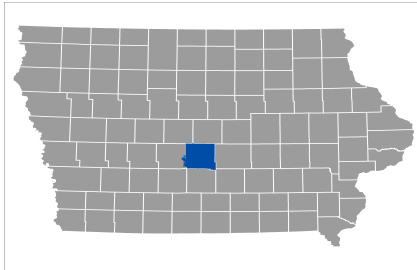


FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 3



POLK COUNTY, IOWA AND INCORPORATED AREAS

COMMUNITY NAME	CID	COMMUNITY NAME	CID
CITY OF ALLEMAN	190304	CITY OF MITCHELLVILLE	190619
CITY OF ALTOONA	190546	CITY OF PLEASANT HILL	190489
CITY OF ANKENY	190226	CITY OF POLK CITY	190933
CITY OF BONDURANT	190707	POLK COUNTY, UNINCORPORATED AREAS	190901
CITY OF CLIVE	190488	CITY OF RUNNELLS	190800
CITY OF DES MOINES	190227	CITY OF SHELDAHL*	190804
CITY OF ELKHART*	190229	CITY OF URBANDALE	190230
CITY OF GRIMES	190228	CITY OF WEST DES MOINES	190231
CITY OF JOHNSTON	190745	CITY OF WINDSOR HEIGHTS	190687

*No Special Flood Hazard Areas Identified



FEMA

EFFECTIVE:
FEBRUARY 1, 2019

FLOOD INSURANCE STUDY NUMBER
19153CV001A

Version Number 2.2.2.1

TABLE OF CONTENTS

Volume 1

	<u>Page</u>
SECTION 1.0 – INTRODUCTION	1
1.1 The National Flood Insurance Program	1
1.2 Purpose of this Flood Insurance Study Report	2
1.3 Jurisdictions Included in the Flood Insurance Study Project	2
1.4 Considerations for using this Flood Insurance Study Report	5
SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS	15
2.1 Floodplain Boundaries	15
2.2 Floodways	16
2.3 Base Flood Elevations	25
2.4 Non-Encroachment Zones	25
2.5 Coastal Flood Hazard Areas	25
2.5.1 Water Elevations and the Effects of Waves	25
2.5.2 Floodplain Boundaries and BFEs for Coastal Areas	25
2.5.3 Coastal High Hazard Areas	26
2.5.4 Limit of Moderate Wave Action	26
SECTION 3.0 – INSURANCE APPLICATIONS	26
3.1 National Flood Insurance Program Insurance Zones	26
3.2 Coastal Barrier Resources System	27
SECTION 4.0 – AREA STUDIED	28
4.1 Basin Description	28
4.2 Principal Flood Problems	28
4.3 Non-Levee Flood Protection Measures	34
4.4 Levees	35
SECTION 5.0 – ENGINEERING METHODS	38
5.1 Hydrologic Analyses	38
5.2 Hydraulic Analyses	54
5.3 Coastal Analyses	62
5.3.1 Total Stillwater Elevations	62
5.3.2 Waves	62
5.3.3 Coastal Erosion	62
5.3.4 Wave Hazard Analyses	62
5.4 Alluvial Fan Analyses	63
SECTION 6.0 – MAPPING METHODS	63
6.1 Vertical and Horizontal Control	63
6.2 Base Map	64
6.3 Floodplain and Floodway Delineation	65

TABLE OF CONTENTS *(continued)*

Volume 2

6.4	Coastal Flood Hazard Mapping	118
6.5	FIRM Revisions	118
6.5.1	Letters of Map Amendment	118
6.5.2	Letters of Map Revision Based on Fill	118
6.5.3	Letters of Map Revision	119
6.5.4	Physical Map Revisions	119
6.5.5	Contracted Restudies	120
6.5.6	Community Map History	120
SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION		122
7.1	Contracted Studies	122
7.2	Community Meetings	125
SECTION 8.0 – ADDITIONAL INFORMATION		129
SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES		130

Figures

	<u>Page</u>
Figure 1: FIRM Panel Index	7
Figure 2: FIRM Notes to Users	8
Figure 3: Map Legend for FIRM	11
Figure 4: Floodway Schematic	17
Figure 5: Wave Runup Transect Schematic	25
Figure 6: Coastal Transect Schematic	26
Figure 7: Frequency Discharge-Drainage Area Curves	52
Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas	62
Figure 9: Transect Location Map	63

Tables

Tables -Volume 1

	<u>Page</u>
Table 1: Listing of NFIP Jurisdictions	3
Table 2: Flooding Sources Included in this FIS Report	18
Table 3: Flood Zone Designations by Community	27
Table 4: Coastal Barrier Resources System Information	27
Table 5: Basin Characteristics	28
Table 6: Principal Flood Problems	28
Table 7: Historic Flooding Elevations	31
Table 8: Non-Levee Flood Protection Measures	35
Table 9: Levees	37
Table 10: Summary of Discharges	39

