing. Once this occurs, other ice pads may "hang up," gradually covering the entire river with "pad ice.” This is commonly known as an "ice bridge.” This condition can result in severe stage fluctuation as the ice bridge forms, as it consolidates, or as it breaks up. As additional "pad ice" floats downstream, the "ice bridge" grows in an upstream

direction. As the "ice bridge" continues to form, it may thicken to the point where an "ice gorge" blocks the flow of the river in the channel. This can result in extremely rapid increases in upstream water surface elevations (WSELs) and resultant overbank flooding.

Flood records on Papillion Creek and Big Papillion Creek are available from 1929 to the present. Of this record, the data prior to the establishment of the Fort Crook gaging station near Capehart Road by the USACE in 1946 are, at best, fragmentary. Flooding prior to 1929 has undoubtedly occurred but no records are available. From 1929 to the present, flooding occurred in 1929, 1932, 1936, 1941, 1943, 1948, 1950, 1959, 1960, 1964, and 1965. The largest flood of record at the Fort Crook stream gage occurred on June 17, 1964, having a discharge of 32,300 cfs. This flood had an approximate recurrence interval of 10 years.

Flooding has occurred along Springfield Creek usually as a result of intense rainfall. Floods occurred in 1959, 1964, and 1965. Of these floods, the flood of June 16-17, 1964, was supposedly the largest. State Highway 50 was overtopped in places, and several residences and the fairgrounds in the City of Springfield were flooded.

Floods have undoubtedly occurred on Buffalo Creek. However, due to the lack of development within the floodplain, little data are available documenting past floods.

Flooding due to Papillion Creek is of much shorter duration with less warning prior to the peak. Flooding due to Mud Creek, and especially Betz Road Ditch and Squaw Creek, can result from heavy rainfall on a relatively local basis creating short duration flooding with little warning prior to the peak.

Flood records on West Branch Papillion Creek are limited in scope and are available for only recent years. Floods occurring since records have been kept occurred in 1948, 1950, 1959, 1964, and 1965. Like Papillion Creek and Big Papillion Creek, the largest flood of record on West Branch Papillion Creek occurred in June 1964, having an approximate discharge of 40,800 cfs at the USACE gaging station located approximately seven miles upstream from the mouth at Giles Road. The approximate recurrence interval of this flood is slightly under the 1-percent-annual-chance recurrence.

Flooding along Mud Creek occurs relatively frequently. The most recent floods were in 1967 and 1971 as a result of heavy rainfall. Of these two floods, the 1967 flood was the largest, having an approximate recurrence interval of 25 years. Betz Road Ditch, within the past 10 years, has experienced flooding in 1967 and 1971. Due to the close proximity of Betz Road Ditch to Mud Creek, the same intense rainfall storm produced floods on both streams. The 1967 flood was the largest flood causing the loss of one life. No estimate of discharge was made.

Floods have undoubtedly occurred on Squaw Creek. However, due to the lack of development within the floodplain, little data are available documenting past floods.

Flood records are unavailable on Walnut Creek and Midland Creek and tributaries. Although flooding has occurred along these streams, flood accounts are rare. This is probably due to the rural nature of these streams, which, in the past, has produced relatively minor flood damage and personal hardship.

The Hell Creek floodplain was used primarily only for agricultural purposes until the late 1950s and early 1960s. From this time period to the present, extensive residential development occurred in portions of the Hell Creek basin and floodplain. Prior to this residential development, damages resulting from Hell Creek floods were relatively low. However, extremely heavy damages occurred along portions of the Hell Creek floodplain as a result of heavy rainfall over the basin during the evening of June 16, 1964. Flooding from this rainfall was in the vicinity of the 0.2-percent-annual-chance flood magnitude along portions of Hell Creek.

## 2.4 Flood Protection Measures

Several dams and reservoirs are located in the Missouri River basin upstream from Sarpy County. Of these dams and reservoirs, six located on the main stem of the Missouri River provide essentially all of the flood peak discharge reduction at Sarpy County from the Missouri River. Data on these dams are provided in the following tabulation:

Missouri River Dams

| Dam | Location | Year Operational |
|---|---|---|
| Big Bend | Fort Thompson, South Dakota | 1964 |
| Fort Peck | Fort Peck, Montana | 1940 |
| Fort Randall | Pickstown, South Dakota | 1953 |
| Garrison | Riverdale, North Dakota | 1955 |
| Gavins Point | Yankton, South Dakota | 1955 |
| Oahe | Pierre, South Dakota | 1962 |

The Missouri River also has bank stabilization works and federal and private levee systems located in the Sarpy County area. The USACE had constructed the Missouri River Levee Unit R-616 along the Missouri River from State Highway 370 downstream to Papillion Creek, from river mile 601.2 to river mile 596.5 (Reference 13). This levee provides that portion of Sarpy County, between State Highway 370 and upstream from Papillion Creek and landward of the levee, with protection from Missouri River floods in excess of the 0.2-percent-annual-chance flood.

The USACE also constructed Missouri River Levee Unit R-613 (Reference 14). This levee extends along both sides of Papillion Creek from Capehart Road to the

mouth, along the right bank of the Missouri River from Papillion Creek to the Platte River, and along the left bank of the Platte River from the mouth upstream to U.S. Highways 75. The U.S. Highway 75 road grade functions as the tie-off for the levee. The R-613 levee was considered to provide protection from a 1-percent-annual chance flood from the Platte River. Protection is provided on the landward side of this levee unit from the 0.2-percent-annual-chance flood on Papillion Creek, the Platte River, and the Missouri River.

Upstream from the U.S. Highway 6 and Burlington Northern & Santa Fe Railway bridges levees are located along part of both the left (east) and right banks of the river in the Sarpy County reach. The Western Sarpy Drainage District levee is located on the Sarpy County (east) side of the river. Because the levees lack the necessary height and structural integrity, neither the left or right bank levees in this reach can be considered adequate to provide protection from a 1-percent-annual-chance flood.

Although the levees do not provide protection from the 1-percent-annual-chance flood, they do affect flood stages on the riverward side.

Several dams and reservoirs are located in the Platte River basin in Colorado, Wyoming, and Nebraska. The influence of these dams and reservoirs was included in the frequency-discharge relationship for the Platte River in Sarpy County. Private levees exist along the Platte River and the Elkhorn River in Sarpy County. These levees vary considerably in composition, height, and overall ability to withstand floods. Because of this inconsistency, their flood protection adequacy can vary from flood to flood.

The Papio-Missouri River NRD has had a continuing program since 1968 to construct channel and levee improvements along Papillion Creek and Big Papillion Creek. These improvements are complete from Capehart Road in Bellevue, Nebraska, upstream through Sarpy County except for tie-back levees along Mud Creek, and a short portion on the right bank upstream from the West Papillion Creek confluence. These improvements provide, in general, protection against the 10-percent-annual-chance flood.

Channel straightening by local interests has occurred on Papillion Creek, Big Papillion Creek, and West Papillion Creek, and on portions of Buffalo Creek, Springfield Creek, Mud Creek, Betz Road Ditch, and Squaw Creek. Tieback levees have been constructed along the downstream portions of Mud Creek, Betz Road Ditch, and Squaw Creek, also by local interests.

The USACE has constructed two dams and reservoirs on tributaries of Papillion Creek that impound the 1-percent-annual-chance flow (References 15 and 15). These dams are located approximately 14 miles upstream from the Sarpy County-Douglas County line. Sparse levee construction and floodplain filling by local interests have occurred along West Papillion Creek in Papillion.

There are no flood-protection structures on streams in the City of Springfield area. Many farmers use contour farming, strip-cropping, terracing, and grassed waterways to control erosion.

## 3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

### 3.1 Hydrologic Analyses

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

#### 3.1.1 Methods for Revised Studies

West Papillion Creek, Hell Creek, Midland Creek, South Papillion Creek, Unnamed South Papillion Creek Tributary, Unnamed West Papillion Creek Tributary, and Walnut Creek were revised as part of the current restudy. A hydrologic analysis was conducted on West Papillion Creek and its tributaries to predict the rainfall-runoff relationship using U.S. Army Corps of Engineers' Hydrologic Engineering Center, Hydrologic Modeling System (HEC-HMS) (Reference 25). The West Papillion Creek was divided into 108 subbasins. After all the subbasins runoffs were calculated, they were

combined along the stream network and routed downstream.

In the West Papillion Creek Basin, Wehrspann Lake (Site 20) controls 13.1 square miles, Zorinsky Lake (Site 18) controls 16.4 square miles and Walnut Creek (Site 21) controls 3.3 square miles. Numerous smaller dams are located in the West Papillion Creek Watershed. The effects of five of these smaller dams, Zorinsky Sediment Basin No. 3, Dam Site 13, Boys Town Dam No. 1, Midlands Lake Dam, and Shadow Lake Dam were included in the hydrologic analyses conducted for this study.

A levee system exists on the right bank of the main channel of West Papillion Creek from Walnut Creek, near 96th St., downstream to 42nd St. and on the left bank from just west of 84th St., near Adams St., to the abandoned Chicago, Rock Island, and Pacific Railroad (CRIPRR) embankment, approximately 44th St. The HEC-HMS model was used to adjust peak discharges on the main channel of West Papillion Creek for the existing levee system. It is anticipated that most of the flap gates will be closed at the time of peak discharge on the main channel of West Papillion Creek, so it was assumed that the flap gates would be closed throughout the storm event. Assuming the flap gates would be closed allowed the drainage areas behind the levee to be disconnected from the main channel of West Papillion Creek. This approach was used to provide estimated peak discharges on the main channel of West Papillion Creek adjusted for the levee system.

Because the required freeboard for the 1-percent annual chance flood vent was no longer provided by the previously mentioned levee system on West Papillion Creek, the peak discharges within the leveed reach were revised for analysis of three (3) different levee conditions: 1) no left levee, 2) no right levee and 3) with both left and right levees. The only revision was the contribution of Midland Creek to the 2- and 1-percent annual chance events on West Papillion Creek for the no right levee and no left and right levee conditions only.

Discharge-probability relationships for the West Papillion Creek tributaries: Midland Creek; South Midland Creek; West, Walnut Creek; Hell Creek; West Papillion Creek Tributary; South Papillion Creek; and South Papillion Creek Tributary, consisted of utilizing data developed by the hydrologic analyses for West Papillion Creek.

Peak discharge-drainage area relationships for the streams studied by detailed methods are shown in Table 5 and Table 6 for existing land use and future land use conditions respectively. Table 7 and Table 8 illustrate the revisions to peak discharges on West Papillion Creek for analysis of conditions without the right levee for existing and future land use conditions.

In the West Papillion Creek Basin, Wehrspann Lake (Site 20) controls 13.1 square miles, Zorinsky Lake (Site 18) controls 16.4 square miles and Walnut Creek (Site 21) controls 3.3 square miles. The five dams control 59.0 square miles of the 402-square mile drainage basin. In the hydrologic analyses done for this study, the effects of these dams were included.

### 3.1.2 Methods for Existing Studies

The following section describes the methodology used for previously studied flooding sources that were incorporated into this FIS, but that were not revised as part of the restudy.

The discharge-probability relationships for the Missouri River at Omaha are based upon the Missouri River Agricultural Levee Restudy Program Hydrology Report, prepared by the USACE (Reference 17). Eight gaging stations on the main stem of the Missouri River, one of them located just downstream from the U.S. Interstate 480 Bridge in Omaha, were the principle sources of data for defining these relationships. Stage records from the years 1898 to 1929 and stage-discharge records from the years 1929 to 1960 were used in the study. Stage values, which were available for each of the gaging stations prior to 1929, were converted to discharge values by appropriate rating curves. The study of main stem reservoir effects on daily discharge hydrographs was limited to the period subsequent to 1930, when extensive gaging of tributary streams began. Eleven representative hydrographs were selected for each of the eight main-stem gaging stations. The representative hydrographs used for the Omaha station were from the years 1932, 1939, 1941, 1942, 1948, 1950, 1951, 1954, 1956, 1958, and 1960. To develop a frequency-discharge relationship, the reservoir-modified annual flood peaks of the 11 representative hydrograph years were plotted in descending order. Eye-fit curves were drawn using the plotted points as guides, giving appropriate consideration to the consistency of the reservoir effects.

Peak flood flows for the Platte and Elkhorn Rivers through Sarpy County, including the 10-, 2-, 1-, and 0.2-percent-annual-chance floods were developed through analysis of records from the USGS stream gaging stations at Louisville and near Ashland, Nebraska, using the USACE HEC-FFA computer program (Reference 18). The HEC-FFA program follows the procedures outlined in Water Resources Council Bulletin 17B to produce the desired seasonal computed flow frequency. Peak flows developed for the Louisville gage were used for the Platte River from the Missouri River to the confluence of Salt Creek. Peak flows developed for the Ashland gage were used from upstream of Salt Creek to the Elkhorn River. Because the Elkhorn River and the Platte River have a common floodplain from the confluence of the Elkhorn River channel with the Platte River channel almost to the upstream boundary of Sarpy County, the Ashland gage peak flows were used at that location. For the small portion of Sarpy County upstream from where

the Elkhorn River flows combine with the Platte River, the peak flows computed for the North Bend Gage were used there.

Periods of record for the gage stations associated with this study included only those years that provided complete and pertinent data. The respective record lengths used for analyses for each station are as follows:

| | |
|---|---|
| Platte River at Louisville | 1954-1994 |
| Platte River near Ashland | 1929-1960, 1989-1994 |
| Platte River at North Bend | 1950-1994 |

Data from the USGS gaging stations on the Platte River at Duncan and Grand Island, Nebraska, was used with the Louisville, Ashland and North Bend gage data to develop regional skews. A combined season flow-frequency relationship for the stations was computed using the combined probability equation from the final snowmelt season and rainfall season computed flow-frequency relationships

The discharge-probability relationships for Buffalo Creek and Springfield Creek were developed using the Environmental Protection Agency (EPA) Stormwater Management Model (Reference 19). The Buffalo Creek and Springfield Creek basins were divided into 127 and 69 subbasins, respectively. Rainfall data utilized were derived from U.S. Weather Bureau Technical Paper No. 40 (Reference 20). A soil infiltration rate of 0.3 inch per hour was utilized throughout the basin.

At two locations on Buffalo Creek, a decrease in discharge is evident as the stream proceeds downstream. One point is located approximately 1,500 feet downstream from South 156$^{th}$ Street where there is some overbank storage. The other point is located in the region of approximately 800 feet upstream of 168th Street to the mouth. The problem in this region is the perched channel; when the water overtops its banks, it disseminates over the floodplain. On the upstream side of Platteview Road and approximately 1,800 feet downstream of Fairview Road, a decrease of discharge on Springfield Creek is evident. This is due to overbank storage.

There are no streamflow records for Springfield Creek. Peak discharges for floods of 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence intervals were computed using the HEC-1 computer program with Clark's unit-hydrograph (Reference 21), EPA Stormwater Management Model (Reference 19), and a USGS regional flood-frequency analysis (Reference 22). Results from the three methods were computed by representatives of the USACE and the USGS at a meeting held in March 1976. The comparisons were favorable, and the values agreed upon were computed from the averages utilizing all three methods and were adjusted upward giving more weight to the higher figures. Discharges were computed for both the upstream and downstream

ends of the study reach and were interpolated at four intermediate points on a drainage-area basis.

Five dams have been constructed in the Papillion Creek Basin that significantly affects the major runoff events. In the Little Papillion Creek Basin, Glenn Cunningham Lake (Site 11) controls 17.8 square miles of the basin. In the Big Papillion Creek Basin, Standing Bear Lake (Site 16) controls 6.0 square miles and Candlewood Lake (Site 17) controls 2.4 square miles.

The discharges used in the study for Big Papillion Creek above the confluence with West Papillion Creek were taken from the USACE 1985 Reevaluation Report for the Papillion Creek and Tributary Lakes (Reference 23). The EPA Stormwater Management Model, as modified by the USACE, was used to predict the rainfall-runoff relationship in the Papillion Creek Basin. The Big Papillion Creek Basin was divided into 635 subbasins. The Little Papillion Creek Basin was divided into 235. After all the subbasin runoffs were calculated, they were combined along the stream network and routed downstream. Floods that occurred in June 1964 and September 1965 were used for calibration of the Stormwater Management Model. Calibration runs were made by varying the roughness and retention storage values until the flood hydrographs were adequately reproduced. During calibration runs, it was determined that a flood routing model that defined the channel geometry in more detail was needed for flood routing on the main channels. A Herders Model was used to route flows along Big Papillion Creek (Reference 24).

For analytical purposes, the valley was segmented into short reaches by a series of cross sections. Each cross section was defined by elevation-conveyance-top width relationships. Thirty-two conveyance curves were used on Big Papillion Creek above the West Papillion confluence.

Floods which occurred September 2, 1997, July 6, 1998, and August 6, 1999 were used for calibration and verification of the HEC-HMS model. Calibration runs were made by varying the unit hydrograph parameters and retention storage values until the flood hydrographs were adequately reproduced.

The National Weather Service Dynamic Wave Operational (DWOPER) model (Reference 26) was used to simulate the progression of the 1-percent-annual-chance flood wave through the reach of Papillion Creek downstream from the Big Papillion Creek-West Papillion Creek confluence to Capehart Road. The DWOPER model was used because it has the capability to simulate flow-over and storage behind levees. It was believed that the existing Papio-Missouri River NRD levees in this reach would have a significant effect on discharges in this reach. Twenty-eight cross sections were used as the basis for the DWOPER model. The DWOPER model was configured to allow flow over the top of the Papio-Missouri River NRD levees when the stages in the creek reached the elevation of the tops of the levees. Flow over the levees was allowed to pond behind the levees in "cells" formed by levee tiebacks and other obstructions to flow. Calibrating the effect of the Papio-Missouri River NRD levees on flood events was difficult because there have not been any flood events large enough to overtop them since the levees were constructed. An alternate method of calibrating the DWOPER model was to estimate the elevation of natural berms along the channel during the 1964 flood in order to simulate the storage effects on the floodplain on the hydrograph.

Peak discharges for the 10-, 2-, and 0.2-percent-annual-chance flood events were derived at various locations along Papillion Creek from the confluence of West Papillion Creek and Big Papillion Creek to the mouth, based on the 1-percent-annual-chance flood-routed discharge, a standard deviation of 0.247 and a skew coefficient of zero. The scope of this study did not allow routing by DWOPER other than for the 1-percent-annual-chance flood event.

The discharge-probability relationships for Betz Road Ditch were derived by the use of the rational formula. A "C" value of 0.45 was selected for the 1-percent-annual-chance flood discharge. This value was adjusted depending upon the event recurrence interval. Allowances were made for the storage of floodwaters upstream from street crossings and other barriers that impede flow. Downstream of State Highway 370, the 10-, 2-, and 1-percent-annual-chance flood discharges were adjusted to use the full discharge calculated above State Highway 370 down to the mouth. This adjustment was made because of the increased culvert capacity through the State Highway 370 embankment.

The discharge-probability relationships for Mud Creek and Squaw Creek were developed using the EPA Stormwater Management Model (Reference 19). The Mud Creek and Squaw Creek basins were divided into 57 and 21 subbasins, respectively. The rainfall data utilized were derived from the U.S. Weather Bureau Technical Paper No. 40 (Reference 20). A soil infiltration rate of 0.3 inch per hour was utilized throughout the basin.