TABLE OF CONTENTS *(continued)*

Tables -Volume 1 (continued)

Table 11: Summary of Non-Coastal Stillwater Elevations	52
Table 12: Stream Gage Information used to Determine Discharges	52
Table 13: Summary of Hydrologic and Hydraulic Analyses	55
Table 14: Roughness Coefficients	61
Table 15: Summary of Coastal Analyses	62
Table 16: Tide Gage Analysis Specifics	62
Table 17: Coastal Transect Parameters	63
Table 18: Summary of Alluvial Fan Analyses	63
Table 19: Results of Alluvial Fan Analyses	63
Table 20: Countywide Vertical Datum Conversion	64
Table 21: Stream-by-Stream Vertical Datum Conversion	64
Table 22: Base Map Sources	65
Table 23: Summary of Topographic Elevation Data used in Mapping	66
Table 24: Floodway Data	67

Tables - Volume 2

Table 24: Floodway Data	101
Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams	118
Table 26: Summary of Coastal Transect Mapping Considerations	118
Table 27: Incorporated Letters of Map Change	119
Table 28: Community Map History	121
Table 29: Summary of Contracted Studies Included in this FIS Report	122
Table 30: Community Meetings	126
Table 31: Map Repositories	129
Table 32: Additional Information	130
Table 33: Bibliography and References	131

Exhibits

Exhibits - Volume 2

Flood Profiles	<u>Panel</u>
Beaver Creek	01-05 P
Des Moines River	06-09 P
Dovetail	10 P
Fourmile Creek	11-24 P
Frink Creek	25 P
Jordan Creek	26-32 P
Little Beaver Creek	33-39 P
Little Beaver Creek Tributary A	40-41 P
Little Beaver Creek Tributary North	42 P
Little Beaver Creek Tributary South	43 P
Little Beaver Creek Split	44 P
Little Fourmile Creek	45 P
Little Walnut Creek	46-48 P
Meadowlark Creek	49 P
Middle Creek	50 P
Muchikinock Creek	51-52 P

TABLE OF CONTENTS *(continued)*

Exhibits – Volume 2 (continued)

Flood Profiles	<u>Panel</u>
Mud Creek	53-67 P

Volume 3

Exhibits – Volume 3

Flood Profiles	<u>Panel</u>
North Walnut Creek	68-72 P
Otter Creek	73 P
Prairie Creek	74 P
Raccoon River	75-95 P
Rock Creek	96-101 P
Saylor Creek	102-104 P
Saylor Creek Tributary	105-106 P
Seventh Ward Ditch	107 P
South Walnut Creek	108-109 P
Spring Creek	110-116 P
Tributary A	117 P
Tributary D	118 P
Tributary E	119 P
Walnut Creek	120-127 P
Yeader Creek	128-129 P

Published Separately

Flood Insurance Rate Map (FIRM)

FLOOD INSURANCE STUDY REPORT POLK COUNTY, IOWA AND INCORPORATED AREAS

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community's regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Polk County, Iowa and Incorporated Areas.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
CITY OF ALLEMAN	190304	07080105, 07100008	19153C0035F, 19153C0055F, 19153C0065F	
CITY OF ALTOONA	190546	07100008	19153C0220F, 19153C0240F, 19153C0245F, 19153C0380F	
CITY OF ANKENY	190226	07100004, 07100008	19153C0045F, 19153C0065F, 19153C0070F, 19153C0185F, 19153C0205F, 19153C0210F, 19153C0215F, 19153C0220F	
CITY OF BONDURANT	190707	07080105, 07100008	19153C0230F, 19153C0235F, 19153C0240F	
CITY OF CARLISLE	190274	07100008	19153C0370F, 19153C090F	Warren County FIS Report, 2018
CITY OF CLIVE	190488	07100006	19153C0165F, 19153C0305F, 19153C0310F, 19153C0326F, 19153C0327F	
CITY OF DES MOINES	190227	07100004, 07100006, 07100008,	19153C0189F, 19153C0195F, 19153C0215F, 19153C0220F, 19153C0327F, 19153C0329F, 19153C0335F, 19153C0340F, 19153C0345F, 19153C0355F, 19153C0360F, 19153C0365F, 19153C0370F, 19153C0380F	
CITY OF ELKHART ¹	190229	07080105, 07100008	19153C0070F	
CITY OF GRIMES	190228	07100004, 07100006	19153C0155F, 19153C0160F, 19153C0165F, 19153C0166F, 19153C0167F, 19153C0168F, 19153C0169F	
CITY OF JOHNSTON	190745	07100004	19153C0160F, 19153C0167F, 19153C0176F, 19153C0177F, 19153C0178F, 19153C0179F, 19153C0185F, 19153C0186F, 19153C0187F, 19153C0188F, 19153C0189F, 19153C0195F	
CITY OF MITCHELLVILLE	190619	07080105, 07100008	19153C0245F, 19153C0275F	