Peak discharge-drainage area relationships for the streams studied by detailed methods are shown in Table 5.

Table 5 - Summary of Discharges (Existing Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Existing Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| Betz Road Ditch | | | | | |
| At confluence with Papillion Creek | 1.8 | 940 | 1,900 | 2,680 | 3,000 |
| Just upstream of State Highway 370 | 1.7 | 940 | 1,900 | 2,680 | 6,100 |
| Just downstream of Lloyd Street | 1.2 | 850 | 1,720 | 2,400 | 5,900 |
| Just upstream of Lloyd Street | 0.8 | 570 | 1,180 | 1,600 | 3,800 |
| Just downstream of Lincoln Road | 0.5 | 490 | 1,000 | 1,370 | 3,000 |
| Just upstream of Lincoln Road | 0.3 | 290 | 600 | 800 | 1,800 |
| Buffalo Creek | | | | | |
| At confluence with Platte River | 25.8 | 11,000 | 17,500 | 20,600 | 30,000 |
| Approximately 1,200 feet upstream of South 156th Street | 22.9 | 11,200 | 17,800 | 21,000 | 30,500 |
| Approximately 800 feet upstream of South 168th Street | 21.7 | 11,300 | 18,500 | 22,000 | 31.000 |
| Approximately 210 feet downstream of Pflug Road | 17.1 | 9,500 | 15,000 | 17,900 | 26,000 |
| Approximately 200 feet downstream of Pflug Road | 14.5 | 8,000 | 12,900 | 15,300 | 22,000 |
| Approximately 210 feet downstream of South 180th Street | 12.6 | 7,350 | 12,000 | 14,300 | 20,700 |
| Approximately 200 feet downstream of South 180th Street | 10.3 | 6,200 | 9,900 | 11,900 | 17,200 |
| Approximately 1,490 feet upstream of Platteview Road | 8.8 | 5,700 | 9,100 | 10,800 | 15,700 |
| Approximately 1,500 feet upstream of Platteview Road | 4.8 | 3,000 | 4,900 | 5,900 | 8,600 |
| Hell Creek | | | | | |
| At confluence with West Papillion Creek | 5.7 | 3,530 | 4,980 | 5,730 | 7,930 |
| Douglas-Sarpy County Line | 3.3 | 2,120 | 2,970 | 3,380 | 4,640 |
| Midland Creek | | | | | |
| At confluence with West Papillion Creek | 3.7 | 1,460 | 2,010 | 2,290 | 3,130 |
| Downstream of Highway 370 and CRIPRR | 3.3 | 1,250 | 1,720 | 1,980 | 2,710 |
| Upstream of Highway 370 and CRIPRR | 3.3 | 1,250 | 1,720 | 1,980 | 2,790 |
| Downstream of West Midland Creek | 3.0 | 1,030 | 1,490 | 1,720 | 2,350 |

## Table 5 - Summary of Discharges (Existing Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Existing Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| Midland Creek (continued) | | | | | |
| At Shadow Lake | 2.3 | 580 | 610 | 620 | 1,010 |
| At Midlands Lake | 0.9 | 700 | 840 | 890 | 1,230 |
| At 84th Street | 0.7 | 890 | 1,230 | 1,370 | 1,860 |
| Missouri River | | | | | |
| At the southern Sarpy County boundary | 322,800 | 125,000 | 170,000 | 190,000 | 250,000 |
| Mud Creek | | | | | |
| At the confluence with Papillion Creek | 10.7 | 3,600 | 5,900 | 7,100 | 11,000 |
| Approximately 2,000 feet upstream of confluence with Papillion Creek | 10.4 | 3,600 | 5,900 | 7,100 | 11,000 |
| Approximately 2,100 feet upstream of confluence with Papillion Creek | 9.8 | 2,900 | 4,850 | 5,900 | 9,200 |
| Approximately 6,300 feet upstream of confluence with Papillion Creek | 9.3 | 2,750 | 4,650 | 5,600 | 8,800 |
| Approximately 6,400 feet upstream of confluence with Papillion Creek | 8.1 | 1,820 | 3,300 | 4,400 | 7,300 |
| Approximately 100 feet downstream of Cornhusker Road | 7.9 | 1,820 | 3,300 | 4,400 | 7,300 |
| Approximately 400 feet upstream of Kasper Street | 7.0 | 1,320 | 2,550 | 3,300 | 5,600 |
| At Childs Road | 6.5 | 1,020 | 1,900 | 2,500 | 4,500 |
| At Chandler Road | 5.8 | 240 | 800 | 1,450 | 3,100 |
| Approximately 2,700 feet upstream of Chandler Road | 5.6 | 0 | 550 | 1,100 | 2,500 |
| Papillion Creek / Big Papillion Creek | | | | | |
| At confluence with Missouri River | 402 | 19,800 | 30,700 | 35,900* | 49,100 |
| Just downstream of confluence of West Branch Papillion Creek | 377 | 25,000 | 38,600 | 45,300 | 61,300 |
| Just upstream of confluence of West Branch Papillion Creek | 239 | 12,200 | 18,600 | 21,300 | 28,400 |
| At Sarpy-Douglas County Boundary | 232 | 18,900 | 28,850 | 33,000 | 44,000 |
| Platte River | | | | | |
| At confluence with Missouri River | 90,000 | 114,000 | 205,000 | 250,000 | 405,000 |
| Approximately 5,150 feet upstream of U.S. Interstate 80 | 89,800 | 87,000 | 151,000 | 187,000 | 300,000 |
| Just upstream of confluence of Elkhorn River | 82,900 | 62,000 | 106,000 | 132,000 | 220,000 |

## Table 5 - Summary of Discharges (Existing Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Existing Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| South Midland Creek | | | | | |
| At confluence with Midland Creek | 1.4 | 1,270 | 1,780 | 2,010 | 2,770 |
| West of 72nd St. | 0.7 | 670 | 940 | 1,060 | 1,450 |
| Springfield Creek | | | | | |
| Approximately 8,000 feet upstream of confluence with Platte River | 15.8 | 9,000 | 14,300 | 17,000 | 24,500 |
| Approximately 8,010 feet upstream of confluence with Platte River | 12.8 | 7,300 | 11,800 | 14,000 | 21,500 |
| Approximately 600 feet upstream of Platteview Road | 9.8 | 6,300 | 10,100 | 11,900 | 18,000 |
| Approximately 610 feet upstream of Platteview Road | 6.4 | 3,700 | 6,000 | 7,100 | 10,700 |
| Approximately 2,600 feet upstream of Platteview Road | 5.9 | 3,800 | 6,200 | 7,400 | 11,100 |
| Approximately 2,650 feet upstream of Platteview Road | 5.1 | 3,250 | 5,350 | 6,400 | 9,400 |
| Approximately 1,810 feet downstream of Fairview Road | 4.9 | 3,100 | 5,100 | 6,100 | 9,000 |
| Approximately 1,800 feet downstream of Fairview Road | 4.0 | 2,700 | 4,350 | 5,200 | 7,000 |
| Approximately 1,600 feet upstream of Fairview Road | 3.8 | 3,050 | 4,900 | 5,900 | 8,600 |
| Approximately 1,610 feet upstream of Fairview Road | 3.5 | 2,750 | 4,450 | 5,350 | 8,000 |
| Approximately 2,600 feet upstream of Fairview Road | 3.3 | 2,700 | 4,350 | 5,200 | 7,800 |
| Approximately 2,650 feet upstream-of Fairview Road | 2.7 | 2,260 | 3,600 | 4,300 | 6,400 |
| South Papillion Creek | | | | | |
| Confluence with West Papillion Creek | 39.4 | 12,650 | 17,250 | 20,100 | 28,600 |
| Downstream of South Papillion Tributary | 38.1 | 12,460 | 17,090 | 19,900 | 28,310 |
| Upstream of South Papillion Creek Tributary | 32.8 | 11,290 | 16,020 | 18,570 | 25,910 |
| Downstream of Wehrspann Lake Tributary | 28.6 | 10,520 | 14,860 | 17,120 | 23,630 |
| Upstream of Wehrspann Lake Tributary | 15.4 | 10,510 | 14,860 | 17,110 | 23,670 |
| 168th St. | 12.8 | 9,280 | 13,170 | 15,070 | 20,760 |
| Downstream of 192nd St. | 6.0 | 5,950 | 8,160 | 9,170 | 12,530 |
| 192nd St. | 4.3 | 4,300 | 5,930 | 6,670 | 9,130 |
| Highway 31 (204th St.) | 2.7 | 2,790 | 3,890 | 4,380 | 6,000 |
| Squaw Creek | | | | | |
| At South 36th Street | 1.7 | 2,150 | 3,100 | 3,600 | 5,000 |
| Approximately 1,000 feet downstream of Cornhusker Road | 1.5 | 2,000 | 2,940 | 3,450 | 4,900 |

## Table 5 - Summary of Discharges (Existing Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Existing Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| Squaw Creek (continued) | | | | | |
| Approximately 2,400 feet upstream of Cornhusker Road | 1.3 | 1,920 | 2,880 | 3,350 | 4,850 |
| Approximately 2,500 feet upstream of Cornhusker Road | 1.2 | 1,750 | 2,650 | 3,100 | 4,400 |
| Approximately 4,500 feet upstream of Cornhusker Road | 1.1 | 1,720 | 2,600 | 3 100 | 4,600 |
| Approximately 4,600 feet upstream of Cornhusker Road | 0.7 | 1,240 | 1,900 | 2,260 | 3,400 |
| Approximately 5,800 feet upstream of Cornhusker Road | 0.7 | 1,180 | 1,860 | 2,200 | 3,150 |
| Approximately 5,900 feet upstream of Cornhusker Road | 0.5 | 820 | 1,320 | 1,580 | 2,300 |
| Walnut Creek | | | | | |
| At confluence with West Branch Papillion Creek | 4.4 | 1,040 | 1,440 | 1,620 | 2,220 |
| At outlet of Walnut Creek Lake | 3.3 | 110 | 120 | 120 | 120 |
| West Midland Creek | | | | | |
| At the confluence with Midland Creek | 0.7 | 930 | 1,250 | 1,390 | 1,910 |
| 84th St. | 0.5 | 640 | 870 | 970 | 1,1320 |
| West Papillion Creek[1] | | | | | |
| Confluence with Big Papillion Creek[1] | 134.8 | 24,640 | 30,490[2] | 35,290[2] | 49,570 |
| Downstream of Midland Creek[1] | 127.1 | 23,940 | 30,170[2] | 34,830[2] | 47,090 |
| Upstream of Midland Creek[1] | 121.2 | 23,360 | 30,870 | 35,540 | 45,300 |
| 84th St. [1] | 121.2 | 23,380 | 30,920 | 35,600 | 45,330 |
| Downstream of Walnut Creek[1] | 119.4 | 23,060 | 30,470 | 35,000 | 44,460 |
| Upstream of Walnut Creek[1] | 114.0 | 22,860 | 30,190 | 34,380 | 43,970 |
| Downstream of South Papillion Creek[1] | 108.2 | 21,690 | 28,090 | 31,880 | 41,070 |
| Upstream of South Papillion Creek | 63.1 | 10,750 | 13,300 | 16,460 | 23,920 |
| Douglas-Sarpy County Line | 61.4 | 10,740 | 13,840 | 17,020 | 24,600 |
| Unnamed Tributary of South Papillion Creek | | | | | |
| Confluence with South Papillion Creek | 5.4 | 5,180 | 7,100 | 8,020 | 10,970 |
| 132nd St. | 2.9 | 3,310 | 4,630 | 5,210 | 7,140 |
| Unnamed Tributary of West Papillion Creek | | | | | |
| Confluence with West Papillion Creek | 3.7 | 2,830 | 4,080 | 4,700 | 6,560 |
| 114th St. | 2.0 | 1,810 | 2,570 | 2,910 | 4,020 |
| Nebraska Highway 370 | 0.9 | 850 | 1,190 | 1,340 | 1,830 |

*Discharge decreased due to storage

1. Modeled with existing West Papillion Creek levee system and channel improvements up to Walnut Creek, near 96th St., and proposed West Papillion Creek channel improvements from Walnut Cree up to Giles Road.
2. 50 and 100-yr peak discharges adjusted for storage from existing West Papillion Creek levee system.

Table 6 - Summary of Discharges (Future Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Future Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| Hell Creek | | | | | |
| At confluence with West Papillion Creek | 5.7 | 3,600 | 5,050 | 5,800 | 8,010 |
| Douglas-Sarpy County Line | 3.3 | 2,160 | 3,010 | 3,420 | 4,690 |
| | | 1,570 | 2,170 | 2,460 | 3,290 |
| Midland Creek | | | | | |
| At confluence with West Papillion Creek | 3.7 | 1,370 | 1,910 | 2,160 | 2,840 |
| Downstream of Highway 370 and CRIPRR | 3.3 | 1,370 | 1,910 | 2,180 | 2,960 |
| Upstream of Highway 370 and CRIPRR | 3.3 | 1,200 | 1,710 | 1,920 | 2,500 |
| Downstream of West Midland Creek | 3.0 | 590 | 620 | 640 | 1,520 |
| At Shadow Lake | 2.3 | 780 | 880 | 900 | 1,360 |
| At Midlands Lake | 0.9 | 1,020 | 1,390 | 1,550 | 2,080 |
| At 84th Street | 0.7 | 1,570 | 2,170 | 2,460 | 3,290 |
| South Papillion Creek | | | | | |
| Confluence with West Papillion Creek | 39.4 | 13,720 | 18,700 | 21,980 | 31,010 |
| Downstream of South Papillion Tributary | 38.1 | 13,560 | 18,570 | 21,800 | 30,740 |
| Upstream of South Papillion Creek Tributary | 32.8 | 12,790 | 17,790 | 20,580 | 28,360 |
| Downstream of Wehrspann Lake Tributary | 28.6 | 11,980 | 16,660 | 19,020 | 26,040 |
| Upstream of Wehrspann Lake Tributary | 15.4 | 11,970 | 16,680 | 19,050 | 26,110 |
| 168th St. | 12.8 | 10,680 | 14,860 | 16,850 | 23,000 |
| Downstream of 192nd St. | 6.0 | 6,770 | 9,200 | 10,320 | 14,030 |
| 192nd St. | 4.3 | 4,990 | 6,810 | 7,630 | 10,380 |
| Highway 31 (204th St.) | 2.7 | 3,320 | 4,570 | 5,100 | 6,910 |
| Unnamed Tributary of South Papillion Creek | | | | | |
| Confluence with South Papillion Creek | 5.4 | 5,600 | 7,580 | 8,520 | 11,550 |
| 132nd St. | 2.9 | 3,590 | 4,950 | 5,540 | 7,520 |
| Unnamed Tributary of West Papillion Creek | | | | | |
| Confluence with West Papillion Creek | 3.7 | 3,300 | 4,660 | 5,310 | 7,330 |
| 114th St. | 2.0 | 2,130 | 2,980 | 3,350 | 4,590 |
| Nebraska Highway 370 | 0.9 | 1,010 | 1,390 | 1,560 | 2,110 |
| Walnut Creek | | | | | |
| At confluence with West Branch Papillion Creek | 4.4 | 1,090 | 1,500 | 1,690 | 2,300 |
| At outlet of Walnut Creek Lake | 3.3 | 110 | 120 | 120 | 120 |

## Table 6 - Summary of Discharges (Future Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Future Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| West Midland Creek | | | | | |
| At the confluence with Midland Creek | 0.7 | 950 | 1,260 | 1,400 | 1,930 |
| 84th St. | 0.5 | 640 | 880 | 980 | 1,330 |
| West Papillion Creek[1] | | | | | |
| Confluence with Big Papillion Creek[1] | 134.8 | 26,970 | 32,640[2] | 37,050[2] | 52,170 |
| Downstream of Midland Creek[1] | 127.1 | 26,060 | 32,190[2] | 36,400[2] | 49,240 |
| Upstream of Midland Creek[1] | 121.2 | 25,310 | 32,840 | 37,010 | 47,600 |
| 84th St. [1] | 121.2 | 25,320 | 32,880 | 37,070 | 47,630 |
| Downstream of Walnut Creek[1] | 119.4 | 24,980 | 32,400 | 36,430 | 46,870 |
| Upstream of Walnut Creek[1] | 114.0 | 24,770 | 31,990 | 35,790 | 46,380 |
| Downstream of South Papillion Creek[1] | 108.2 | 23,640 | 30,040 | 33,520 | 43,420 |
| Upstream of South Papillion Creek | 63.1 | 11,280 | 15,070 | 18,340 | 26,560 |
| Douglas-Sarpy County Line | 61.4 | 11,450 | 15,600 | 18,930 | 27,300 |

1. Modeled with existing West Papillion Creek levee system and channel improvements up to Walnut Creek, near 96th St., and proposed West Papillion Creek channel improvements from Walnut Cree up to Giles Road.
2. 50 and 100-yr peak discharges adjusted for storage from existing West Papillion Creek levee system.

## Table 7 – West Papillion Creek Peak Discharges Revised for Conditions without Right Levee (Existing Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Future Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| West Papillion Creek[2] | | | | | |
| At confluence with Big Papillion Creek[2] | 134.8 | No Change | 31,380 | 36.380 | No Change |
| Downstream of Midland Creek[2] | 127.1 | No Change | 31,070 | 35,940 | No Change |

1. 50 and 100-yr peak discharges adjusted to include Midland Creek for conditions without right levee (storage included for remainder of existing West Papillion Creek levee system)
2. 10- and 500-yr peak discharges were not reduced for levee storage; therefore, no adjustment was necessary for analysis without levees.

Table 8 – West Papillion Creek Peak Discharges Revised for Conditions without Right Levee (Future Conditions)

| Flooding Source and Location | Drainage Area (sq. miles) | Future Conditions Peak Discharges[1](cfs) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|---|
| West Papillion Creek[2] | | | | | |
| At confluence with Big Papillion Creek[2] | 134.8 | No Change | 33,640 | 38,240 | No Change |
| Downstream of Midland Creek[2] | 127.1 | No Change | 33,180 | 37,590 | No Change |

1. 50- and 100-yr peak discharges adjusted to include Midland Creek for conditions without right levee (storage included for remainder of existing West Papillion Creek levee system)
2. 10- and 500-yr peak discharges were not reduced for levee storage; therefore, no adjustment was necessary for analysis without levees.

The hydrologic analysis conducted on the portion of Springfield Creek and on the tributary of Buffalo Creek studied by approximate methods consisted of utilizing data developed by the hydrologic analysis on Springfield Creek and on Buffalo Creek, respectively. This analysis utilized the EPA Stormwater Management Model (Reference 19). A regional analysis was conducted to determine an approximate 1-percent-annual-chance discharge for those streams studied by approximate methods, tributaries of West Papillion Creek, South Branch Papillion Creek, and the Platte River, respectively. This analysis utilized data developed for hydrology determinations on similar streams in the same general area.

The hydrologic analysis conducted on the five tributary streams of Mud Creek studied by approximate methods consisted of utilizing data developed by the hydrologic analysis on Mud Creek. The EPA Stormwater Management Model developed discharge data for those streams tributary to Mud Creek as part of the Mud Creek analysis (Reference 19).