¹ No Special Flood Hazard Areas Identified

² Panel Not Printed

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
CITY OF PLEASANT HILL	190489	07100008	19153C0360F, 19153C0370F, 19153C0380F, 19153C0390F	
CITY OF POLK CITY	190933	07100004	19153C0030F, 19153C0040F, 19153C0045F	
POLK COUNTY, UNINCORPORATED AREAS	190901	07080105, 07100004, 07100006, 07100008	19153C0025F, 19153C0030F, 19153C0035F, 19153C0040F, 19153C0045F, 19153C0055F, 19153C0060F, 19153C0065F, 19153C0070F, 19153C0100F, 19153C0125F, 19153C0155F, 19153C0160F, 19153C0165F, 19153C0166F, 19153C0176F, 19153C0177F, 19153C0178F, 19153C0179F, 19153C0185F, 19153C0186F, 19153C0187F, 19153C0188F, 19153C0189F, 19153C0195F, 19153C0205F, 19153C0210F, 19153C0215F, 19153C0220F, 19153C0230F, 19153C0235F, 19153C0240F, 19153C0245F, 19153C0275F, 19153C0320F, 19153C0326F, 19153C0327F, 19153C0340F, 19153C0345F, 19153C0360F, 19153C0365F, 19153C0370F, 19153C0380F, 19153C0385F, 19153C0390F, 19153C0395F, 19153C0405F, 19153C0415F, 19153C0535F, 19153C0555F	
CITY OF RUNNELLS	190800	07100008	19153C0415F	
CITY OF SHELDAHL ¹	190804	07100004, 07100008	19153C0030F	
CITY OF URBANDALE	190230	07100004, 07100006	19153C0165F, 19153C0167F, 19153C0168F, 19153C0169F, 19153C0186F, 19153C0187F, 19153C0188F, 19153C0189F, 19153C0305F, 19153C0310F, 19153C0326F, 19153C0327F	
CITY OF WEST DES MOINES	190231	07100006	19153C0295F, 19153C0305F, 19153C0310F, 19153C0315F, 19153C0320F, 19153C0326F, 19153C0327F, 19153C0328F, 19153C0329F, 19153C0340F, 19153C0435F ² , 19153C0457F, 19153C0476F	
CITY OF WINDSOR HEIGHTS	190687	07100006	19153C0326F, 19153C0327F, 19153C0329F	

¹ No Special Flood Hazard Areas Identified

² Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 31, “Map Repositories,” within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

There are previous FIS reports for the individual communities in Polk County and the unincorporated areas of Polk County. Refer to Table 28 for information about subsequent revisions to the FIRMs.

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

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is

shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at <https://www.fema.gov> or contact your appropriate FEMA Regional Office for more information about this program.

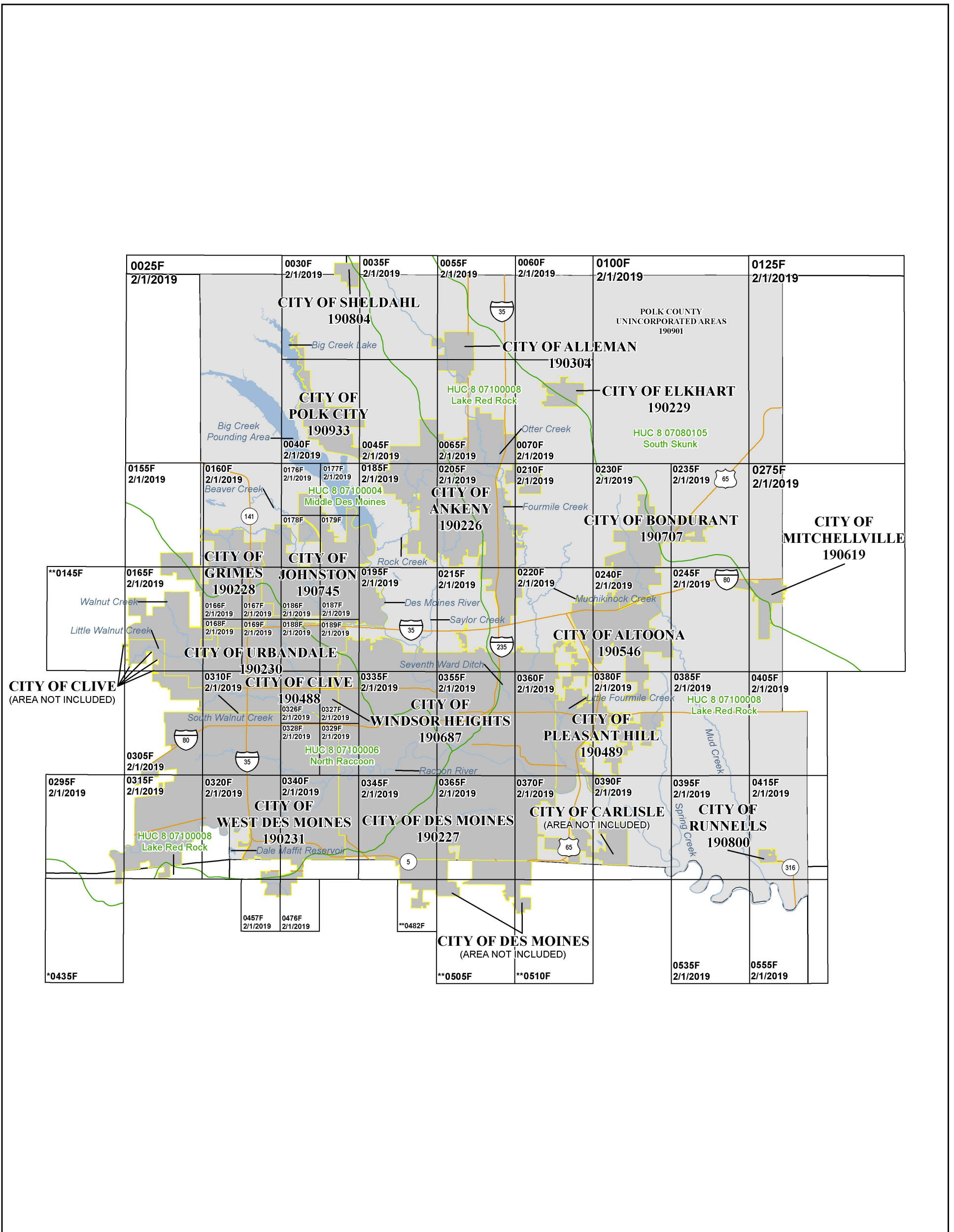
- Previous FIS Reports and FIRMs may have included levees that were accredited as providing protection from the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees with providing protection from the base flood, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled “Mapping of Areas Protected by Levee Systems.”

Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database. For all other levees, the user is encouraged to contact the appropriate local community.

Please also note that FEMA has identified one or more levees in this jurisdiction that have not been demonstrated by the community or levee owner to meet the requirements of 44CFR Part 65.10, of the NFIP regulations as it relates to the levee’s capacity to provide 1% annual chance flood protection. As such, temporary actions are being taken until such time as FEMA is able to initiate a new flood risk project to apply new levee analysis and mapping procedures to leveed areas. These temporary actions involve using the flood hazard data shown on the previous effective FIRM exactly as shown on that prior FIRM and identifying the area with bounding lines and special map notes. If a vertical datum conversion was executed for the county, then the Base Flood Elevations shown on the FIRM will now reflect elevations referenced to the North American Vertical Datum of 1988 (NAVD88). These levees are on FIRM panel(s) 19153C0195F, 19153C0335F, 19153C0355F, 19153C0360F, 19153C0370F, and 19153C0390F, on the Des Moines River, Raccoon River, and Fourmile Creek and are identified on FIRM panels as potential areas of flood hazard data changes based on further review. Please refer to Section 4.4 of this FIS report for more information.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at <https://www.fema.gov/>.

Figure 1: FIRM Panel Index



1 inch = 4 miles

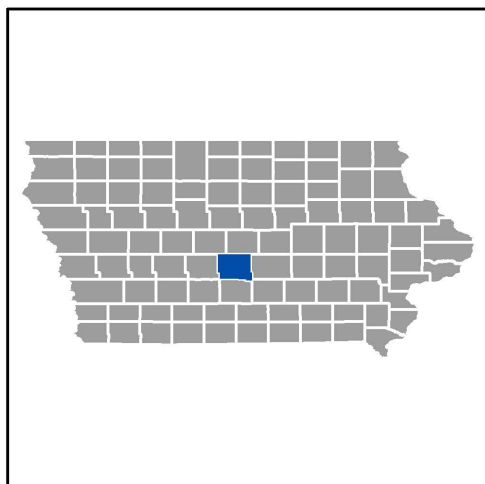
0 1.5 3 6 Miles

Map Projection:
NAD 1983 StatePlane Iowa South FIPS 1402 Feet
North American Datum of 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

[HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

SEE FIS REPORT FOR ADDITIONAL INFORMATION



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

POLK COUNTY, IOWA AND INCORPORATED AREAS

PANELS PRINTED:

0025, 0030, 0035, 0040, 0045, 0055, 0060, 0065, 0070, 0100, 0125, 0155, 0160, 0165, 0166, 0167, 0168, 0169, 0176, 0177, 0178, 0179, 0185, 0186, 0187, 0188, 0189, 0195, 0205, 0210, 0215, 0220, 0230, 0235, 0240, 0245, 0275, 0295, 0305, 0310, 0315, 0320, 0326, 0327, 0328, 0329, 0335, 0340, 0345, 0355, 0360, 0365, 0370, 0380, 0385, 0390, 0395, 0405, 0415, 0457, 0476, 0535, 0555



FEMA

MAP NUMBER
19153CIND0A

EFFECTIVE DATE
FEBRUARY 1, 2019

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 28 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

Figure 2. FIRM Notes to Users (continued)

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane Iowa South Zone, 1402. The horizontal datum was North American Datum of 1983 (NAD83, GRS1980 Spheroid). Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to North American Vertical Datum of 1988 (NAVD88). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and North American Vertical Datum of 1988, visit the National Geodetic Survey website at <https://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

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

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided in digital format by the United States Department of Agriculture (USDA). This information was derived from digital orthophotography at a 1-meter resolution from photography dated 2013. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Polk County, Iowa and Incorporated Areas, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

Figure 2. FIRM Notes to Users (continued)

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Polk County, Iowa and Incorporated Areas, effective February 1, 2019.

ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <https://www.fema.gov/national-flood-insurance-program>.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*



Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)

Zone A The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.

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

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

Zone AR The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

Zone A99 The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.

Zone V The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.

Zone VE Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.



Regulatory Floodway determined in Zone AE.

Figure 3: Map Legend for FIRM (continued)






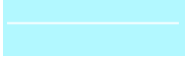







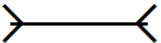
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Zone X Protected by Accredited Levee: Areas protected by an accredited levee, dike or other flood control structures. See Notes to Users for important information.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible
	Unshaded Zone X: Areas determined to be outside the 0.2% annual chance floodplain
FLOOD HAZARD AND OTHER BOUNDARY LINES	
	Flood Zone Boundary (white line)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
 <i>Aqueduct Channel Culvert Storm Sewer</i>	Channel, Culvert, Aqueduct, or Storm Sewer
 <i>Dam Jetty Weir</i>	Dam, Jetty, Weir
	Levee, Dike or Floodwall accredited or provisionally accredited to provide protection from the 1% annual chance flood
	Levee, Dike or Floodwall not accredited to provide protection from the 1% annual chance flood.
 <i>Bridge</i>	Bridge

Figure 3: Map Legend for FIRM (continued)


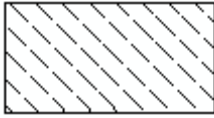

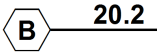
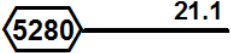
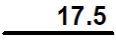
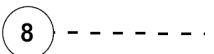


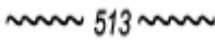





<p>COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. See Notes to Users for important information.</p>	
 CBRS AREA 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 OTHERWISE PROTECTED AREA 09/30/2009	Otherwise Protected Area
<p>REFERENCE MARKERS</p>	
	River mile Markers
<p>CROSS SECTION & TRANSECT INFORMATION</p>	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
 	<p>Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.</p> <p>Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.</p>
	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
<p>ZONE AE (EL 16)</p>	Static Base Flood Elevation value (shown under zone label)
<p>ZONE AO (DEPTH 2)</p>	Zone designation with Depth
<p>ZONE AO (DEPTH 2) (VEL 15 FPS)</p>	Zone designation with Depth and Velocity

Figure 3: Map Legend for FIRM (continued)

BASE MAP FEATURES	
<u>Missouri Creek</u>	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
<u>MAPLE LANE</u>	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
 RAILROAD	Railroad
—————	Horizontal Reference Grid Line
—	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
4276⁰⁰⁰mE	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Polk County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 23), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Polk County IA, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 13. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Within this jurisdiction, there are one or more levees that have not been demonstrated by the communities or levee owners to meet the requirements of 44CFR Part 65.10 of the NFIP regulations (44 CFR 65.10) as it relates to the levee’s capacity to provide 1-percent- annual chance flood protection. As such, the floodplain boundaries in this area are subject to change. Please refer

to Section 4.4 of this FIS for more information on how this may affect the floodplain boundaries shown on this FIRM.

2.2 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 balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water-surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. Regulations for State require communities in Polk County to limit increases caused by encroachment to 1.0 feet and several communities have adopted additional restrictions. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic

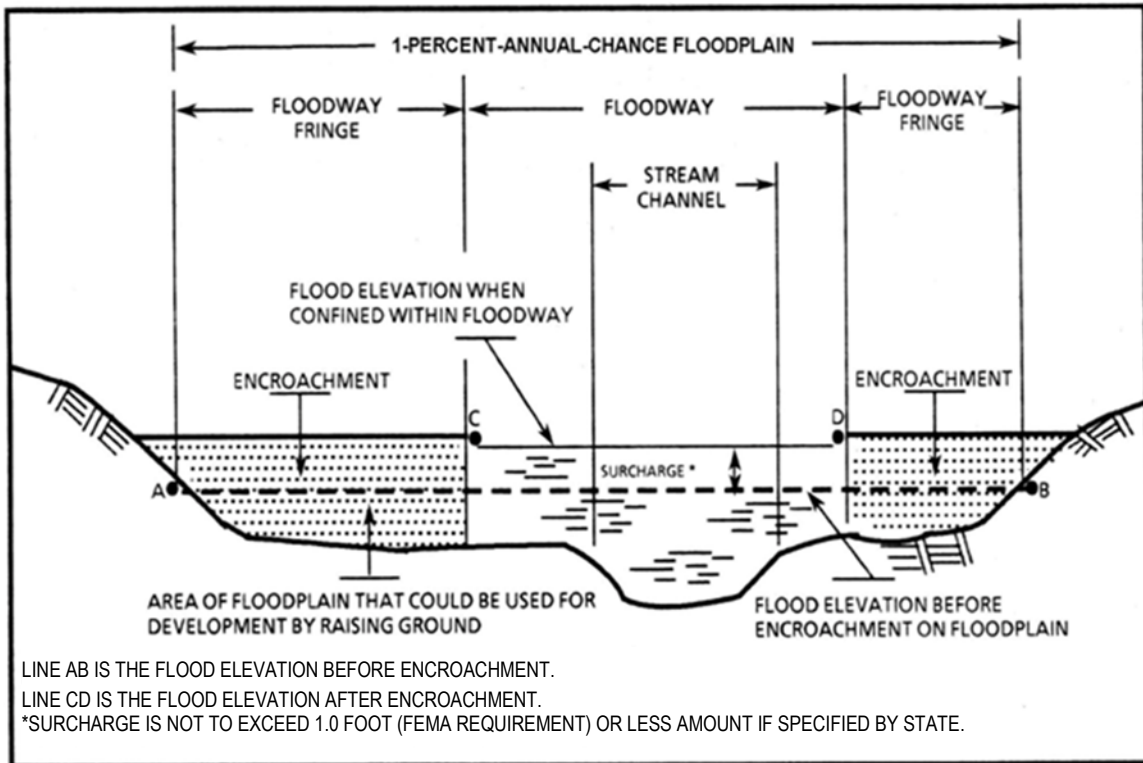


Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
All Zone A's unless otherwise noted	Polk County Unincorporated Areas and Incorporated Areas	Stream specific	Stream specific	07080105, 07100004, 07100006, 07100008	246	-	N	A	2013
Beaver Creek	City of Johnston, City of Urbandale, Polk County Unincorporated Areas	Confluence with Des Moines River; Approximately 100 ft downstream of 114 th Street	City of Johnston corporate limits; Approximately 260 ft downstream of State Route 141	07100004	25.6	-	Y	AE	1981
Beaver Creek Tributary 14	City of Des Moines, Polk County Unincorporated Areas	Confluence with Beaver Creek	450 ft below Meredith Drive	07100004	0.7	-	N	A	2014
Big Creek Lake	City of Polk City, Polk County Unincorporated Areas	N/A	N/A	07100004	-	N/A	N	AE	N/A
Big Creek Pounding Area	City of Johnston, City of Polk City, Polk County Unincorporated Areas	N/A	N/A	07100004	-	N/A	N	AE	N/A
Des Moines River	City of Des Moines, City of Johnston, City of Pleasant Hill, Polk County Unincorporated Areas	Approximately 5 miles downstream of I-65	At Interstate 80 Bridge	07100004, 07100008	19.7	-	Y	AE	2013

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Des Moines River	City of Johnston, Polk County Unincorporated Areas	At Interstate 80 Bridge	Saylorville Dam	07100004	5.0	-	Y	AE	2005
Dovetail	City of Grimes	Confluence with Meadowlark Creek	At SE Grimes Boulevard	07100004	0.4	-	Y	AE	2013
Fourmile Creek	City of Des Moines, City of Pleasant Hill	Confluence with Des Moines River	At Fairview Drive	07100008	2.6	-	Y	AE	2016
Fourmile Creek	City of Alleman, City of Ankeny, City of Des Moines, City of Pleasant Hill, Polk County Unincorporated Areas	At Fairview Drive	At Northern Polk County boundary	07100008	31.0	-	Y	AE	2014
Frink Creek	City of Des Moines	Confluence with Raccoon River	1,200 ft upstream of Park Avenue	07100006	2.8	-	Y	AE	1999
Gulf Creek	City of Des Moines	600 ft upstream of confluence with Walnut Creek	At Interstate 235	07100006	0.4	-	N	A	2014
Jordan Creek	City of West Des Moines	Approximately 0.02 miles downstream of 81 st Street	Confluence with Raccoon River	07100006	9.0	-	Y	AE	2013
Karen Acres	City of Urbandale	Confluence with North Walnut Creek	At Douglas Avenue	07100006	1.1	-	N	A	2014
Lake Easter	City of Des Moines	N/A	N/A	07100008	-	N/A	N	AE	N/A