Elevations for floods of the selected recurrence intervals for the lake on Walnut Creek are shown in Table 9.

Table 9 - Summary of Stillwater Elevations

| Flooding Source and Location | Elevation (Feet NAVD) 10-Percent-Annual-Chance | 2-Percent-Annual-Chance | 1-Percent-Annual-Chance | 0.2-Percent-Annual-Chance |
|---|---|---|---|---|
| Walnut Creek Lake | * | * | 1,082.3 | * |
| Wehrspann Creek Lake | * | * | 1,095.5 | * |

*Information not available

## 3.2 Hydraulic Analyses

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

### 3.2.1 Methods for Revised Studies

Cross section data and topographic mapping for West Papillion Creek, Midland Creek, Walnut Creek, an Unnamed Tributary to West Papillion Creek, Hell Creek, South Papillion Creek, and an Unnamed Tributary to South Papillion Creek and was taken from LiDAR data flown in March and April of 2004 (Reference 1). This LiDAR data was used to create a digital terrain model (DTM) as a triangulated irregular network (TIN) and 2-foot contours. The TIN was the primary topographic data source for the HEC-RAS model geometry and was used for floodplain delineation. Stream bed elevations from the TIN were not adjusted because the water depth during the collection of the LiDAR data reflected baseflow conditions.

Hydraulic structure data for West Papillion Creek, Midland Creek, Walnut Creek, South Papillion Creek, Unnamed Tributary to South Papillion Creek, Hell Creek, and Unnamed Tributary to West Papillion Creek was field surveyed using total station or laser scanning techniques conducted from August to October 2004.

At the direction of FEMA, Region VII, all planned construction for Raynor Parkway, 48th Street, and 96th Street crossings of West Papillion Creek was considered as existing conditions. All planned construction for Lincoln Road crossing Walnut Creek was considered as existing conditions. Plans for the roadway and bridge improvements were obtained from the Papio-Missouri River NRD.

Earthen levees are located on the left and right banks of West Papillion Creek from approximately 42nd Street to approximately 96th Street. The levees are assumed failed due to overtopping or lack of freeboard and are not considered to provide protection from a 1-percent-annual-chance flood from the West Papillion Creek. The levee could be subject to overtopping and the area landward of the levee inundated during larger floods. Base flood elevations within the levees assume no overtopping. The elevations for the assumption that each respective levee will fail are shown outside the respective left or right levee. It is noted that for locations where the 1-percent annual chance

WSELs on the river side of the levee are higher than the actual top of levee elevations, the base flood elevation is reported as the modeled elevation up to 0.5 ft above the actual top of levee elevation. For modeled elevations more than 0.5 ft above the actual top of levee elevation, the base flood elevation is reported as the actual top of levee elevation plus 0.5 ft. The 0.5 ft is a practical limitation for the height of weir flow during levee overtopping.

The U.S. Army Corps of Engineer's (USACE) Hydrologic Engineering Center (HEC) River Analysis System (HEC-RAS, Version 3.1.2) (Reference 45) was used to generate the hydraulic flood profiles for the streams studied by detailed methods within the West Papillion Watershed. The hydraulic analyses for this study are based only on the effects of unobstructed flow through bridges and other hydraulic structures.

Starting WSELs for West Papillion Creek and at the mouth of each respective tributary stream were determined by normal-depth computations.

Roughness coefficients for West Papillion Creek, Hell Creek, Midland Creek, South Papillion Creek, Unnamed South Papillion Creek Tributary, Unnamed West Papillion Creek Tributary, and Walnut Creek were determined from field inspection and surface photography.
Table 10 provides roughness coefficients used for each stream studied by detailed methods in the study.

### 3.2.2 Methods for Existing Studies

Cross section data for Buffalo Creek, the Missouri River, and Springfield Creek were determined by photogrammetric methods utilizing aerial photographs taken in 1973 for the Missouri River (Reference 27) and in 1976 for Buffalo Creek and Springfield Creek (Reference 28). The underwater cross sections for the Missouri River were obtained by hydrographic surveys. Additional cross section data in the vicinity of Hansen's Lakes from the Nebraska Natural Resources Commission were used to better define the flood boundaries (Reference 29). Data contained in a floodplain study by the Nebraska Natural Resources Commission were used to determine WSELs and flood boundaries from the Missouri River upstream of Louisville (Reference 30). Topographic mapping having a scale of 1:2,400, and a contour interval of two feet was available on the Missouri River (Reference 30). Topographic mapping was also available on Buffalo Creek and Springfield Creek with a scale of 1:2,400 and a contour interval of four feet (Reference 32). Bridge losses on the Missouri River are negligible since only pier losses affect the WSELs.

Cross section data for Mud Creek were determined by field survey in 1975. Additional cross section data were derived from plans for U.S. Highway 75 and utilized in the Mud Creek analysis (Reference 33). Cross section data for Squaw Creek were determined by aerial photogrammetric methods using aerial photographs taken in 1976 (Reference 34). Topographic mapping

having a scale of 1:1,200 and a contour interval of two feet was also available on Squaw Creek (Reference 35). Bridges on Squaw Creek were surveyed in 1977 to obtain elevation and structural geometry used in computing bridge losses.

Cross section data for Papillion Creek/Big Papillion Creek within the limits of the July 1, 2004, LOMR was taken from USGS topographic data with a scale of 1:12,000, and a contour interval of 10 feet (Reference 39). Cross section data for Papillion Creek/Big Papillion creek outside of the limits of the LOMR were field surveyed in 1991.

A HEC-2 hydraulic model was set up for Betz Road Ditch (Reference 40). At locations where minimal changes have occurred, cross section data from the model used in the previous FIS report were used. In the reach between Betz Road and Lloyd Street Channel, cross sections and culvert information were taken from as-built plans provided by the City of Bellevue. Above Fairfax Drive, a consulting firm provided the cross section data. For the reach from below Betz Road to the mouth, new survey and culvert information was provided by NDOR.

Culverts along Betz Road Ditch were modeled using the HEC-2 Special Culvert method. Other bridges were modeled using the HEC-2 Normal Bridge method. For the reach between Lloyd Street and Fairfax Drive and the reach just downstream of Lincoln Avenue, flow through underground conduits was subtracted from the overland flow using culvert nomographs to determine the conduit flow.

Cross sections for the Platte River upstream of U.S. Interstate 80 were provided by the Nebraska DNR. The DNR cross section data was developed using photogrammetric methods from aerial photographs taken on May 7, 1997. New surveys of the Platte River stream bed were obtained by the DNR at the U.S. Interstate 80, U.S. Highway 6 and Union Pacific Railroad bridges. Selected stream bed cross sections were obtained upstream of U.S. Interstate 80 by the USACE in August 2001. At cross sections where stream bed surveys were not available, a stream bed was added based on the surveyed stream bed sections.

Cross section data for streams studied by approximate methods were derived from USGS 7.5 minute series quadrangle mapping (Reference 38).

Bridge hydraulics were computed using the HEC-2 normal bridge and special bridge methods (Reference 40). The former Missouri Pacific Railroad bridge at Louisville was removed from the hydraulic model since the bridge has been abandoned and removed. The abandoned former Chicago, Rock Island and Pacific Railroad near South Bend was converted into a hiking and biking trail bridge in 2001. The Papio-Missouri River NRD provided plans for the converted bridge configuration. Bridge data for the U.S. Highway 75 bridge and the State Highway 50 bridge, the U.S. Interstate 80 bridges and the U.S.

Highway 6 bridge were provided by the Nebraska Department of Roads (NDOR). The hydraulic analyses for this study are based only on the effects of unobstructed flow through bridges and other hydraulic structures.

From the mouth of the Platte River upstream to U.S. Highway 75, the left (north) Federal Levee R-613 is located on the left bank of the river. The U.S. Highway 75 road grade functions as the tie-off for the levee. The R-613 levee was considered to provide protection from a 1-percent-annual-chance flood from the Platte River. The levee could be subject to overtopping and the area landward of the levee inundated during larger floods.

The hydraulic analysis of the Platte River and Elkhorn River in Sarpy County considered both rivers as one system. This was due to the close proximity of one river to another and the resultant interchange of floodwater occupying a common floodplain. So as to give an accurate indication of flood heights, the profiles for the Platte and Elkhorn Rivers show the elevations within the levees. On the maps, the higher elevations are shown within the levees. The elevations for the assumption that the levees will fail are shown outside the levee. On the upper portions of the Elkhorn River system, two zones were computed, one for the area within the levees and one for the area outside of the levees.

Ice jams can occur in the study reach of the Platte River, particularly upstream of U.S. Highway 6. Because of the history of ice jams in that reach, ice-affected water surface profiles were developed for the reach of the Platte River upstream of U.S. Highway 6. Ice-affected water surface profiles were developed using the snowmelt season peak flows and the HEC-2 ice option (Reference 38). While a flood of a given frequency can occur during the snowmelt season, the flood stages may not always be ice-affected. In order to determine BFEs that include the possibility of ice-affected stages, the composite probability method described in FEMA Publication 37 (Reference 41) was used.

Although the levees located along part of both the left and right banks of the Elkhorn River do not provide protection from the 1-percent-annual-chance flood, they do affect flood stages on the riverward side. In order to determine the maximum flood stages that could be attained within the levees, a HEC-2 hydraulic model was set up with effective flow confined riverward of the levees. The split flow option of HEC-2 was used to compute the flows that would spill out from within the levees when they were overtopped. This method allowed water surface profiles to be developed that included a surcharge above the levee top elevations. The confined, split flow water surface profiles were plotted on the water surface profiles where they were higher than the unconfined profiles.

Unconfined water surface profiles were used to determine the BFEs landward of the levees and for the floodway delineation. The unconfined water surface profiles in general, were based on failed levee conditions on both sides of the

river. However, at certain locations upstream from the Elkhorn River confluence, the levee on the right bank was high enough, having some freeboard above the 1-percent-annual-chance flood, to be considered as the boundary of effective flow (but not the flood boundary). The left bank levee was not considered the effective flow boundary.

The sheet flow and ponding zones along Buffalo and Springfield Creeks were determined using detailed survey information, topographic maps (Reference 42), and engineering judgment. The sheet flow area on the right shore of Buffalo Creek was determined by assuming that the water would back up behind Buffalo Road until it reached a sufficient height to overtop the road. At this point, the USACE added 1.0 foot to the road elevation for water clearance, then subtracted the ground elevations from this and obtained a depth of 2.0 feet. The three ponding areas were determined in a similar manner. One foot of clearance was added to the road elevation, and then the boundaries were determined by use of survey information and the above-referenced topographic maps.

For the reach of Papillion Creek below Capehart Road, a hydraulic model was obtained from a USACE study of the R-613 levee system. Cross sections for this model were field surveyed in 1991. For convenience, the models for Papillion Creek above and below Capehart Road were combined into a single model. In the hydraulic model used for Papillion Creek above Capehart Road, WSELs were largely controlled by the Papio-Missouri River NRD levee system. Maximum WSELs were attained at locations where tieback levees were overtopped. All levees and tiebacks above Capehart Road are assumed failed due to overtopping or lack of free board and are considered to have no hydraulic effect. From Capehart Road to upstream of State Highway 370, substantial changes have been made in the floodplain for the construction of the Kennedy Freeway and its associated roadways and bridges. At the direction of FEMA, Region VII, all existing or planned construction for the Kennedy Freeway was considered as existing conditions. Plans for the freeway and improvements to other roads were provided by the NDOR. The main Kennedy Freeway embankment runs parallel to Papillion Creek on the left (east) floodplain overbank from Capehart Road to State Highway 370. The embankment was simulated using encroachments added to the cross sections at the limit of the embankment closest to the stream. The area of the floodplain overbank east of the freeway was not considered effective for flow. New or enlarged bridges were modeled at Capehart Road, State Highway 370, South 25th Street, South 36th Street, and Cornhusker Road. Bridge plans were provided by the NDOR and Sarpy County. These bridges were modeled using the HEC-2 Special Bridge routine. Water surface profiles were developed using the USACE September 1990 version of the HEC-2 step-backwater program (Reference 40).

The hydraulic model used for the July 1, 2004, LOMR on Big Papillion Creek was HEC-BPR, a modified HEC-2 by the USACE, Omaha District.

Water surface profiles for all other streams were developed using the USACE step-backwater computer program HEC-2 (Reference 44). Starting WSELs for the Missouri River were based on downstream backwater computations. Starting WSELs for Papillion Creek were based upon stage-discharge relationships developed for the Missouri River at the mouth of each respective stream. Similarly, starting WSELs for Buffalo Creek and Springfield Creek were based upon stage-discharge relationships developed for the Platte River.

Starting WSELs for Papillion Creek were based on stage-discharge relationships developed for the Missouri River at the mouth. Starting elevation for Big Papillion Creek were those computed for Papillion Creek at the confluence of Big Papillion Creek and West Papillion Creek. Starting elevations for Betz Road Ditch were set at critical depth at the confluence with Papillion Creek.

For the reach of Papillion/Big Papillion Creek upstream of Capehart Road, flood boundaries east of the Kennedy Freeway are based on the WSELs computed for the stream west of the embankment. Actual flood depths east of the freeway were not computed. Below Capehart Road, 0.2-percent-annual-chance flooding may result from levee overtopping and possible failure. The 0.2-percent-annual-chance flood boundaries are not shown in this area.

Starting WSELs for Mud Creek and Squaw Creek were based upon stage-discharge relationships developed for Papillion Creek at the mouth of each stream.

Starting WSELs for the restudy of the Platte River were obtained from the stage-probability plots, combining the open-water (free flow) stage-frequency and the ice-affected stage-frequency.

The WSELs on those streams studied by approximate methods in the incorporated Cities of Bellevue, Papillion, and La Vista were determined by normal-depth computations.

Roughness coefficients (Manning’s “n”) for the Missouri River and the Elkhorn River were assigned so the computed water surface profiles would match previously obtained high water marks and stream gaging stations. Roughness coefficients for Buffalo Creek and Springfield Creek were estimated by field inspection at each cross section. Roughness coefficients (Manning's "n") for the Platte River were determined according to calibration to available high water marks and to the USGS stream gages at Louisville and Ashland, Nebraska.

Roughness coefficients for Papillion Creek, Big Papillion Creek, and Betz Road Ditch were determined from field inspection and surface photography.

Roughness coefficients for Mud Creek and Squaw Creek were estimated by field inspection at each cross section.

Roughness coefficients for Walnut Creek, Midland Creek, West Midland Creek, and South Midland Creek were estimated by field inspection at each cross section.

The following table provides roughness coefficients used for each stream studied by detailed methods in the study.

Table 10 - Manning's "n" Values

| Stream | Berm "n" Value | Channel "n" Value | Overbank "n" Value |
|---|---|---|---|
| Betz Road Ditch | 0.035 | 0.020 | 0.040-0.080 |
| Elkhorn River | | 0.035 | 0.080-0.120 |
| Hell Creek | | 0.020-0.060 | 0.030-0.100 |
| Midland Creek | | 0.045-0.060 | 0.030-0.080 |
| Missouri River | | 0.017-0.025 | 0.035-0.15 |
| Mud Creek | | 0.017-0.040 | 0.035-0.10 |
| Papillion Creek/Big Papillion Creek | 0.035 | 0.024-0.032 | 0.065-0.075 |
| Platte River | | 0.017-0.025 | 0.050-0.095 |
| South Midland Creek | | 0.040 | 0.070-0.100 |
| South Papillion Creek | | 0.040-0.065 | 0.030-0.120 |
| Springfield Creek | | 0.030-0.045 | 0.050-0.100 |
| Squaw Creek | | 0.045 | 0.060-0.10 |
| Walnut Creek | | 0.040-0.055 | 0.040-0.080 |
| West Midland Creek | | 0.040 | 0.010-0.100 |
| West Papillion Creek | 0.035 | 0.028-0.06 | 0.040-0.100 |
| Unnamed Tributary of South Papillion Creek | | 0.050-0.055 | 0.030-0.100 |
| Unnamed Tributary of West Papillion Creek | | 0.040-0.065 | 0.040-0.060 |

The USACE has constructed Levee R-616 along the west bank of the Missouri River from the confluence of Papillion Creek upstream to State Highway 370. The USACE has certified that Levee R-616 has sufficient stability and freeboard to protect properties along the landward side from a 1-percent-annual-chance flood. The levee could be subject to overtopping and the area landward of the levee inundated during larger floods.

The USACE has performed interior drainage calculations and has determined 1-percent-annual-chance ponding elevations for areas along the landward side of Levee R-616. The ponding areas were delineated using topographic maps compiled by the USACE (Reference 38). The ponding areas were designated Zone AH with 1-percent-annual-chance elevations identified. The remaining areas protected from a 1-percent-annual-chance flood by Levee R-616 were removed from the SFHA designation and redesignated Zone X.

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 (Exhibit 2).

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

## 3.3 Vertical Datum

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

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in BFEs across the corporate limits between the communities. Data points used in computing the vertical datum conversion factor are shown in Table 11.

Table 11 - Vertical Datum Conversion

| Quad Name | Corner | Latitude | Longitude | Conversion from NGVD 29 to NAVD 88 |
|---|---|---|---|---|
| Wann | SE | 41.124 | 96.250 | +0.361 |
| Gretna | SE | 41.124 | 96.125 | +0.341 |
| Ralston | SE | 41.124 | 96.000 | +0.331 |
| Omaha South | SE | 41.124 | 95.875 | +0.312 |
| Ashland East | SE | 40.999 | 96.250 | +0.322 |
| Springfield | SE | 40.999 | 96.125 | +0.318 |
| Average | | | | +0.331 |

For the Platte and Elkhorn Rivers, the vertical datum conversion factor of 0.4 feet, which was previously determined in adjacent Douglas County, was used in this study. The average vertical datum conversion factor of 0.3 feet was used for all other streams in Sarpy County.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

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

## 4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS report 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, Floodway Data Table, and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

### 4.1 Floodplain Boundaries

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

#### 4.1.1 Methods for Revised Studies

For West Papillion Creek, Hell Creek, Midland Creek, South Papillion Creek, Unnamed South Papillion Creek Tributary, Unnamed West Papillion Creek Tributary, and Walnut Creek the floodplain boundaries were interpolated using triangulated irregular networks (TINs) and 2-foot contours created from the LiDAR data obtained in 2004 (Reference 1).

#### 4.1.2 Methods for Existing Studies

Between cross sections, the boundaries were interpolated using topographic maps at scales of and 1:2,400 (Reference 34) and 1:1,200 (Reference 35) with a contour interval of 2 feet for Squaw Creek. Topographic maps at a scale of 1:2,400 with a contour interval of 2 feet were used for the Missouri River (Reference 34), and topographic maps at a scale of 1:2,400 with a contour interval of 4 feet for Buffalo Creek and Springfield Creek were used (Reference 36). Topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 36) and topographic maps having a scale of

1:24,000 and a contour interval of 10 feet (Reference 37) were used for the non-revised reach of Midland Creek, West Midland Creek, and South Midland Creek. Topographic maps at a scale of 1:2,400 with a contour interval of two feet were used for Betz Road Ditch and Mud Creek (Reference 33). Topographic maps at a scale of 1:12,000 with a 10-foot contour interval were used for Papillion/Big Papillion Creek (Reference 39). Topographic maps at scales of 1:12,000, and 1:24,000, with a contour interval of 10 feet (Reference 42 were used for the sheet flow and ponding zones along Buffalo and Springfield Creek, and the streams studied by approximate methods. For the Platte and Elkhorn Rivers, USGS 7.5 minute quadrangle maps were used for base mapping (Reference 46). From U.S. Highway 75 through the Hawaiian Village development, spot ground elevations developed from photogrammetry by the Nebraska DNR were used to help delineate the flood boundaries. From Louisville to U.S. Interstate 80, topographic mapping at a scale of 1:4,800 with a contour interval of 4 feet was used (Reference 47). Upstream of U.S. Interstate 80, flood boundaries were determined between cross sections by the Nebraska Natural Resources Commission using photogrammetric methods.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, and AO), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards (Zone X). For West Papillion Creek, Hell Creek, , South Papillion Creek, Unnamed South Papillion Creek Tributary, Unnamed West Papillion Creek Tributary, Walnut Creek, and the revised reach of Midland Creek, the future-conditions 1-percent annual-chance floodplain correspond to the floodplains that are determined based on future-conditions hydrology (Zone X (Future Base Flood)). In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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

## 4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that

the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the FIRM were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 12). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 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 WSEL of the 1-percent-annual-chance flood more than 1.0 foot at any point.

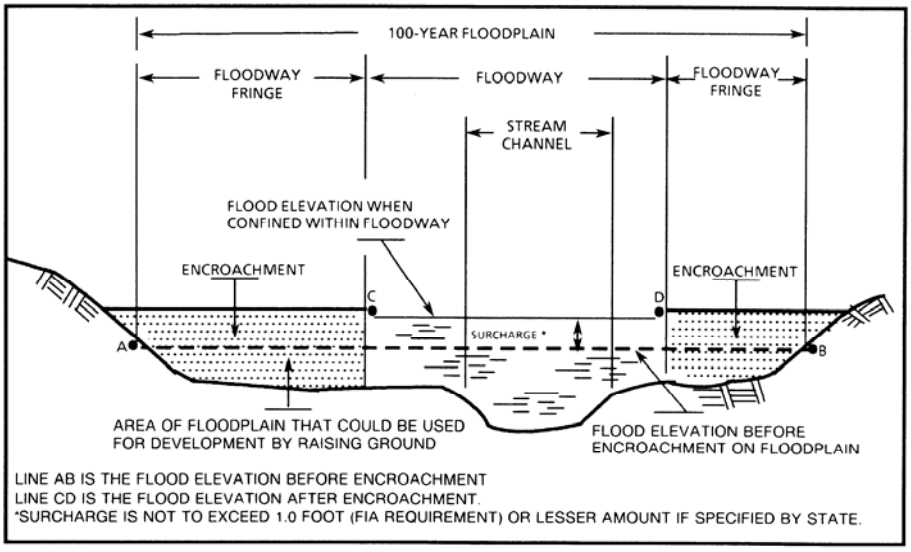



Figure 1 - Floodway Schematic

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BETZ ROAD DITCH | | | | | | | | |
| A | 1,850 | 26 | 249 | 10.8 | 987.6 | 980.8[2] | 980.8 | 0.0 |
| B | 2,100 | 37 | 282 | 9.5 | 987.6 | 985.1[2] | 985.1 | 0.0 |
| C | 2,670 | 29 | 207 | 13.0 | 987.6 | 987.3[2] | 987.3 | 0.0 |
| D | 3,230 | 67 | 700 | 3.8 | 991.0 | 991.0 | 991.7 | 0.7 |
| E | 3,620 | 47 | 352 | 7.6 | 999.0 | 999.0 | 999.0 | 0.0 |
| F | 4,418 | 70 | 514 | 5.2 | 1,003.2 | 1,003.2 | 1,003.3 | 0.1 |
| G | 4,917 | 82 | 626 | 4.3 | 1,007.9 | 1,007.9 | 1,007.9 | 0.0 |
| H | 5,280 | 56 | 492 | 5.2 | 1,010.6 | 1,010.6 | 1,010.6 | 0.0 |
| I | 5,580 | 60 | 409 | 6.2 | 1,010.7 | 1,010.7 | 1,010.7 | 0.0 |
| J | 5,776 | 43 | 342 | 7.5 | 1,016.9 | 1,016.9 | 1,017.0 | 0.1 |
| K | 6,430 | 40 | 230 | 11.1 | 1,017.5 | 1,017.5 | 1,017.7 | 0.2 |
| L | 6,930 | 38 | 203 | 12.6 | 1,019.0 | 1,019.0 | 1,019.2 | 0.2 |
| M | 7,231 | 46 | 360 | 6.8 | 1,022.2 | 1,022.2 | 1,022.2 | 0.0 |
| N | 7,425 | 38 | 236 | 10.4 | 1,028.2 | 1,028.2 | 1,028.2 | 0.0 |
| O | 8,080 | 30 | 175 | 13.7 | 1,035.7 | 1,035.7 | 1,035.7 | 0.0 |
| P | 8,770 | 95 | 151 | 7.2 | 1,050.0 | 1,050.0 | 1,050.5 | 0.5 |
| Q | 9,280 | 119 | 199 | 5.4 | 1,056.4 | 1,056.4 | 1,056.4 | 0.0 |

[1]Feet above confluence with Papillion Creek
[2]Elevation computed without consideration of backwater effects from Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# BETZ ROAD DITCH

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BETZ ROAD DITCH (Continued) | | | | | | | | |
| R | 10,044 | 110 | 464 | 3.1 | 1,057.6 | 1,057.6 | 1,058.2 | 0.6 |
| S | 10,696 | 47 | 188 | 7.4 | 1,059.6 | 1,059.6 | 1,059.7 | 0.1 |
| T | 11,292 | 30 | 220 | 3.6 | 1,073.1 | 1,073.1 | 1,073.6 | 0.5 |
| U | 11,475 | 25 | 176 | 4.5 | 1,073.2 | 1,073.2 | 1,073.8 | 0.6 |

[1]Feet above confluence with Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# BETZ ROAD DITCH

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BUFFALO CREEK | | | | | | | | |
| A | 9,082 | 350 | 2,865 | 7.3 | 1,031.2 | 1,031.2 | 1,032.1 | 0.9 |
| B | 9,502 | 200 | 2,322 | 9.0 | 1,031.8 | 1,031.8 | 1,032.8 | 1.0 |
| C | 9,952 | 289 | 2,934 | 7.2 | 1,033.6 | 1,033.6 | 1,034.2 | 0.6 |
| D | 10,542 | 154 | 1,867 | 11.2 | 1,034.2 | 1,034.2 | 1,034.8 | 0.6 |
| E | 11,652 | 279 | 4,106 | 5.1 | 1,037.3 | 1,037.3 | 1,038.3 | 1.0 |
| F | 12,342 | 150 | 2,168 | 9.7 | 1,037.7 | 1,037.7 | 1,038.7 | 1.0 |
| G | 13,232 | 168 | 2,440 | 8.6 | 1,039.9 | 1,039.9 | 1,040.5 | 0.6 |
| H | 13,352 | 168 | 2,471 | 8.5 | 1,040.1 | 1,040.1 | 1,040.6 | 0.5 |
| I | 13,542 | 213 | 3,697 | 5.7 | 1,042.0 | 1,042.0 | 1,042.5 | 0.5 |
| J | 15,102 | 330 | 2,151 | 9.8 | 1,042.7 | 1,042.7 | 1,043.3 | 0.6 |
| K | 16,122 | 205 | 2,269 | 9.3 | 1,045.7 | 1,045.7 | 1,045.9 | 0.2 |
| L | 16,902 | 150 | 1,940 | 10.8 | 1,046.7 | 1,046.7 | 1,047.3 | 0.6 |
| M | 17,382 | 150 | 2,309 | 9.1 | 1,048.2 | 1,048.2 | 1,049.1 | 0.9 |
| N | 17,912 | 150 | 1,892 | 11.2 | 1,050.1 | 1,050.1 | 1,050.8 | 0.7 |
| O | 18,252 | 177 | 2,528 | 8.4 | 1,052.3 | 1,052.3 | 1,052.8 | 0.5 |
| P | 18,472 | 239 | 2,836 | 7.8 | 1,054.3 | 1,054.3 | 1,054.8 | 0.5 |
| Q | 18,612 | 232 | 2,816 | 7.8 | 1,054.5 | 1,054.5 | 1,055.0 | 0.5 |

[1]Feet above confluence with Platte River

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# BUFFALO CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BUFFALO CREEK (Continued) | | | | | | | | |
| R | 19,832 | 196 | 2,362 | 9.1 | 1,056.3 | 1,056.3 | 1,057.0 | 0.7 |
| S | 20,932 | 274 | 2,326 | 9.3 | 1,058.0 | 1,058.0 | 1,058.8 | 0.8 |
| T | 21,852 | 262 | 2,372 | 9.2 | 1,060.1 | 1,060.1 | 1,061.1 | 1.0 |
| U | 22,062 | 500 | 4,501 | 4.9 | 1,062.9 | 1,062.9 | 1,063.9 | 1.0 |
| V | 23,422 | 672 | 4,716 | 4.6 | 1,064.5 | 1,064.5 | 1,065.2 | 0.7 |
| W | 23,812 | 576 | 4,146 | 4.3 | 1,065.3 | 1,065.3 | 1,066.0 | 0.6 |
| X | 24,542 | 548 | 2,603 | 6.9 | 1,066.4 | 1,066.4 | 1,067.0 | 0.6 |
| Y | 25,112 | 525 | 3,218 | 5.6 | 1,067.7 | 1,067.7 | 1,068.7 | 1.0 |
| Z | 25,932 | 628 | 4,015 | 4.5 | 1,069.7 | 1,069.7 | 1,070.5 | 0.8 |
| AA | 26,902 | 431 | 3,088 | 5.8 | 1,071.0 | 1,071.0 | 1,071.7 | 0.7 |
| AB | 27,932 | 162 | 2,134 | 8.4 | 1,072.4 | 1,072.4 | 1,073.1 | 0.7 |
| AC | 28,302 | 164 | 1,753 | 10.2 | 1,073.0 | 1,073.0 | 1,073.6 | 0.6 |
| AD | 28,842 | 328 | 2,262 | 6.8 | 1,074.5 | 1,074.5 | 1,075.3 | 0.8 |
| AE | 29,032 | 150 | 2,100 | 7.3 | 1,076.0 | 1,076.0 | 1,076.9 | 0.9 |
| AF | 29,392 | 150 | 1,912 | 8.0 | 1,076.3 | 1,076.3 | 1,077.2 | 0.9 |
| AG | 29,812 | 230 | 1,735 | 8.8 | 1,077.2 | 1,077.2 | 1,077.9 | 0.7 |

[1]Feet above confluence with Platte River

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BUFFALO CREEK (Continued) | | | | | | | | |
| AH | 30,382 | 380 | 2,822 | 5.4 | 1,079.0 | 1,079.0 | 1,079.8 | 0.8 |
| AI | 30,832 | 324 | 1,961 | 7.7 | 1,079.9 | 1,079.9 | 1,080.6 | 0.7 |
| AJ | 31,402 | 373 | 3,349 | 4.2 | 1,082.3 | 1,082.3 | 1,083.2 | 0.9 |
| AK | 32,182 | 168 | 1,706 | 8.3 | 1,083.0 | 1,083.0 | 1,083.8 | 0.8 |
| AL | 32,732 | 150 | 1,358 | 10.5 | 1,083.8 | 1,083.8 | 1,084.7 | 0.9 |
| AM | 34,002 | 348 | 2,476 | 5.8 | 1,088.3 | 1,088.3 | 1,088.5 | 0.2 |
| AN | 34,322 | 354 | 2,604 | 5.5 | 1,088.6 | 1,088.6 | 1,088.9 | 0.3 |
| AO | 34,512 | 174 | 1,744 | 6.8 | 1,090.5 | 1,090.5 | 1,090.8 | 0.3 |
| AP | 34,842 | 203 | 2,159 | 5.5 | 1,090.8 | 1,090.8 | 1,091.3 | 0.5 |
| AQ | 35,312 | 187 | 1,617 | 7.4 | 1,091.1 | 1,091.1 | 1,091.6 | 0.5 |
| AR | 36,222 | 150 | 1,479 | 8.0 | 1,092.6 | 1,092.6 | 1,093.5 | 0.9 |
| AS | 36,792 | 154 | 1,364 | 8.7 | 1,093.9 | 1,093.9 | 1,094.7 | 0.8 |
| AT | 37,282 | 150 | 1,290 | 9.2 | 1,095.1 | 1,095.1 | 1,095.8 | 0.7 |
| AU | 37,902 | 152 | 1,547 | 7.2 | 1,097.5 | 1,097.5 | 1,098.0 | 0.5 |
| AV | 37,952 | 152 | 1,573 | 6.9 | 1,097.7 | 1,097.7 | 1,098.2 | 0.5 |
| AW | 38,132 | 240 | 1,507 | 7.2 | 1,100.2 | 1,100.2 | 1,101.2 | 1.0 |
| AX | 38,752 | 270 | 2,275 | 4.7 | 1,102.0 | 1,102.0 | 1,103.0 | 1.0 |

[1]Feet above confluence with Platte River

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# BUFFALO CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| BUFFALO CREEK (Continued) | | | | | | | | |
| AY | 39,342 | 252 | 1,932 | 5.6 | 1,102.8 | 1,102.8 | 1,103.5 | 0.7 |
| AZ | 40,032 | 220 | 1,805 | 5.9 | 1,103.5 | 1,103.5 | 1,104.4 | 0.9 |
| BA | 40,562 | 252 | 979 | 6.0 | 1,104.4 | 1,104.4 | 1,105.3 | 0.9 |
| BB | 40,852 | 159 | 1,035 | 5.7 | 1,105.6 | 1,105.6 | 1,106.1 | 0.5 |

[1]Feet above confluence with Platte River

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2,3] (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY[4] (FEET NAVD) | WITH FLOODWAY[4] (FEET NAVD) | INCREASE (FEET) |
| ELKHORN RIVER | | | | | | | | |
| AH | 3,028 | 10,890/5,650 | 49,506 | 3.8 | 1,087.1 | 1,083.1 | 1,084.1 | 1.0 |
| AI | 7,766 | 10,800/5,650 | 56,963 | 3.3 | 1,091.1 | 1,087.7 | 1,088.6 | 0.9 |
| AJ | 11,215 | 9,300/4,170 | 53,761 | 3.5 | 1,093.8 | 1,090.3 | 1,091.3 | 1.0 |
| AK | 15,267 | 5,237/4,290 | 30,219 | 6.2 | 1,096.3 | 1,094.0 | 1,094.6 | 0.6 |
| AL | 18,338 | 5,807/4,300 | 34,714 | 5.4 | 1,098.1 | 1,096.9 | 1,097.4 | 0.5 |
| AM | 24,352 | 9,061/7,300 | 41,086 | 4.6 | 1,100.7 | 1,099.9 | 1,100.2 | 0.3 |

[1]Feet above confluence with Platte River
[2]Combined floodway width of Platte River and Elkhorn River
[3]Total width/width within Sarpy County
[4]Elevation computed including ice jam effects

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# ELKHORN RIVER

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| HELL CREEK | | | | | | | | | |
| A | 2,005 | 246 | 1,098 | 5.2 | 1,036.6 | 1,036.6 | 1,037.2 | 0.6 | 1,037.6 |
| B | 2,697 | 50 | 610 | 9.4 | 1,039.5 | 1,039.5 | 1,039.9 | 0.4 | 1,039.6 |
| C | 3,540 | 71 | 667 | 8.6 | 1,043.1 | 1,043.1 | 1,043.2 | 0.1 | 1,043.2 |
| D | 4,495 | 41 | 600 | 9.6 | 1,045.5 | 1,045.5 | 1,045.6 | 0.1 | 1,045.6 |
| E | 5,221 | 101 | 842 | 6.8 | 1,048.0 | 1,048.0 | 1,048.0 | 0.0 | 1,048.1 |

[1]Feet above confluence with West Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# HELL CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| MIDLAND CREEK | | | | | | | | | |
| A | 3,065 | 46 | 387 | 5.9 | 1,010.9[2] | 1,007.6[3] | 1,007.6 | 0.0 | 1,008.0 |
| B | 3,392 | 57 | 366 | 6.3 | 1,010.9[2] | 1,008.9[3] | 1,008.9 | 0.0 | 1,009.3 |
| C | 3,834 | 84[4] | 464 | 4.9 | 1,011.3 | 1,011.3 | 1,011.3 | 0.0 | 1,011.7 |
| D | 4,635 | 57 | 434 | 4.6 | 1,013.8 | 1,013.8 | 1,013.8 | 0.0 | 1,014.2 |
| E | 5,165 | 44 | 320 | 6.2 | 1,015.4 | 1,015.4 | 1,015.4 | 0.0 | 1,015.9 |
| F | 5,837 | 142 | 388 | 6.7 | 1,028.5 | 1,028.5 | 1,028.5 | 0.0 | 1,029.2 |
| G | 6,439 | 112 | 271 | 9.1 | 1,030.6 | 1,030.6 | 1,030.6 | 0.0 | 1,031.2 |
| H | 6,750 | 207 | 935 | 3.9 | 1,030.8 | 1,030.8 | 1,031.6 | 0.8 | |
| I | 7,205 | 57 | 362 | 9.9 | 1,032.1 | 1,032.1 | 1,032.5 | 0.4 | |
| J | 7,685 | 62 | 514 | 6.9 | 1,034.5 | 1,034.5 | 1,035.5 | 1.0 | |
| K | 8,470 | 53 | 288 | 5.6 | 1,036.7 | 1,036.7 | 1,037.7 | 1.0 | |
| L | 8,995 | 38 | 198 | 8.1 | 1,039.4 | 1,039.4 | 1,039.5 | 0.1 | |
| M | 9,735 | 36 | 183 | 7.7 | 1,044.2 | 1,044.2 | 1,044.2 | 0.0 | |
| N | 10,105 | 34 | 177 | 8.5 | 1,046.5 | 1,046.5 | 1,046.5 | 0.0 | |
| O | 10,530 | 45 | 233 | 6.9 | 1,049.3 | 1,049.3 | 1,049.4 | 0.1 | |
| P | 10,990 | 49 | 233 | 7.3 | 1,051.5 | 1,051.5 | 1,051.5 | 0.0 | |

[1]Feet above confluence with West Papillion Creek
[2]Elevation computed with consideration of backwater effects from West Papillion Creek condition without right levee
[3]Elevation computed without consideration of backwater effects from West Papillion Creek
[4]This value reflects the mapped width. This value differs from the modeled width which has been adjusted for skew.