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Little Beaver Creek	City of Grimes, City of Johnston, Polk County Unincorporated Areas	Confluence with Beaver Creek	Approximately 0.02 miles upstream of NW 142 nd Street/Y Avenue	07100004	9.53	-	Y	AE	2014
Little Beaver Creek Tributary A	City of Grimes, Polk County	Confluence with Little Beaver Creek	Approximately 0.03 miles upstream of NW 142 nd Street/Y Avenue	07100004	1.4	-	Y	AE	2013
Little Beaver Creek Tributary North	City of Grimes	Confluence with Little Beaver Creek	Approximately 0.02 miles upstream of E 1 st Street	07100004	0.9	-	Y	AE	2016
Little Beaver Creek Tributary South	City of Grimes	Approximately 0.73 miles downstream of SE Little Beaver Drive	Approximately 0.16 miles upstream of S James Street	07100004	1.1	-	Y	AE	2013
Little Fourmile Creek	City of Pleasant Hill, City of Altoona, City of Des Moines, Polk County Unincorporated Areas	Approximately 1.5 miles upstream of confluence with Fourmile Creek	At Interstate 80	07100008	5.9	-	N	AE	2014
Little Fourmile Creek Tributary 1	City of Altoona, Polk County Unincorporated Areas	Confluence with Little Fourmile Creek	At SW 8 th Street	07100008	1.7	-	N	A	2014
Little Fourmile Creek Tributary 2	City of Altoona	Confluence with Little Fourmile Creek	Evans Boulevard	07100008	0.7	-	N	A	2014
Little Walnut Creek	City of Clive, City Of Urbandale	Confluence with Walnut Creek	At Western Clive Corporate Limits	07100006	5.6	-	Y	AE	2000
Meadowlark Creek	City of Grimes	Approximately 0.01 miles downstream of SE 3 rd Street	At SE 11 th Street	07100004	0.5	-	Y	AE	2013

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Middle Creek	City of West Des Moines	Approximately 0.77 miles upstream of 40 th Avenue	Approximately 0.56 miles upstream of N 35 th Street	07100008	1.3	-	Y	AE	1997
Muchikinock Creek	Polk County Unincorporated Areas	Confluence with Fourmile Creek	At NE 78 th Avenue	07100008	5.9	-	Y	AE	2000
Mud Creek	Polk County Unincorporated Areas	Confluence with Des Moines River	At 0.28 miles upstream of NE 3 rd Avenue	07100008	8.5	-	Y	AE	1980
Mud Creek	City of Altoona, Polk County Unincorporated Areas	At 0.28 miles upstream of NE 3 rd Avenue	At 900 ft upstream of NE 62 nd Avenue	07100008	9.3	-	Y	AE	2014
Mud Creek	City of Bondurant	At 900 ft upstream of NE 62 nd Avenue	At 0.47 miles upstream of NW 2 nd Street	07100008	3.1	-	N	A	1980
Mud Creek	City of Bondurant, Polk County Unincorporated Areas	At 0.47 miles upstream of NW 2 nd Street	At NE 94 th Avenue	07100008	1.7	-	Y	AE	1980
Mud Creek Tributary 11	City of Altoona, Polk County Unincorporated Areas	At NE 80 th Street	At N 9 th Street	07100008	1.7	-	N	A	2014
North Walnut Creek	City of Clive, City of Grimes, City of Urbandale, City of Windsor Heights	Confluence with Walnut Creek	At Northern Urbandale Corporate Limits	07100006	5.6	-	Y	AE	2013
Otter Creek	City of Ankeny	Confluence with Fourmile Creek	Approximately 700 ft upstream of 36 th Street	07100008	1.7	-	Y	AE	1999

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Prairie Creek	City of Grimes, Polk County Unincorporated Areas	Confluence with Little Beaver Creek	Approximately 0.76 miles upstream of W 1 st Street	07100004	1.2	-	Y	AE	2013
Raccoon River	City of Des Moines, City of West Des Moines	Confluence with Des Moines River	At 63 rd Street	07100006	8.5	-	Y	AE	1999
Raccoon River	City of West Des Moines, Polk County Unincorporated Areas	At 63 rd Street	Approximately 6.1 miles upstream of Interstate 35	07100006	11.5	-	Y	AE	2006
Raccoon River	City of West Des Moines	Approximately 6.1 miles upstream of Interstate 35	Approximately 10.5 miles upstream of Interstate 35	07100006	4.4	-	Y	AE	1997
Randleman Lake	City of Carlisle, City of Pleasant Hill, City of Runnells, Polk County Unincorporated Areas	N/A	N/A	07100008	-	N/A	N	AE	N/A
Rock Creek	City of Ankeny, Polk County Unincorporated Areas	Confluence with Des Moines River	Approximately 3,300 ft upstream of Interstate 35	07100004,	9.2	-	Y	AE	1999
Rocklyn Creek	City of Urbandale	Confluence with North Walnut Creek	At Douglas Avenue	07100006	1.9	-	N	A	2014
Saylor Creek	City of Ankeny, Polk County Unincorporated Areas	Confluence with Des Moines River	Approximately 3,400 ft upstream of Oralabor Road	07100004	9.3	-	Y	AE	1999