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# MIDLAND CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2] (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| MISSOURI RIVER | | | | | | | | |
| A | 3,114,134 | 3,022 | 34,701 | 5.5 | 966.3 | 966.3 | 967.0 | 0.7 |
| B | 3,146,405 | 3,007 | 32,775 | 5.8 | 966.4 | 966.4 | 967.0 | 0.6 |
| C | 3,149,309 | 2,962 | 35,426 | 5.4 | 966.9 | 966.9 | 967.6 | 0.7 |
| D | 3,152,117 | 2,991 | 36,572 | 5.2 | 966.9 | 966.9 | 967.9 | 1.0 |
| E | 3,155,117 | 2,991 | 36,828 | 5.2 | 968.0 | 968.0 | 968.5 | 0.5 |
| F | 3,158,865 | 3,022 | 34,555 | 5.5 | 968.5 | 968.5 | 969.0 | 0.5 |
| G | 3,161,875 | 3,043 | 34,304 | 5.5 | 968.5 | 968.5 | 969.5 | 1.0 |
| H | 3,163,935 | 3,049 | 34,887 | 5.5 | 968.9 | 968.9 | 969.7 | 0.8 |
| I | 3,165,835 | 3,041 | 34,271 | 5.5 | 969.7 | 969.7 | 970.1 | 0.4 |
| J | 3,167,950 | 3,009 | 37,956 | 5.0 | 970.3 | 970.3 | 970.6 | 0.3 |
| K | 3,169,795 | 3,082 | 37,715 | 5.0 | 970.4 | 970.4 | 971.0 | 0.6 |
| L | 3,171,750 | 3,006 | 36,087 | 5.3 | 970.5 | 970.5 | 971.2 | 0.7 |
| M | 3,173,755 | 3,354 | 38,105 | 5.0 | 970.7 | 970.7 | 971.4 | 0.7 |
| N | 3,175,655 | 2,756 | 34,316 | 5.5 | 970.9 | 970.9 | 971.7 | 0.8 |
| O | 3,177,715 | 2,630 | 34,238 | 5.6 | 971.4 | 971.4 | 971.9 | 0.5 |
| P | 3,179,720 | 2,416 | 29,318 | 6.5 | 971.7 | 971.7 | 971.9 | 0.2 |
| Q | 3,181,675 | 2,684 | 31,007 | 6.1 | 971.8 | 971.8 | 972.4 | 0.6 |

[1]Feet above mouth
[2]Width extends beyond county boundary

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# MISSOURI RIVER

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2] (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| MISSOURI RIVER (Continued) | | | | | | | | |
| R | 3,182,785 | 3,287 | 38,888 | 4.9 | 972.0 | 972.0 | 972.8 | 0.8 |
| S | 3,184,845 | 3,350 | 40,092 | 4.7 | 973.2 | 973.2 | 973.3 | 0.1 |
| T | 3,187,695 | 3,540 | 40,801 | 4.7 | 973.4 | 973.4 | 973.9 | 0.5 |
| U | 3,200,894 | 3,430 | 43,506 | 4.4 | 975.1 | 975.1 | 975.6 | 0.5 |
| V | 3,208,762 | 3,430 | 40,613 | 4.7 | 976.5 | 976.5 | 976.8 | 0.3 |
| W | 3,214,517 | 4,095 | 51,385 | 3.7 | 977.2 | 977.2 | 978.1 | 0.9 |
| X | 3,217,738 | 3,240 | 42,301 | 4.5 | 977.8 | 977.8 | 978.6 | 0.8 |
| Y | 3,220,166 | 3,450 | 26,820 | 7.1 | 977.8 | 977.8 | 978.6 | 0.8 |
| Z | 3,223,018 | 3,420 | 33,107 | 5.7 | 978.3 | 978.3 | 979.1 | 0.8 |

[1]Feet above mouth
[2]Width extends beyond county boundary

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# MISSOURI RIVER

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| MUD CREEK | | | | | | | | |
| A | 2,588 | 153 | 1,245 | 4.7 | 989.3 | 984.4[2] | 984.4 | 0.0 |
| B | 3,335 | 81 | 501 | 11.6 | 989.3 | 984.4[2] | 984.4 | 0.0 |
| C | 3,735 | 89 | 586 | 9.9 | 989.3 | 986.5[2] | 986.5 | 0.0 |
| D | 4,136 | 172 | 1,223 | 4.7 | 989.3 | 989.3 | 989.3 | 0.0 |
| E | 4,536 | 197 | 1,663 | 3.4 | 989.7 | 989.7 | 989.7 | 0.0 |
| F | 5,400 | 56 | 603 | 9.4 | 997.5 | 997.5 | 997.5 | 0.0 |
| G | 5,950 | 249 | 1,999 | 2.8 | 1,000.0 | 1,000.0 | 1,000.9 | 0.9 |
| H | 6,640 | 355 | 1,898 | 2.6 | 1,000.8 | 1,000.8 | 1,001.8 | 1.0 |
| I | 6,980 | 126 | 940 | 4.7 | 1,001.3 | 1,001.3 | 1,002.2 | 0.9 |
| J | 7,110 | 77 | 375 | 11.7 | 1,003.8 | 1,003.8 | 1,003.8 | 0.0 |
| K | 8,195 | 75 | 548 | 8.0 | 1,010.3 | 1,010.3 | 1,010.4 | 0.1 |
| L | 9,695 | 188 | 652 | 6.4 | 1,020.4 | 1,020.4 | 1,020.6 | 0.2 |
| M | 10,295 | 200 | 1,006 | 4.0 | 1,021.4 | 1,021.4 | 1,022.3 | 0.9 |
| N | 10,630 | 290 | 1,556 | 2.6 | 1,022.0 | 1,022.0 | 1,022.7 | 0.7 |
| O | 11,305 | 305 | 539 | 4.6 | 1,022.1 | 1,022.1 | 1,023.0 | 0.9 |
| P | 11,485 | 215 | 330 | 7.4 | 1,023.6 | 1,023.6 | 1,024.1 | 0.5 |
| Q | 12,000 | 268 | 1,044 | 3.5 | 1,025.1 | 1,025.1 | 1,025.8 | 0.7 |

[1]Feet above confluence with Papillion Creek
[2]Elevation computed without consideration of backwater effects from Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# MUD CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| MUD CREEK (Continued) | | | | | | | | |
| R | 12,400 | 230 | 849 | 4.2 | 1,026.9 | 1,026.9 | 1,027.0 | 0.1 |
| S | 12,580 | 152 | 430 | 8.2 | 1,027.2 | 1,027.2 | 1,027.8 | 0.6 |
| T | 13,450 | 200 | 1,151 | 2.9 | 1,031.8 | 1,031.8 | 1,032.7 | 0.9 |
| U | 13,990 | 198 | 864 | 3.7 | 1,032.0 | 1,032.0 | 1,033.0 | 1.0 |
| V | 14,590 | 163 | 641 | 4.8 | 1,033.0 | 1,033.0 | 1,033.6 | 0.6 |
| W | 15,200 | 145 | 756 | 3.8 | 1,034.3 | 1,034.3 | 1,034.6 | 0.3 |
| X | 15,900 | 106 | 349 | 4.6 | 1,037.8 | 1,037.8 | 1,037.8 | 0.0 |
| Y | 16,460 | 101 | 189 | 7.9 | 1,037.9 | 1,037.9 | 1,038.4 | 0.5 |
| Z | 17,090 | 131 | 376 | 6.4 | 1,041.0 | 1,041.0 | 1,041.0 | 0.0 |
| AA | 18,100 | 136 | 614 | 3.3 | 1,045.8 | 1,045.8 | 1,046.6 | 0.8 |
| AB | 18,510 | 122 | 491 | 3.8 | 1,046.5 | 1,046.5 | 1,047.2 | 0.7 |
| AC | 19,160 | 100 | 246 | 6.7 | 1,048.8 | 1,048.8 | 1,049.0 | 0.2 |
| AD | 20,290 | 204 | 896 | 1.6 | 1,054.5 | 1,054.5 | 1,054.7 | 0.2 |
| AE | 20,800 | 293 | 1,099 | 1.2 | 1,054.7 | 1,054.7 | 1,054.9 | 0.2 |
| AF | 21,280 | 222 | 586 | 2.1 | 1,054.9 | 1,054.9 | 1,055.1 | 0.2 |
| AG | 21,750 | 60 | 171 | 6.8 | 1,056.2 | 1,056.2 | 1,056.4 | 0.2 |
| AH | 22,300 | 60 | 159 | 6.9 | 1,059.0 | 1,059.0 | 1,059.6 | 0.6 |
| AI | 22,470 | 60 | 194 | 5.7 | 1,059.5 | 1,059.5 | 1,060.5 | 1.0 |

[1]Feet above confluence with Papillion Creek

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# MUD CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PAPILLION CREEK / BIG PAPILLION CREEK | | | | | | | | |
| A | 28,830 | 353 | 5,400 | 6.9 | 984.7 | 984.7 | 985.3 | 0.6 |
| B | 29,770 | 1,480 | 22,165 | 1.7 | 986.3 | 986.3 | 986.8 | 0.5 |
| C | 31,750 | 1,100 | 13,177 | 2.9 | 986.4 | 986.4 | 987.0 | 0.6 |
| D | 33,400 | 658 | 8,192 | 4.6 | 986.5 | 986.5 | 987.3 | 0.8 |
| E | 33,880 | 1,400 | 15,942 | 2.3 | 987.3 | 987.3 | 988.0 | 0.7 |
| F | 36,300 | 1,950 | 21,700 | 1.7 | 987.8 | 987.8 | 988.5 | 0.7 |
| G | 38,080 | 1,180[2] | 14,736 | 2.5 | 989.4 | 989.4 | 990.0 | 0.6 |
| H | 39,270 | 2,325 | 24,848 | 1.5 | 989.5 | 989.5 | 990.4 | 0.9 |
| I | 41,240 | 1,907 | 23,640 | 1.6 | 989.6 | 989.6 | 990.5 | 0.9 |
| J | 42,790 | 1,506 | 15,090 | 3.0 | 990.8 | 989.8[3] | 990.8 | 1.0 |
| K | 45,200 | 510 | 5,320 | 4.2 | 992.6 | 990.7[3] | 991.5 | 0.8 |
| L | 46,000 | 652 | 7,558 | 3.0 | 993.4 | 991.1[3] | 991.8 | 0.7 |
| M | 47,240 | 2,181 | 17,264 | 1.4 | 993.4 | 992.7[4] | 993.2 | 0.5 |
| N | 48,420 | 2,665 | 21,385 | 1.1 | 993.4 | 992.8[4] | 993.3 | 0.5 |
| O | 50,635 | 2,997 | 22,276 | 1.1 | 993.4 | 992.9[4] | 993.5 | 0.6 |
| P | 51,735 | 3,202 | 25,785 | 1.0 | 993.4 | 992.9[4] | 993.6 | 0.7 |

[1]Feet above confluence with Missouri River
[2]Width does not include Mud Creek floodway
[3]Elevation computed without consideration of flooding controlled by West Papillion Creek
[4]Elevation computed without consideration of backwater effects from West Papillion Creek

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# PAPILLION CREEK / BIG PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PAPILLION CREEK / BIG PAPILLION CREEK (Continued) | | | | | | | | |
| Q | 53,600 | 2,567 | 22,475 | 1.2 | 993.5 | 993.5 | 994.2 | 0.7 |
| R | 55,730 | 2,845 | 21,699 | 1.3 | 993.7 | 993.7 | 994.4 | 0.7 |
| S | 56,900 | 2,646 | 19,525 | 1.5 | 993.8 | 993.8 | 994.6 | 0.8 |
| T | 58,050 | 3,037 | 20,085 | 1.5 | 994.0 | 994.0 | 994.8 | 0.8 |
| U | 60,370 | 3,435 | 22,655 | 1.4 | 994.6 | 994.6 | 995.5 | 0.9 |
| V | 62,440 | 3,048 | 14,140 | 2.2 | 996.0 | 996.0 | 996.6 | 0.6 |
| W | 64,020 | 2,504 | 12,628 | 2.6 | 996.8 | 996.8 | 997.6 | 0.8 |

[1]Feet above confluence with Missouri River

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# PAPILLION CREEK / BIG PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2] (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PLATTE RIVER | | | | | | | | |
| A | 8,150 | 5,664/1,898 | 43,284 | 5.8 | 966.0 | 965.9[3] | 966.2 | 0.3 |
| B | 16,330 | 2,369/775 | 33,133 | 7.5 | 975.9 | 975.9 | 975.9 | 0.0 |
| C | 20,490 | 2,369/775 | 22,971 | 10.9 | 976.7 | 976.7 | 977.0 | 0.3 |
| D | 23,200 | 2,982/2,982 | 38,745 | 6.5 | 978.7 | 978.7 | 979.1 | 0.4 |
| E | 32,530 | 4,666/3,410 | 54,138 | 4.6 | 986.7 | 986.7 | 987.6 | 0.9 |
| F | 39,250 | 1,301/905 | 18,016 | 13.9 | 988.7 | 988.7 | 989.0 | 0.3 |
| G | 45,270 | 2,132/695 | 31,496 | 7.9 | 994.4 | 994.4 | 995.1 | 0.7 |
| H | 54,970 | 2,644/1,600 | 22,117 | 11.3 | 998.2 | 998.2 | 998.7 | 0.5 |
| I | 60,510 | 2,560/1,550 | 30,082 | 8.3 | 1,004.9 | 1,004.9 | 1,005.3 | 0.4 |
| J | 69,950 | 2,460/1,700 | 26,117 | 9.6 | 1,010.5 | 1,010.5 | 1,010.7 | 0.2 |
| K | 79,530 | 3,091/2,500 | 24,563 | 10.2 | 1,016.1 | 1,016.1 | 1,016.3 | 0.2 |
| L | 83,470 | 2,579/1,660 | 25,835 | 9.7 | 1,019.5 | 1,019.5 | 1,019.7 | 0.2 |
| M | 88,670 | 2,475/1,300 | 38,362 | 6.5 | 1,027.1 | 1,027.1 | 1,027.7 | 0.6 |
| N | 92,245 | 2,410/1,380 | 27,446 | 9.1 | 1,027.7 | 1,027.7 | 1,028.1 | 0.4 |
| O | 97,370 | 1,812/1,040 | 20,251 | 12.3 | 1,029.8 | 1,029.8 | 1,030.3 | 0.5 |
| P | 99,720 | 2,123/1,205 | 26,637 | 9.4 | 1,032.0 | 1,032.0 | 1,032.9 | 0.9 |
| Q | 102,720 | 2,286/1,400 | 23,831 | 10.5 | 1,033.9 | 1,033.9 | 1,034.4 | 0.5 |

[1]Feet above confluence with Missouri River
[2]Total width/width within Sarpy County
[3]Elevation computed without consideration of backwater effects from Missouri River

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# PLATTE RIVER (WITH LEVEE)

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2] (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| PLATTE RIVER (Continued) | | | | | | | | |
| R | 105,845 | 2,277/1,500 | 20,304 | 12.3 | 1,035.7 | 1,035.7 | 1,036.3 | 0.6 |
| S | 110,420 | 1,593/605 | 20,306 | 12.3 | 1,041.2 | 1,041.2 | 1,041.3 | 0.1 |
| T | 114,570 | 2,043/845 | 30,843 | 8.1 | 1,045.7 | 1,045.7 | 1,046.4 | 0.7 |
| U | 117,295 | 2,533/1,380 | 34,716 | 7.2 | 1,047.3 | 1,047.3 | 1,047.9 | 0.7 |
| V | 119,895 | 2,463/1,550 | 29,335 | 8.5 | 1,048.5 | 1,048.5 | 1,049.0 | 0.5 |
| W | 123,770 | 2,877/2,020 | 32,447 | 7.7 | 1,052.2 | 1,052.2 | 1,052.5 | 0.3 |
| X | 126,970 | 3,425/2,350 | 39,766 | 6.3 | 1,054.2 | 1,054.2 | 1,055.1 | 0.9 |
| Y | 133,170 | 3,886/2,795 | 44,607 | 5.6 | 1,059.3 | 1,059.3 | 1,059.6 | 0.3 |
| Z | 139,370 | 8,066/4,140 | 61,338 | 3.0 | 1,061.5 | 1,061.5 | 1,061.9 | 0.4 |
| AA | 143,170 | 9,100/5,700 | 60,079 | 3.1 | 1,062.7 | 1,062.7 | 1,063.2 | 0.5 |
| AB | 148,570 | 14,100/10,600 | 74,005 | 2.5 | 1,067.4 | 1,067.4[3] | 1,068.2[3] | 0.8 |
| AC | 152,620 | 13,700/11,950 | 91,680 | 2.0 | 1,069.9 | 1,068.8[3] | 1,069.5[3] | 0.7 |
| AD | 158,720 | 12,550/12,005 | 63,720 | 2.9 | 1,074.2 | 1,071.4[3] | 1,072.4[3] | 1.0 |
| AE | 161,820 | 12,106/11,198 | 62,293 | 3.0 | 1,078.0 | 1,074.3[3] | 1,075.3[3] | 1.0 |
| AF | 167,570 | 10,400/6,900 | 56,687 | 3.3 | 1,081.4 | 1,078.1[3] | 1,078.9[3] | 0.8 |
| AG | 170,620 | 11,300/5,905 | 53,407 | 3.5 | 1,085.2 | 1,080.6[3] | 1,081.6[3] | 1.0 |
| AH | 173,970 | 10,890/5,650 | 49,506 | 3.8 | 1,087.1 | 1,083.1[3] | 1,084.1[3] | 1.0 |

[1]Feet above confluence with Missouri River
[2]Total width/width within Sarpy County
[3]Elevation computed including ice jam effects

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# PLATTE RIVER (WITH LEVEE)

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY[3] (FEET NAVD) | INCREASE (FEET) |
| PLATTE RIVER (continued) | | | | | | | | |
| AI | 179,595[1] | 10,800/5,200[2] | 56,963 | 3.3 | 1,091.1 | 1,087.7[3] | 1,088.6[3] | 0.9 |
| AJ | 182,670[1] | 9,300/4,170[2] | 53,761 | 3.5 | 1,093.8 | 1,090.3[3] | 1,091.3[3] | 1.0 |
| AK | 186,870[1] | 5,237/4,290[2] | 30,219 | 6.2 | 1,096.3 | 1,094.0[3] | 1,094.6[3] | 0.6 |
| AL | 190,270[1] | 5,807/4,300[2] | 34,714 | 5.4 | 1,098.1 | 1,096.9[3] | 1,097.4[3] | 0.5 |
| AM | 193,720[1] | 9,061/7,300[2] | 41,086 | 4.6 | 1,100.7 | 1,099.9[3] | 1,100.2[3] | 0.3 |
| SOUTH MIDLAND CREEK | | | | | | | | |
| A | 385[4] | 44 | 207 | 9.2 | 1,037.0 | 1,037.0 | 1,037.0 | 0.0 |
| B | 765[4] | 61 | 294 | 6.5 | 1,039.4 | 1,039.4 | 1,040.1 | 0.7 |
| C | 1,200[4] | 56 | 302 | 6.3 | 1,040.8 | 1,040.8 | 1,041.7 | 0.9 |
| D | 1,590[4] | 72 | 387 | 4.9 | 1,042.7 | 1,042.7 | 1,043.0 | 0.3 |

[1]Feet above confluence with Missouri River
[2]Total width/width within Sarpy County
[3]Elevation computed including ice jam effects
[4]Feet above confluence with Midland Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# PLATTE RIVER (WITH LEVEE) / SOUTH MIDLAND CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| SOUTH PAPILLION CREEK | | | | | | | | | |
| A | 2,679 | 127 | 2,033 | 9.9 | 1,036.2 | 1,036.2 | 1,036.2 | 0.0 | 1,037.5 |
| B | 3,476 | 187 | 2,214 | 9.1 | 1,037.7 | 1,037.7 | 1,037.9 | 0.2 | 1,038.8 |
| C | 4,054 | 187 | 2,536 | 7.9 | 1,039.7 | 1,039.7 | 1,039.9 | 0.2 | 1,040.7 |
| D | 5,722 | 302 | 2,179 | 8.5 | 1,042.5 | 1,042.5 | 1,043.0 | 0.5 | 1,043.7 |
| E | 6,430 | 279 | 2,473 | 7.5 | 1,044.8 | 1,044.8 | 1,044.8 | 0.0 | 1,044.8 |
| F | 7,304 | 284 | 2,552 | 7.3 | 1,048.2 | 1,048.2 | 1,048.2 | 0.0 | 1,048.5 |
| G | 7,863 | 320 | 2,599 | 7.1 | 1,049.0 | 1,049.0 | 1,049.0 | 0.0 | 1,049.4 |
| H | 8,393 | 340 | 2,431 | 7.6 | 1,049.6 | 1,049.6 | 1,049.8 | 0.2 | 1,050.2 |
| I | 9,011 | 340 | 2,167 | 9.5 | 1,050.6 | 1,050.6 | 1,050.9 | 0.3 | 1,051.2 |
| J | 10,055 | 351[2] | 2,671 | 7.5 | 1,054.4 | 1,054.4 | 1,055.0 | 0.6 | 1,054.9 |
| K | 10,516 | 315 | 2,467 | 7.5 | 1,055.0 | 1,055.0 | 1,055.5 | 0.5 | 1,055.5 |
| L | 11,260 | 320 | 3,373 | 5.5 | 1,056.9 | 1,056.9 | 1,057.2 | 0.3 | 1,057.5 |
| M | 11,891 | 320 | 2,418 | 7.6 | 1,057.3 | 1,057.3 | 1,057.6 | 0.3 | 1,058.1 |
| N | 13,226 | 320 | 2,201 | 8.4 | 1,059.9 | 1,059.9 | 1,060.3 | 0.4 | 1,060.6 |
| O | 14,162 | 331 | 2,255 | 8.2 | 1,061.6 | 1,061.6 | 1,062.2 | 0.6 | 1,062.3 |
| P | 14,765 | 300 | 2,272 | 8.9 | 1,063.2 | 1,063.2 | 1,063.7 | 0.5 | 1,063.8 |

[1]Feet above confluence with West Papillion Creek
[2]This value reflects the mapped width. This value differs from the modeled width which has been adjusted for skew

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SOUTH PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| SOUTH PAPILLION CREEK | | | | | | | | | |
| Q | 15,409 | 300 | 2,885 | 6.4 | 1,065.8 | 1,065.8 | 1,065.8 | 0.0 | 1,066.6 |
| R | 16,362 | 340 | 2,714 | 6.8 | 1,066.7 | 1,066.7 | 1,067.2 | 0.5 | 1,067.5 |
| S | 17,445 | 260 | 2,525 | 6.8 | 1,068.0 | 1,068.0 | 1,068.7 | 0.7 | 1,068.6 |
| T | 18,052 | 170 | 2,635 | 6.5 | 1,068.9 | 1,068.9 | 1,069.6 | 0.7 | 1,069.5 |
| U | 19,369 | 110 | 2,053 | 8.4 | 1,072.2 | 1,072.2 | 1,072.6 | 0.4 | 1,073.4 |
| V | 20,419 | 164 | 2,869 | 6.0 | 1,073.9 | 1,073.9 | 1,074.3 | 0.4 | 1,075.0 |
| W | 20,899 | 250 | 2,926 | 7.3 | 1,084.1 | 1,084.1 | 1,084.1 | 0.0 | 1,084.7 |
| X | 21,492 | 300 | 3,428 | 5.6 | 1,085.3 | 1,085.3 | 1,085.6 | 0.3 | 1,086.0 |
| Y | 22,835 | 360 | 3,214 | 5.0 | 1,086.3 | 1,086.3 | 1,087.1 | 0.8 | 1,086.9 |
| Z | 23,972 | 380 | 3,199 | 5.0 | 1,087.4 | 1,087.4 | 1,088.3 | 0.9 | 1,088.0 |
| AA | 25,192 | 320 | 2,162 | 7.4 | 1,088.9 | 1,088.9 | 1,089.6 | 0.7 | 1,089.5 |
| AB | 26,681 | 260 | 1,892 | 8.0 | 1,092.2 | 1,092.2 | 1,092.5 | 0.3 | 1,092.7 |
| AC | 27,660 | 302 | 2,748 | 5.5 | 1,094.7 | 1,094.7 | 1,095.0 | 0.3 | 1,095.3 |
| AD | 29,230 | 271 | 1,860 | 9.7 | 1,096.6 | 1,096.6 | 1,096.9 | 0.3 | 1,097.2 |
| AE | 30,301 | 190 | 2,555 | 5.6 | 1,101.4 | 1,101.4 | 1,101.8 | 0.4 | 1,102.1 |
| AF | 31,346 | 209 | 1,764 | 8.0 | 1,102.6 | 1,102.6 | 1,102.9 | 0.3 | 1,103.4 |

[1]Feet above confluence with West Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SOUTH PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| SOUTH PAPILLION CREEK | | | | | | | | | |
| AG | 32,479 | 214 | 2,131 | 6.9 | 1,107.6 | 1,107.6 | 1,107.6 | 0.0 | 1,108.4 |
| AH | 33,423 | 300 | 2,200 | 6.9 | 1,110.4 | 1,110.4 | 1,110.4 | 0.0 | 1,111.7 |
| AI | 34,511 | 239 | 2,335 | 6.0 | 1,111.7 | 1,111.7 | 1,112.1 | 0.4 | 1,112.6 |
| AJ | 35,610 | 163 | 1,430 | 9.8 | 1,112.8 | 1,112.8 | 1,113.1 | 0.3 | 1,113.8 |
| AK | 36,638 | 267 | 1,610 | 8.7 | 1,118.4 | 1,118.4 | 1,118.4 | 0.0 | 1,119.4 |
| AL | 37,269 | 266 | 1,548 | 8.5 | 1,119.7 | 1,119.7 | 1,119.7 | 0.0 | 1,120.7 |
| AM | 37,903 | 204 | 1,871 | 5.9 | 1,121.5 | 1,121.5 | 1,121.6 | 0.1 | 1,122.4 |
| AN | 38,506 | 256 | 1,639 | 6.6 | 1,122.9 | 1,122.9 | 1,123.0 | 0.1 | 1,124.3 |
| AO | 40,132 | 355 | 2,515 | 4.2 | 1,130.0 | 1,130.0 | 1,130.5 | 0.5 | 1,130.3 |
| AP | 41,540 | 89 | 1,353 | 7.7 | 1,131.9 | 1,131.9 | 1,132.2 | 0.3 | 1,132.5 |
| AQ | 42,534 | 117 | 947 | 9.7 | 1,134.4 | 1,134.4 | 1,134.5 | 0.1 | 1,135.3 |
| AR | 43,552 | 85 | 1,182 | 7.8 | 1,138.6 | 1,138.6 | 1,138.6 | 0.0 | 1,139.5 |
| AS | 44,555 | 162[2] | 1,538 | 6.0 | 1,145.6 | 1,145.6 | 1,145.9 | 0.3 | 1,145.4 |
| AT | 45,573 | 330 | 1,264 | 5.3 | 1,150.0 | 1,150.0 | 1,150.2 | 0.2 | 1,150.1 |
| AU | 46,268 | 285 | 854 | 5.1 | 1,152.2 | 1,152.2 | 1,152.9 | 0.7 | 1,152.8 |
| AV | 47,080 | 290 | 1,840 | 2.4 | 1,161.1 | 1,161.1 | 1,161.1 | 0.0 | 1,162.9 |

[1]Feet above confluence with West Papillion Creek
[2]This value reflects the mapped width. This value differs from the modeled width which has been adjusted for skew

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SOUTH PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| SOUTH PAPILLION CREEK | | | | | | | | | |
| AW | 48,339 | 270 | 1,198 | 3.7 | 1,162.0 | 1,162.0 | 1,162.3 | 0.3 | 1,138.0 |
| AX | 49,028 | 242 | 648 | 6.8 | 1,164.6 | 1,164.6 | 1,164.6 | 0.0 | 1,165.0 |
| AY | 49,569 | 260 | 905 | 4.8 | 1,167.4 | 1,167.4 | 1,167.7 | 0.3 | 1,167.7 |
| AZ | 50,666 | 270 | 1,177 | 3.7 | 1,172.3 | 1,172.3 | 1,172.5 | 0.2 | 1,173.0 |
| BA | 51,084 | 270 | 1,510 | 3.6 | 1,176.7 | 1,176.7 | 1,176.9 | 0.2 | 1,177.0 |
| BB | 51,829 | 300 | 1,078 | 4.1 | 1,177.3 | 1,177.3 | 1,177.8 | 0.5 | 1,177.6 |
| BC | 52,275 | 300 | 1,070 | 5.3 | 1,178.9 | 1,178.9 | 1,179.1 | 0.2 | 1,179.2 |

[1]Feet above confluence with West Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SOUTH PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SPRINGFIELD CREEK | | | | | | | | |
| A | 9,300 | 225 | 1,923 | 8.8 | 1,027.6 | 1,027.6 | 1,028.4 | 0.8 |
| B | 9,730 | 223 | 1,717 | 9.9 | 1,028.8 | 1,028.8 | 1,029.6 | 0.8 |
| C | 10,160 | 237 | 2,202 | 7.7 | 1,031.3 | 1,031.3 | 1,031.9 | 0.6 |
| D | 10,760 | 248 | 2,115 | 6.6 | 1,032.5 | 1,032.5 | 1,033.5 | 1.0 |
| E | 11,020 | 242 | 1,927 | 7.2 | 1,033.0 | 1,033.0 | 1,033.9 | 0.9 |
| F | 11,330 | 194 | 1,562 | 8.8 | 1,033.7 | 1,033.7 | 1,034.5 | 0.8 |
| G | 11,595 | 363 | 2,477 | 5.5 | 1,034.8 | 1,034.8 | 1,035.8 | 1.0 |
| H | 11,895 | 348 | 2,043 | 6.7 | 1,035.4 | 1,035.4 | 1,036.3 | 0.9 |
| I | 12,550 | 375 | 2,326 | 5.8 | 1,037.5 | 1,037.5 | 1,038.4 | 0.9 |
| J | 12,855 | 364 | 2,571 | 5.2 | 1,038.7 | 1,038.7 | 1,039.6 | 0.9 |
| K | 13,150 | 309 | 2,593 | 5.1 | 1,039.3 | 1,039.3 | 1,040.2 | 0.9 |
| L | 13,230 | 341 | 3,019 | 4.4 | 1,039.7 | 1,039.7 | 1,040.6 | 0.9 |
| M | 13,515 | 505 | 3,139 | 4.2 | 1,040.0 | 1,040.0 | 1,040.9 | 0.9 |
| N | 13,705 | 310 | 2,045 | 6.5 | 1,040.3 | 1,040.3 | 1,041.2 | 0.9 |
| O | 13,935 | 210 | 1,908 | 6.9 | 1,041.6 | 1,041.6 | 1,042.6 | 1.0 |
| P | 14,283 | 352 | 3,092 | 4.4 | 1,042.9 | 1,042.9 | 1,043.7 | 0.8 |
| Q | 14,423 | 340 | 2,546 | 5.4 | 1,043.9 | 1,043.9 | 1,044.3 | 0.4 |

[1]Feet above confluence with Platte River

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SPRINGFIELD CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SPRINGFIELD CREEK (Continued) | | | | | | | | |
| R | 14,590 | 277 | 2,329 | 5.9 | 1,044.1 | 1,044.1 | 1,044.5 | 0.4 |
| S | 14,743 | 278 | 2,092 | 6.6 | 1,044.3 | 1,044.3 | 1,044.8 | 0.5 |
| T | 15,031 | 286 | 2,141 | 6.4 | 1,045.1 | 1,045.1 | 1,045.7 | 0.6 |
| U | 15,351 | 318 | 2,431 | 5.6 | 1,046.1 | 1,046.1 | 1,046.7 | 0.6 |
| V | 15,733 | 242 | 1,996 | 6.5 | 1,046.8 | 1,046.8 | 1,047.4 | 0.6 |
| W | 15,859 | 250 | 1,727 | 7.5 | 1,047.1 | 1,047.1 | 1,047.6 | 0.5 |
| X | 16,073 | 250 | 1,848 | 7.0 | 1,048.2 | 1,048.2 | 1,048.6 | 0.4 |
| Y | 16,255 | 200 | 1,774 | 7.3 | 1,048.5 | 1,048.5 | 1,049.3 | 0.8 |
| Z | 16,447 | 190 | 1,614 | 8.1 | 1,049.0 | 1,049.0 | 1,049.8 | 0.8 |
| AA | 16,587 | 310 | 2,243 | 5.8 | 1,050.4 | 1,050.4 | 1,051.0 | 0.6 |
| AB | 16,932 | 523 | 3,461 | 3.8 | 1,051.5 | 1,051.5 | 1,052.3 | 0.8 |
| AC | 17,085 | 339 | 2,321 | 5.6 | 1,051.9 | 1,051.9 | 1,052.4 | 0.5 |
| AD | 17,534 | 261 | 1,862 | 6.9 | 1,053.0 | 1,053.0 | 1,053.5 | 0.5 |
| AE | 17,947 | 213 | 1,581 | 8.1 | 1,054.7 | 1,054.7 | 1,054.9 | 0.2 |
| AF | 17,984 | 189 | 1,721 | 7.4 | 1,055.1 | 1,055.1 | 1,055.3 | 0.2 |
| AG | 18,107 | 230 | 2,187 | 5.9 | 1,055.5 | 1,055.5 | 1,056.1 | 0.6 |
| AH | 18,210 | 201 | 1,906 | 6.7 | 1,055.6 | 1,055.6 | 1,056.2 | 0.6 |

[1]Feet above confluence with Platte River

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SPRINGFIELD CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SPRINGFIELD CREEK (Continued) | | | | | | | | |
| Al | 18,275 | 181 | 1,805 | 7.1 | 1,055.6 | 1,055.6 | 1,056.3 | 0.7 |
| AJ | 18,462 | 265 | 2,507 | 5.1 | 1,056.4 | 1,056.4 | 1,057.1 | 0.7 |
| AK | 18,637 | 228 | 2,482 | 5.2 | 1,056.7 | 1,056.7 | 1,057.4 | 0.7 |
| AL | 18,849 | 220 | 2,367 | 5.4 | 1,057.0 | 1,057.0 | 1,057.6 | 0.6 |
| AM | 19,063 | 372 | 3,564 | 3.5 | 1,057.3 | 1,057.3 | 1,058.0 | 0.7 |
| AN | 19,120 | 390 | 4,082 | 3.1 | 1,057.4 | 1,057.4 | 1,058.1 | 0.7 |
| AO | 19,308 | 339 | 2,320 | 5.4 | 1,057.5 | 1,057.5 | 1,058.1 | 0.6 |
| AP | 19,587 | 225 | 1,540 | 8.2 | 1,057.5 | 1,057.5 | 1,058.3 | 0.8 |
| AQ | 19,721 | 274 | 2,099 | 5.7 | 1,060.2 | 1,060.2 | 1,060.2 | 0.0 |
| AR | 19,971 | 274 | 1,977 | 6.1 | 1,060.4 | 1,060.4 | 1,060.5 | 0.1 |
| AS | 20,506 | 130 | 1,382 | 5.1 | 1,061.2 | 1,061.2 | 1,061.8 | 0.6 |
| AT | 20,671 | 115 | 1,288 | 5.5 | 1,061.5 | 1,061.5 | 1,062.1 | 0.6 |
| AU | 21,411 | 89 | 1,014 | 7.1 | 1,062.3 | 1,062.3 | 1,062.8 | 0.5 |
| AV | 21,721 | 86 | 942 | 7.6 | 1,062.7 | 1,062.7 | 1,063.2 | 0.5 |
| AW | 21,921 | 106 | 884 | 8.3 | 1,063.4 | 1,063.4 | 1,063.9 | 0.5 |
| AX | 22,421 | 136 | 969 | 7.6 | 1,064.9 | 1,064.9 | 1,065.5 | 0.6 |
| AY | 22,571 | 150 | 874 | 8.5 | 1,065.6 | 1,065.6 | 1,066.0 | 0.4 |

[1]Feet above confluence with Platte River

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SPRINGFIELD CREEK (Continued) | | | | | | | | |
| AZ | 23,111 | 150 | 1,026 | 6.8 | 1,067.8 | 1,067.8 | 1,068.4 | 0.6 |
| BA | 23,421 | 166 | 895 | 7.6 | 1,068.6 | 1,068.6 | 1,069.2 | 0.6 |
| BB | 23,771 | 150 | 799 | 8.3 | 1,070.4 | 1,070.4 | 1,071.0 | 0.6 |
| BC | 24,011 | 169 | 1,786 | 3.5 | 1,072.5 | 1,072.5 | 1,073.1 | 0.6 |
| BD | 24,541 | 120 | 1,223 | 4.7 | 1,072.7 | 1,072.7 | 1,073.3 | 0.6 |
| BE | 24,996 | 98 | 928 | 5.6 | 1,073.4 | 1,073.4 | 1,074.0 | 0.6 |
| BF | 25,420 | 150 | 606 | 8.7 | 1,073.9 | 1,073.9 | 1,074.4 | 0.5 |
| BG | 25,690 | 150 | 784 | 6.8 | 1,075.5 | 1,075.5 | 1,075.6 | 0.1 |
| BH | 26,010 | 88 | 580 | 9.3 | 1,076.6 | 1,076.6 | 1,076.7 | 0.1 |
| BI | 26,480 | 172 | 890 | 6.1 | 1,079.2 | 1,079.2 | 1,079.2 | 0.0 |
| BJ | 26,760 | 150 | 972 | 5.8 | 1,081.4 | 1,081.4 | 1,081.4 | 0.0 |
| BK | 27,400 | 150 | 745 | 7.6 | 1,082.5 | 1,082.5 | 1,082.7 | 0.2 |
| BL | 27,770 | 151 | 1,089 | 5.3 | 1,083.5 | 1,083.5 | 1,084.1 | 0.6 |
| BM | 28,380 | 150 | 756 | 7.8 | 1,084.7 | 1,084.7 | 1,085.1 | 0.4 |
| BN | 28,810 | 243 | 1,888 | 2.8 | 1,086.5 | 1,086.5 | 1,086.7 | 0.2 |

[1]Feet above confluence with Platte River

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SPRINGFIELD CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SQUAW CREEK | | | | | | | | |
| A | 1,540 | 140 | 506 | 7.1 | 993.4 | 988.2[2] | 988.2 | 0.0 |
| B | 1,920 | 121 | 699 | 5.2 | 993.4 | 990.2[2] | 990.2 | 0.0 |
| C | 2,095 | 181 | 930 | 3.9 | 993.4 | 991.7[2] | 991.7 | 0.0 |
| D | 2,375 | 150 | 1,278 | 2.8 | 993.9 | 993.9 | 994.5 | 0.6 |
| E | 2,980 | 95 | 664 | 5.3 | 994.2 | 994.2 | 994.9 | 0.7 |
| F | 3,422 | 100 | 547 | 6.4 | 995.2 | 995.2 | 996.2 | 1.0 |
| G | 3,890 | 75 | 432 | 8.0 | 997.4 | 997.4 | 998.4 | 1.0 |
| H | 4,440 | 53 | 667 | 5.1 | 1,000.2 | 1,000.2 | 1,000.9 | 0.7 |
| I | 4,955 | 44 | 275 | 1.9 | 1,001.2 | 1,001.2 | 1,001.5 | 0.3 |
| J | 5,460 | 150 | 1,822 | 2.0 | 1,018.9 | 1,018.9 | 1,019.9 | 1.0 |
| K | 5,941 | 205 | 1,707 | 2.0 | 1,019.0 | 1,019.0 | 1,020.0 | 1.0 |
| L | 6,390 | 228 | 1,887 | 1.8 | 1,019.1 | 1,019.1 | 1,020.1 | 1.0 |
| M | 6,895 | 93 | 786 | 4.3 | 1,019.1 | 1,019.1 | 1,020.1 | 1.0 |
| N | 7,451 | 63 | 563 | 5.9 | 1,019.2 | 1,019.2 | 1,020.0 | 0.8 |
| O | 7,890 | 70 | 452 | 6.9 | 1,020.0 | 1,020.0 | 1,021.0 | 1.0 |
| P | 8,300 | 55 | 385 | 8.0 | 1,023.3 | 1,023.3 | 1,024.1 | 0.8 |
| Q | 8,785 | 75 | 623 | 5.0 | 1,025.8 | 1,025.8 | 1,026.5 | 0.7 |

[1]Feet above confluence with Big Papillion Creek
[2]Elevation computed without consideration of backwater effects from West Papillion Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# SQUAW CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| SQUAW CREEK (Continued) | | | | | | | | |
| R | 9,245 | 90 | 819 | 3.8 | 1,026.9 | 1,026.9 | 1,027.8 | 0.9 |
| S | 9,875 | 110 | 826 | 3.4 | 1,027.6 | 1,027.6 | 1,028.4 | 0.8 |
| T | 10,515 | 45 | 297 | 7.5 | 1,035.1 | 1,035.1 | 1,035.1 | 0.0 |
| U | 10,980 | 79 | 558 | 3.7 | 1,036.8 | 1,036.8 | 1,036.8 | 0.0 |
| V | 11,515 | 55 | 294 | 5.2 | 1,037.5 | 1,037.5 | 1,037.6 | 0.1 |

[1]Feet above confluence with Big Papillion Creek

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| UNNAMED TRIBUTARY OF SOUTH PAPILLION CREEK | | | | | | | | | |
| A | 1,137 | 89 | 978 | 8.2 | 1,042.0 | 1,040.1[2] | 1,040.1 | 0.0 | 1,040.5 |
| B | 2,118 | 91 | 1,013 | 7.9 | 1,044.3 | 1,044.3 | 1,044.3 | 0.0 | 1,044.9 |
| C | 3,254 | 84 | 1,075 | 7.5 | 1,047.9 | 1,047.9 | 1,047.9 | 0.0 | 1,048.4 |
| D | 4,274 | 73 | 1,010 | 6.9 | 1,050.9 | 1,050.9 | 1,050.9 | 0.0 | 1,051.5 |
| E | 5,213 | 62 | 803 | 8.7 | 1,053.1 | 1,053.1 | 1,053.1 | 0.0 | 1,053.6 |
| F | 5,693 | 60 | 677 | 10.4 | 1,057.2 | 1,057.2 | 1,057.2 | 0.0 | 1,057.7 |
| G | 6,634 | 72 | 915 | 7.7 | 1,062.6 | 1,062.6 | 1,062.6 | 0.0 | 1,063.1 |
| H | 7,736 | 105 | 951 | 7.4 | 1,066.9 | 1,066.9 | 1,066.9 | 0.0 | 1,067.3 |
| I | 8,753 | 156 | 917 | 5.7 | 1,069.8 | 1,069.8 | 1,069.8 | 0.0 | 1,070.3 |
| J | 9,309 | 97 | 848 | 6.2 | 1,071.2 | 1,071.2 | 1,071.2 | 0.0 | 1,071.7 |
| K | 10,466 | 142 | 498 | 10.5 | 1,075.5 | 1,075.5 | 1,075.5 | 0.0 | 1,075.8 |
| L | 11,274 | 196 | 934 | 5.6 | 1,081.5 | 1,081.5 | 1,081.5 | 0.0 | 1,081.9 |
| M | 12,335 | 111 | 941 | 5.5 | 1,084.3 | 1,084.3 | 1,084.4 | 0.1 | 1,084.6 |
| N | 13,890 | 235 | 3,310 | 1.6 | 1,104.9 | 1,104.9 | 1,105.8 | 0.9 | 1,105.0 |
| O | 15,103 | 169 | 1,121 | 4.7 | 1,105.4 | 1,105.4 | 1,106.4 | 1.0 | 1,105.6 |
| P | 16,207 | 171 | 1,102 | 4.7 | 1,108.6 | 1,108.6 | 1,109.0 | 0.4 | 1,108.9 |

[1]Feet above confluence with Midland Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# UNNAMED TRIBUTARY OF SOUTH PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| UNNAMED TRIBUTARY OF WEST PAPILLION CREEK | | | | | | | | | |
| A | 3,240 | 261 | 577 | 5.0 | 1,029.1 | 1,029.1 | 1,029.4 | 0.3 | 1,029.3 |
| B | 4,415 | 186 | 537 | 5.4 | 1,033.9 | 1,033.9 | 1,034.6 | 0.7 | 1,034.1 |
| C | 5,687 | 55 | 420 | 6.9 | 1,042.7 | 1,042.7 | 1,042.8 | 0.1 | 1,043.3 |
| D | 6,371 | 79 | 630 | 4.6 | 1,047.1 | 1,047.1 | 1,047.2 | 0.1 | 1,048.6 |
| E | 7,098 | 52 | 377 | 7.7 | 1,049.8 | 1,049.8 | 1,049.9 | 0.1 | 1,050.9 |
| F | 7,740 | 44 | 407 | 7.1 | 1,053.7 | 1,053.7 | 1,053.7 | 0.0 | 1,054.6 |
| G | 8,841 | 69 | 524 | 5.6 | 1,057.8 | 1,057.8 | 1,057.8 | 0.0 | 1,058.8 |
| H | 9,466 | 207 | 2,020 | 1.4 | 1,072.3 | 1,072.3 | 1,072.7 | 0.4 | 1,072.6 |
| I | 10,420 | 129 | 1,118 | 2.6 | 1,072.5 | 1,072.5 | 1,072.9 | 0.4 | 1,072.8 |
| J | 11,451 | 66 | 493 | 2.7 | 1,073.0 | 1,073.0 | 1,073.4 | 0.4 | 1,073.5 |
| K | 12,747 | 38 | 233 | 5.8 | 1,075.7 | 1,075.7 | 1,075.8 | 0.1 | 1,076.4 |
| L | 13,303 | 67 | 315 | 4.3 | 1,078.3 | 1,078.3 | 1,078.3 | 0.0 | 1,079.0 |
| M | 14,523 | 116 | 451 | 3.0 | 1,100.4 | 1,100.4 | 1,100.4 | 0.0 | 1,100.7 |
| N | 15,565 | 159 | 1,439 | 0.9 | 1,120.2 | 1,120.2 | 1,120.2 | 0.0 | 1,122.8 |
| O | 16,192 | 146 | 728 | 1.8 | 1,120.2 | 1,120.2 | 1,120.2 | 0.0 | 1,122.8 |
| P | 16,872 | 49 | 225 | 6.0 | 1,120.5 | 1,120.5 | 1,120.5 | 0.0 | 1,122.8 |

[1]Feet above confluence with Midland Creek

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# UNNAMED TRIBUTARY OF WEST PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| UNNAMED TRIBUTARY OF WEST PAPILLION CREEK | | | | | | | | | |
| Q | 18,122 | 133 | 242 | 5.6 | 1,135.9 | 1,135.9 | 1,135.9 | 0.0 | 1,136.1 |
| R | 19,178 | 115 | 241 | 5.6 | 1,147.3 | 1,147.3 | 1,148.1 | 0.8 | 1,147.4 |
| S | 19,964 | 274 | 363 | 3.7 | 1,154.9 | 1,154.9 | 1,154.9 | 0.0 | 1,155.0 |
| T | 20,608 | 252 | 283 | 4.7 | 1,161.3 | 1,161.3 | 1,161.3 | 0.0 | 1,161.4 |

[1]Feet above confluence with Midland Creek

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# UNNAMED TRIBUTARY OF WEST PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| WALNUT CREEK | | | | | | | | | |
| A | 4,633 | 41 | 311 | 4.4 | 1,020.4 | 1019.4[2] | 1,019.4 | 0.0 | 1,019.6 |
| B | 5,458 | 38 | 274 | 5.0 | 1,021.2 | 1,021.2 | 1,021.2 | 0.0 | 1,021.9 |
| C | 6,039 | 84 | 392 | 3.8 | 1,022.9 | 1,022.9 | 1,022.9 | 0.0 | 1,023.7 |
| D | 6,706 | 82 | 318 | 4.3 | 1,024.9 | 1,024.9 | 1,024.9 | 0.0 | 1,025.6 |
| E | 7,780 | 38 | 187 | 7.4 | 1,028.8 | 1,028.8 | 1,028.9 | 0.1 | 1,029.1 |
| F | 8,447 | 36 | 239 | 5.8 | 1,033.2 | 1,033.2 | 1,033.2 | 0.0 | 1,034.0 |
| G | 9,133 | 45 | 259 | 1.6 | 1,034.9 | 1,034.9 | 1,034.9 | 0.0 | 1,035.7 |
| H | 9,609 | 22 | 63 | 6.7 | 1,036.1 | 1,036.1 | 1,036.1 | 0.0 | 1,036.6 |
| I | 10,080 | 27 | 107 | 3.9 | 1,039.6 | 1,039.6 | 1,039.6 | 0.0 | 1,040.0 |
| J | 10,914 | 39 | 195 | 2.2 | 1,043.5 | 1,043.5 | 1,043.5 | 0.0 | 1,044.0 |

[1]Feet above confluence with West Papillion Creek
[2]Elevation computed without consideration of backwater effects from West Papillion Creek

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# WALNUT CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) |
| WEST MIDLAND CREEK | | | | | | | | |
| A | 300 | 46 | 201 | 2.5 | 1,041.4 | 1,041.4 | 1,041.4 | 0.0 |
| B | 640 | 290 | 1,515 | 1.0 | 1,057.6 | 1,057.6 | 1,058.6 | 1.0 |
| C | 1,020 | 440 | 1,644 | 0.9 | 1,057.7 | 1,057.7 | 1,058.7 | 1.0 |
| D | 1,400 | 74 | 164 | 8.5 | 1,059.9 | 1,059.9 | 1,059.9 | 0.0 |
| E | 1,810 | 77 | 247 | 5.7 | 1,064.4 | 1,064.4 | 1,064.5 | 0.1 |
| F | 2,130 | 96 | 240 | 5.8 | 1,066.5 | 1,066.5 | 1,066.5 | 0.0 |

[1]Feet above confluence with Midland Creek

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# WEST MIDLAND CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY[5] (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| WEST PAPILLION CREEK | | | | | | | | | |
| A | 530 | 1,585[2] | 13,815 | 4.8 | 991.9 | 991.9 | 992.2 | 0.3 | 992.0 |
| B | 1,553 | 460 | 5,655 | 6.4 | 992.9 | 992.9 | 993.8 | 0.9 | 993.0 |
| C | 2,731 | 720 | 6,829 | 5.2 | 993.9 | 993.9 | 994.8 | 0.9 | 993.9 |
| D | 4,226 | 285 | 3,570 | 10.0 | 994.5 / 994.7[3] | 994.7 | 995.5 | 0.8 | 994.8 |
| E | 5,480 | 585 | 6,697 | 5.3 | 998.1 / 997.0 / 997.5[4] | 998.4 | 998.6 | 0.2 | 997.3 |
| F | 6,440 | 926 | 10,023 | 4.1 | 998.5 / 998.4 / 998.7[4] | 998.7 | 999.3 | 0.6 | 998.9 |
| G | 7,468 | 1,024 | 9,701 | 4.2 | 1,000.0 / 1,001.2 / 1,001.3[4] | 1,000.2 | 1,000.7 | 0.5 | 1,001.0 |
| H | 8,704 | 619 | 6,735 | 5.3 | 1,000.7 / 1,002.1 / 1,002.3[4] | 1,000.9 | 1,001.4 | 0.5 | 1,002.0 |
| I | 9,661 | 1,100 | 11,053 | 3.2 | 1,001.8 / 1,003.0 / 1,003.5[4] | 1,002.0 | 1,002.5 | 0.5 | 1,003.0 |
| J | 10,922 | 1,100 | 10,165 | 3.6 | 1,002.4 / 1,003.7 / 1,004.3[4] | 1,002.8 | 1,003.2 | 0.4 | 1,003.9 |
| K | 12,352 | 680 | 6,167 | 5.8 | 1,003.8 / 1,005.1 / 1,004.9[4] | 1,003.5 | 1,003.8 | 0.3 | 1,005.3 |
| L | 13,809 | 1,100 | 9,473 | 3.8 | 1,005.5 / 1,006.0 / 1,006.0[4] | 1,005.1 | 1,005.3 | 0.2 | 1,006.3 |
| M | 15,575 | 2,120 | 20,032 | 2.3 | 1,009.4 / 1,009.0 / 1,009.3[4] | 1,008.9 | 1,009.6 | 0.7 | 1,009.0 |
| N | 16,733 | 1,665 | 16,150 | 2.2 | 1,009.6 / 1,009.9 / 1,009.7[4] | 1,009.2 | 1,009.8 | 0.6 | 1,010.0 |

[1]Feet aboveconfluence with Big Papillion Creek
[2]Floodway width includes total width of West Papillion Creek and Big Papillion Creek floodways
[3]Riverward of right levee / landward of right levee
[4]Landward of left levee/ riverward of levees / landward of right levee
[5]Elevations computed without consideration of levees
Note: Reference to left and right are based on looking in downstream direction

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# WEST PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| WEST PAPILLION CREEK (Continued) | | | | | | | | | |
| O | 18,147 | 1,920 | 16,841 | 2.3 | 1,012.2 / 1,011.7 / 1,010.9[3] | 1,010.6[4] | 1,011.0 | 0.4 | 1,011.5 |
| P | 19,228 | 1,465 | 11,145 | 3.4 | 1,012.4 / 1,012.5 / 1,011.2[3] | 1,010.8[4] | 1,011.1 | 0.3 | 1,012.4 |
| Q | 20,522 | 938 | 7,254 | 5.0 | 1,012.9 / 1,013.3 / 1,011.5[3] | 1,011.0[4] | 1,011.6 | 0.6 | 1,013.3 |
| R | 21,826 | 272 | 3,874 | 9.2 | 1,013.9 / 1,014.4 / 1,012.1[3] | 1,011.7[4] | 1,012.2 | 0.5 | 1,014.5 |
| S | 23,035 | 485 | 4,228 | 9.1 | 1,014.6 / 1,014.8 / 1,014.6[3] | 1,014.4[4] | 1,015.1 | 0.7 | 1,014.8 |
| T | 24,393 | 685 | 6,631 | 5.3 | 1,017.5 / 1,017.2[2] | 1,017.0[4] | 1,017.5 | 0.5 | 1,017.8 |
| U | 25,302 | 631 | 5,565 | 6.3 | 1,018.3 / 1,017.5[2] | 1,017.4[4] | 1,017.9 | 0.5 | 1,018.6 |
| V | 26,618 | 448 | 4,542 | 7.7 | 1,018.9 / 1,018.0[2] | 1,017.9[4] | 1,018.5 | 0.6 | 1,019.2 |
| W | 28,135 | 281 | 4,413 | 7.8 | 1,020.4 | 1,020.4 | 1,020.4 | 0.0 | 1,020.7 |
| X | 29,500 | 290 | 4,438 | 7.8 | 1,021.6 | 1,021.6 | 1,021.6 | 0.0 | 1,022.0 |
| Y | 30,455 | 291 | 4,373 | 7.9 | 1,022.0 | 1,022.0 | 1,022.0 | 0.0 | 1,022.4 |
| Z | 31,450 | 307 | 4,381 | 7.9 | 1,022.4 | 1,022.4 | 1,022.5 | 0.1 | 1,022.7 |

[1]Feet above confluence with Big Papillion Creek
[2]Riverward of right levee / landward of right levee
[3]Landward of left levee/ riverward of levees / landward of right levee
[4]Elevations computed without consideration of levees
Note: Reference to left and right are based on looking in downstream direction

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# WEST PAPILLION CREEK

| FLOODING SOURCE | | FLOODWAY | | | 1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY (FEET NAVD) | WITHOUT FLOODWAY (FEET NAVD) | WITH FLOODWAY (FEET NAVD) | INCREASE (FEET) | FUTURE CONDITIONS (FEET NAVD) |
| WEST PAPILLION CREEK (Continued) | | | | | | | | | |
| AA | 32,989 | 301 | 4,274 | 7.6 | 1,023.3 | 1,023.3 | 1,023.7 | 0.4 | 1,023.6 |
| AB | 34,014 | 303 | 4,268 | 7.5 | 1,024.0 | 1,024.0 | 1,024.4 | 0.4 | 1,024.3 |
| AC | 35,097 | 310 | 4,034 | 7.9 | 1,024.8 | 1,024.8 | 1,025.1 | 0.3 | 1,025.1 |
| AD | 36,262 | 298 | 3,739 | 8.5 | 1,025.8 | 1,025.8 | 1,026.1 | 0.3 | 1,026.2 |
| AE | 37,387 | 523[2] | 4,131 | 7.7 | 1,032.8 | 1,032.8 | 1,033.3 | 0.5 | 1,033.0 |
| AF | 38,301 | 500 | 5,018 | 6.4 | 1,034.3 | 1,034.3 | 1,034.9 | 0.6 | 1,034.5 |
| AG | 39,898 | 1,050 | 7,775 | 2.6 | 1,036.1 | 1,036.1 | 1,036.5 | 0.4 | 1,036.5 |
| AH | 41,253 | 823 | 5,346 | 3.2 | 1,038.8 | 1,038.8 | 1,039.2 | 0.4 | 1,039.3 |
| AI | 42,171 | 714 | 4,545 | 3.7 | 1,039.1 | 1,039.1 | 1,039.8 | 0.7 | 1,039.6 |
| AJ | 43,572 | 370 | 2,942 | 5.8 | 1,041.8 | 1,041.8 | 1,042.4 | 0.6 | 1,042.3 |
| AK | 44,520 | 370 | 2,886 | 5.9 | 1,043.2 | 1,043.2 | 1,043.8 | 0.6 | 1,043.9 |

[1]Feet above confluence with Big Papillion Creek
[2]This value reflects the mapped width. This value differs from the modeled width, which has been adjusted for skew.

Table 12

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**SARPY COUNTY, NE**
**AND INCORPORATED AREAS**

# FLOODWAY DATA

# WEST PAPILLION CREEK

The floodway along the Missouri River was widened to include Levee R-616. Therefore, the Missouri River floodway coincides with the location of Missouri River Levee Systems where they are constructed. In areas where levees are not proposed, the minimum floodway width is 3,000 feet. These floodways were checked using HEC-2, Method 1 encroachment option, to verify that the 1-foot, 1-percent-annual-chance flood elevation surcharge criteria was met. The eastern boundary of portions of Sarpy County is the approximate center of the Missouri River. Because of this, regulation of the floodway will require cooperation and coordination between Sarpy County and the governing bodies that have jurisdiction over the floodway on the opposite side of the Missouri River (Council Bluffs, Iowa, and Pottawattomie County, Iowa). Similarly, the southern and western boundary of Sarpy County is the approximate center of the Platte River. Floodway regulation along the Platte River will, therefore, require coordination with Cass County and Saunders County, Nebraska. The floodway for Papillion/Big Papillion Creek coincides with Missouri River Levee Unit 8 - 613 downstream from Capehart Road.

In the reach of Papillion Creek below the West Papillion Creek confluence, a hydrologic analysis was conducted to determine the effect of the floodway encroachments on discharge. The existing conditions hydrologic analysis indicated that during the 1-percent-annual-chance flood event, flow overtops the right bank Papio-Missouri River NRD levees and goes into storage between stream stations 33400 and 42790. This storage results in attenuation of the peak flood discharges flowing into this reach. The presence of fill in the storage area would result in less available storage and higher peak discharges downstream. Any increase in discharges from Capehart Road to the mouth would adversely affect the level of protection provided by Federal Levee R-613 in this reach. A trial floodway alignment was delineated in this reach using the existing condition peak discharges. The HEC-2 cross section geometry was then modified to block out the area of the section landward of the floodway boundaries. These modified sections were used in the DWOPER unsteady flow model to determine peak discharges for floodway conditions. The 1-percent-annual-chance peak discharges for existing and floodway conditions are given at selected locations in the following tabulation:

Peak Discharge in cubic feet per second

| Station | Existing Conditions | With Floodway |
|---|---|---|
| 42490 | 45,300 | 45,300 |
| 41240 | 38,300 | 38,300 |
| 36300 | 37,400 | 37,400 |
| 33400 | 36,000 | 37,600 |
| 28830 | 35,900 | 37,400 |

To prevent any additional increase in downstream peak discharges, no additional encroachments were allowed on the right bank between sections 33400 and 42790. The DWOPER analysis indicated that this was the only part of the floodplain overbank area that was required for storage and attenuation of the peak

discharges. A new floodway was delineated with the right bank encroachments between sections 33400 and 42790 fixed at the limits used for the trial floodway, using the floodway conditions discharges from the above table. On the left bank below State Highway 370, the floodway was fixed at the limit of the Kennedy Freeway embankment.

The floodway boundaries from the January 19, 1995, FIS were revised for the Platte and Elkhorn Rivers. The floodway encroachments at each cross section in the new hydraulic model were first set at the limits of the floodway from the 1995 FIS, adjusting the floodway limits at each cross section to ensure the surcharge did not exceed 1.0 foot. Floodway computations were based on open water conditions.

On the Platte River, ice-affected flows have occurred frequently in the study reach. When flows are ice-affected, the stages for a given Platte River discharge may be significantly higher than stages for the same discharge during open flow conditions. Most of the past instances of failure of the levees have occurred during ice-affected floods. Because of this history, ice affected water surface profiles were developed. Ice-affected flow conditions may be the result of floating ice cover, floating ice jams, or grounded ice jams.

Ice-affected water surface profiles for this study were developed using the ice season peak flows and the HEC-2 ice option. The HEC-2 ice option allowed the incorporation of a floating ice cover with ice characteristics, such as ice thickness and roughness, which can be adjusted at each cross section.

Ice-affected water surface profiles were modeled using the HEC-2 ice option in the hydraulic models for existing and with-project conditions. A Platte River channel parent ice cover from 2.0 to 2.5 feet thick was used. This ice cover was selected to represent heavy ice conditions that occur during the spring ice break-up. Data collected by the State of Nebraska for the years 1996 through 1999 report ice thickness of approximately 2 feet on the lower Platte River. Floodplains are assumed to be free of ice cover. Due to limitations of the HEC-2 ice option, the ice cover cannot be used at the bridge cross sections.

An ice roughness value (Manning's "n") of 0.040 was used at the parent ice cover. In general, ice roughness was assumed to increase with ice thickness. The ice roughness values used in this analysis were in the range given by Nezhikovsky (Reference 48). The selected "n" values for this study were between the break-up line and the freeze-up line, developed by Nezhikovsky. The specific gravity of ice used in these computations was 0.916.

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

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

Zone AE

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

Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

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

Zone X

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

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

## 6.0 FLOOD INSURANCE RATE MAP

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

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

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

The current FIRM presents flooding information for the geographic area of Sarpy County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each floodprone incorporated community and the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 13.

| COMMUNITY NAME | INITIAL IDENTIFICATION | FLOOD HAZARD BOUNDARY MAP REVISION DATE(S) | FIRM EFFECTIVE DATE | FIRM REVISION DATE(S) |
|---|---|---|---|---|
| Bellevue, City of | December 7, 1973 | February 27, 1976 | January 16, 1980 | December 2, 2005<br>January 19, 1995<br>June 4, 1987 |
| Gretna, City of | August 6, 1976 | None | January 19, 1995 | December 2, 2005 |
| La Vista, City of | June 21, 1974 | December 19, 1975 | January 16, 1980 | December 2, 2005<br>January 19, 1995 |
| Papillion, City of | August 18, 1972 | None | August 18, 1972 | December 2, 2005<br>January 19, 1995<br>December 8, 1981<br>January 16, 1981<br>October 10, 1975<br>April 11, 1975<br>July 1, 1974 |
| Sarpy County (Unincorporated Areas) | April 22, 1977 | None | January 16, 1981 | December 2, 2005<br>January 19, 1995<br>June 4, 1987 |
| Springfield, City of | May 3, 1974 | November 28, 1975 | February 15, 1978 | December 2, 2005<br>January 19, 1995<br>October 13, 1981 |

Table 13

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

# SARPY COUNTY, NE
**AND INCORPORATED AREAS**

# COMMUNITY MAP HISTORY

## 7.0 OTHER STUDIES

In February 1967, the USACE published "Review Report for Papillion Creek and Tributaries" (Reference 12). This publication concerned the extent and magnitude of the flood problem in the Papillion Creek basin and proposed a series of dams and reservoirs to be located in the basin. Minor variances between that USACE study and this study are attributed to updated hydrology reflecting the use of a more appropriate routing method to account for the storage areas behind the tributary when the levees are overtopped. The USACE published "Flood Plain Information, Papillion, Big Papillion and West Papillion Creeks, Volume 1, Omaha Metropolitan Region, Nebraska," in November 1967 (Reference 49). This report defined the floodplain in the lower Papillion Creek basin. Information contained in this report is compatible with that contained in this study. Differences that do exist are due to updated computation procedures. In June 1975, the USACE published "Flood Control - Flood Management - Volume V, Water Resources Management Alternatives for the Omaha-Council Bluffs Area," as part of the USACE Urban Studies Program (Reference 50). The purpose of the report was to present the results of studies made regarding existing and potential future flood problems in the Metropolitan Omaha, Nebraska-Council Bluffs, Iowa, study area. The information presented in the report is intended to assist other agencies in making future planning decisions. Flood outlines in that report do not match exactly those shown in this FIS report since an approximate analysis was used to determine flood outlines for the Urban Studies Program. In October 1977, the USACE published "Special Flood Hazard Information Report, Missouri River, Cavins Point Dam to Rulo, Nebraska, Volume I, River Mile 659.4-581.3" (Reference 51). The information shown in this FIS report is compatible with that shown in the Special Flood Hazard Information Report.

The Nebraska Natural Resources Commission published, "Flood Plain Study, Platte River, Missouri River to Louisville, Nebraska," in November 1975 (Reference 30). This study delineated the 1-percent-annual-chance flood boundary of the Platte River. Data contained in this FIS report were extracted from that study and are, therefore, compatible.

FIS reports have been created for Douglas County, Nebraska and Incorporated Areas (Reference 52); Saunders County, Nebraska (Reference 53); Cass County, Nebraska (Reference 54); Harrison County, Iowa (Reference 55), and Pottawattamie County, Iowa (Reference 56). Information contained within these FIS reports is compatible with the Sarpy County FIS report.

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

## 8.0 LOCATION OF DATA

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

## 9.0 BIBLIOGRAPHY AND REFERENCES


1. Horizon's, Inc. West Papillion and its Tributaries, MAS no. 2 – Topographic Development. LiDAR Acquisition/Processing/Quality Control, November 2004.

2. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Bellevue, Sarpy County, Nebraska, January 1980, revised June 1987; Flood Insurance Rate Map, City of Bellevue, Sarpy County, Nebraska, June 4, 1987.
3. Federal Emergency Management Agency, Flood Insurance Study Report, City of La Vista, Sarpy County, Nebraska, July 16, 1980; Flood Insurance Rate Map, January 16, 1980.

4. Federal Emergency Management Agency, Flood Insurance Study Report, City of Papillion, Sarpy County, Nebraska, July 8, 1980; Flood Insurance Rate Map, December 8, 1981.

5. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Sarpy County, Nebraska (Unincorporated Areas), January 1981, revised June 4, 1987.

6. Federal Emergency Management Agency, Flood Insurance Study, City of Springfield, Sarpy County, Nebraska, October 13, 1981.

7. Federal Emergency Management Agency, Flood Insurance Study, Sarpy County, Nebraska and Incorporated Areas, Washington, D.C., January 19, 1995.

8. U.S. Army Corps of Engineers, Omaha District, Hydrologic Analysis, Lower Platte River, Nebraska, Flood Insurance Study, March 1998.

9. 2000 U.S. Census: Sarpy County, Nebraska, retrieved on April 8, 2004, from http://quickfacts.census.gov.

10. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Bulletin 81, Climatography of the United States (Nebraska), Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1941-1970, August 1973.

11. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Douglas and Sarpy Counties, Nebraska, December 1975.

12. U.S. Army Corps of Engineers, Omaha District, Review Report for Papillion Creek and Tributaries, Nebraska, February 1967.

13. U.S. Army Corps of Engineers, Omaha District, Phase II, General Design Memorandum No. R-616-2, January 1976.

14. U.S. Army Corps of Engineers, Omaha District, Missouri River, Sioux City, Iowa to the Mouth, Agricultural Levees, Design Memorandum No. R-613-1, April 1966.

15. U.S. Army Corps of Engineers, Omaha District, Papillion Creek and Tributaries, Nebraska, Design Memorandum No. NPC-15, Site 11, March 1972.

16. U.S. Army Corps of Engineers, Omaha District, Papillion Creek and Tributaries Nebraska, Design Memorandum No. NPC-14, Site 16, October 1971.

17. U.S. Army Corps of Engineers, Omaha District, Hydrology Report, Missouri River Agricultural Levee Restudy Program, March 1962.

18. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-FFA, Flood Frequency Analysis Program, Version 3.0, Davis, California, July 1992.

19. Environmental Protection Agency, Stormwater Management Model, Computer Program, 1971.

20. U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, for Durations from 1 to 100 Years, D. H. Herschfield, May 1961.

21. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Davis, California, 1973.

22. U.S. Geological Survey, Water-Resources Investigations, 76-109, Magnitude and Frequency of Floods in Nebraska, Emil W. Beckman, 1976.

23. U.S. Army Corps of Engineers, Omaha District, Reevaluation Report for Papillion Creek and Tributary Lakes, Volume II, March 1985.

24. Herders Model, U.S. Department of the Army, Corps of Engineers, Missouri River Division Routing Model 1973, using the equations developed by James Herders, University of California at Berkeley.

25. U.S. Army Corps of Engineers Hydrologic Engineering Center, HEC-HMS, Hydrologic Modeling System, Version 2.2.2, 609 Second Street, Davis, California, 95616

26. DWOPER Model, Dynamic Wave Operational Model, version 7-18-1984, developed by D. L. Fread, National Weather Service, Hydrologic Laboratory, Silver Spring, Maryland.

27. Hoskins-Western-Sonderegger, Inc., Aerial Photography, Missouri River, Lincoln, Nebraska, 1973.

28. Hoskins-Western-Sonderegger, Inc., Aerial Photography, Platte River, Elkhorn River, Buffalo Creek, and Springfield Creek, Lincoln, Nebraska, 1976.

29. Nebraska Natural Resources Commission, Cross Section Data in the Vicinity of Hansen's Lakes.

30. Nebraska Natural Resources Commission, Flood Plain Study, Platte River, Missouri River to Louisville, Nebraska, November 1975.

31. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:2,400, Contour Interval two feet: Gavins Point Dam to Rulo, Nebraska, 1973.

32. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:2,400, Contour Interval four feet: Platte River, Elkhorn River, Buffalo Creek, Springfield Creek, Sarpy County, Nebraska, 1976.

33. State of Nebraska, Department of Roads, Plans for Federal Aid Project No. F 138(30), 1972.

34. Gollenon & Schemmer & Associates, Aerial Photographs, Scale 1:2,400, Contour Interval two feet: Missouri River Mile 609 - Upstream, Bellevue, Nebraska, 1973; Hoskins, Western & Sonderegger, Lincoln, Nebraska, Aerial Photographs, Scale 1:2,400, Contour Interval two feet: Missouri River Mile 609 - Downstream, Bellevue, Nebraska, Omaha, Nebraska, 1973.

35. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:1,200, Contour Interval two feet: Squaw Creek, Sarpy County, Nebraska, 1976.

36. U.S. Army Corps of Engineers, Omaha District, Topographic Mapping, Scale 1:4,800, Contour Interval four feet, 1978.

37. U.S. Army Corps of Engineers, Omaha District, Aerial Photography, Scale 1:24,000: Papillion Creek, Big Papillion Creek, West Papillion Creek, Midland Creek, West Midland Creek, and South Midland Creek, 1964.

38. U.S. Geological Survey, 7.5 Minute Series Quadrangle Maps, Scale 1:24,000, Contour Interval 10 feet: Omaha South, Nebraska-Iowa, 1956, (photo revised) 1969; Ralston, Nebraska, 1956, (photo revised) 1969; Missouri River, Gavins Point Dam to Rulo, Nebraska, River Mile 595.5 to 601.9, April 1973; Council Bluffs South, Iowa-Nebraska, 1956, (photo revised) 1964; Pacific Junction, Iowa-Nebraska, 1956, (photo revised) 1969; Plattsmouth, Nebraska, 1956, (photo revised) 1969.

39. U.S. Geological Survey, 7.5 Minute Series Quadrangle Maps, Scale 1:12,000, Contour Interval 10 feet: Rumsey, Nebraska, July 1, 1982; Gilmore, Nebraska, July 1, 1985.

40. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, May 1990.

41. Federal Emergency Management Association, FEMA Publication 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995.

42. U.S. Geological Survey, 7.5 Minute Series Quadrangle Maps, Scale 1:24,000, Contour Interval 10 feet: Council Bluffs South, Iowa-Nebraska, 1956, (photo revised) 1964; Pacific Junction, Iowa-Nebraska, 1956, (photo revised) 1969; Omaha South, Nebraska-Iowa, 1956, (photo revised) 1969; Plattsmouth, Nebraska, 1956, (photo revised) 1969; Ralston, Nebraska, 1956, (photo revised) 1969; Cedar Creek, Nebraska, 1956, (photo revised) 1969; Gretna, Nebraska, 1956, (photo revised) 1959; Springfield, Nebraska, 1956, (photo revised) 1959; Mann, Nebraska, 1968; Ashland East, Nebraska, 1968.

43. U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Hydraulics of Bridge Waterways, March 1978.

44. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles Computer Program, Davis, California, February 1972.

45. U.S. Army Corps of Engineers Hydrologic Engineering Center, HEC-RAS Version 3.1.2, 609 Second Street, Davis, CA 95616

46. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Plattsmouth, Nebraska-Iowa, 1994; Cedar Creek, Nebraska 1956; Springfield, Nebraska, 1969; Manley, Nebraska, 1966; Ashland East, Nebraska, 1968; Wann, Nebraska, 1968.

47. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:4,800, Contour Interval four feet: Platte River 1976.

48. Nezhikovsky, R.A., Coefficient of roughness of bottom surfaces of slush ice cover. Soviet Hydrology, Selected Papers. No. 2, pages 127-150 (1964).

49. U.S. Army Corps of Engineers, Flood Plain Information, Papillion, Big Papillion, and Papillion Creeks, Volume I, Omaha Metropolitan Region, Nebraska, November 1967.

50. U.S. Army Corps of Engineers, Flood Control-Flood Management Volume V, Water Resources Management Alternatives for the Omaha-Council Bluffs Area, June 1975.

51. U.S. Army Corps of Engineers, Special Flood Hazard Information Report, Missouri River, Gavis Point Dam to Rulo, Nebraska, Volume I, River Mile 659.4-481.3, October 1977.

52. Federal Emergency Management Agency, Flood Insurance Study, Douglas County, Nebraska and Incorporated Areas, December 2, 2005.

53. Federal Emergency Management Agency, Flood Insurance Study, Saunders County, Nebraska (Unincorporated Areas), Flood Insurance Study Report, July 19, 1982; Flood Insurance Rate Map, January 19, 1983.

54. Federal Emergency Management Agency, Flood Insurance Study, Cass County, Nebraska and Incorporated Areas, study in progress.

55. Federal Emergency Management Agency, Flood Insurance Study, Harrison County, Iowa and Incorporated Areas, August 9, 2000.

56. Federal Emergency Management Agency, Flood Insurance Study, Pottawattamie County, Iowa and Incorporated Areas, study in progress.

## 10.0 REVISIONS DESCRIPTION

### 10.1 First Revision (Revised October, 2007)

The hydrologic and hydraulic analyses for the December 2005 revision were performed by the USACE, for FEMA under Inter-Agency Agreement EMW-97-IA-0140, Project Order No. 3. This work was completed in November 2001. The Nebraska Department of Natural Resources (DNR) provided new survey data used in this study. Additional data used was developed from the USACE's October 2000 Lower Platte River and Tributaries General Investigations Feasibility Study and the Western Sarpy and Clear Creek Flood Reduction Project, Preconstruction Engineering and Design Phase (Reference 8).

### 10.2 Second Revision (Revised October, 2007)

The current revision was initiated by a restudy request submitted to FEMA by the Papio-Missouri River Natural Resources District (NRD). The CTP agreement for this revision is EMK-2003-CA-3045. The West Papillion Creek watershed and its tributaries, which include the studied reaches of: West Papillion Creek, Hell Creek, Midland Creek, South Papillion Creek, Unnamed South Papillion Creek Tributary, Unnamed West Papillion Creek Tributary, and Walnut Creek were restudied as part of this revision. The study was completed in October 2007.