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Saylor Creek Tributary	City of Ankeny	Confluence with Saylor Creek	Approximately 1,900 ft upstream of State Street	07100004	2.3	-	Y	AE	1999
Saylor Creek Tributary 1	City of Des Moines	At Aurora Avenue	At 8 th Street	07100004	0.6	-	N	A	2014
Seventh Ward Ditch	City of Des Moines	At Easton Boulevard	At Chicago & North Western Railroad	07100004, 07100008	2.2	-	Y	AE	1988
South Walnut Creek	City of Clive	Confluence with Walnut Creek	Approximately 7,850 ft upstream	07100006	2.0	-	Y	AE	1992
Spring Creek	City of Pleasant Hill, Polk County Unincorporated Areas	Confluence with Des Moines River	Approximately 150 ft upstream of 80 th Street	07100008	13.0	-	Y	AE	1988
Tributary A	City of Ankeny, Polk County Unincorporated Areas	Confluence with Fourmile Creek	At 18 th Street	07100008	1.9	-	Y	AE	1999
Tributary D	City of Ankeny	Approximately 40 ft downstream of Irvinedale Drive	Approximately 1,600 ft upstream of Greenwood Street	07100004	2.0	-	Y	AE	1999
Tributary E	City of Ankeny	Confluence with Tributary D	Approximately 450 ft upstream of Greenwood Street	07100004	0.5	-	Y	AE	1999
Walnut Creek	City of Clive, City Of Des Moines, City of Urbandale, City of West Des Moines, City of Windsor Heights	Confluence with Raccoon River	At Northern Urbandale Corporate Limits	07100006	18.1	-	Y	AE	2014
Walnut Creek Tributary 11	City of Urbandale	670 ft downstream of Douglas Avenue	At Meredith Drive	07100006	1.4	-	N	A	2014

Table 2: Flooding Sources Included in this FIS Report (Continued)

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Yeader Creek	City of Des Moines	At Easter Lake	At Des Moines Municipal Airport	07100008	5.3	-	N	AE	1988
Yeader Creek Tributary 1	City of Des Moines	1,600 ft above Easter Lake Drive	1,500 ft above Three Lakes Parkway	07100008	1.2	-	N	A	2014

Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data."

All floodways that were developed for this FIS project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs 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.

2.4 Non-Encroachment Zones

Some States and communities use non-encroachment zones to manage floodplain development. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event.

2.5 Coastal Flood Hazard Areas

2.5.1 Water Elevations and the Effects of Waves

This section is not applicable to this FIS project.

Figure 5: Wave Runup Transect Schematic

[Not Applicable to this FIS Project]

2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

This section is not applicable to this FIS project.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this FIS project.

Figure 6: Coastal Transect Schematic [Not Applicable to this FIS Project]

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, “Map Legend for FIRM.” In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this FIS project.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, “Map Legend for FIRM.” Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in the unincorporated and incorporated areas of Polk County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
CITY OF ALLEMAN	A, AE, X, X (shaded)
CITY OF ALTOONA	A, AE, X, X (shaded)
CITY OF ANKENY	A, AE, X, X (shaded)
CITY OF BONDURANT	A, AE, X, X (shaded)
CITY OF CLIVE	A, AE, X, X (shaded)
CITY OF DES MOINES	A, AE, X, X (shaded)
CITY OF ELKHART	X
CITY OF GRIMES	A, AE, X, X (shaded)
CITY OF JOHNSTON	A, AE, X, X (shaded)
CITY OF MITCHELLVILLE	A, X, X (shaded)
CITY OF PLEASANT HILL	A, AE, X, X (shaded)
CITY OF POLK CITY	A, AE, X, X (shaded)
CITY OF SHELDAHL	X
CITY OF RUNNELLS	AE, X
CITY OF URBANDALE	A, AE, X, X (shaded)
CITY OF WEST DES MOINES	A, AE, X, X (shaded)
CITY OF WINDSOR HEIGHTS	AE, X, X (shaded)
POLK COUNTY, UNINCORPORATED AREAS	A, AE, AH, X, X (shaded)

3.2 Coastal Barrier Resources System

The Coastal Barrier Resources Act (CBRA) of 1982 was established by Congress to create areas along the Atlantic and Gulf coasts and the Great Lakes, where restrictions for Federal financial assistance including flood insurance are prohibited. In 1990, Congress passed the Coastal Barrier Improvement Act (CBIA), which increased the extent of areas established by the CBRA and added “Otherwise Protected Areas” (OPA) to the system. These areas are collectively referred to as the John. H Chafee Coastal Barrier Resources System (CBRS). The CBRS boundaries that have been identified in the project area are in Table 4, “Coastal Barrier Resource System Information.”

Table 4: Coastal Barrier Resources System Information
[Not Applicable to this FIS Project]

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 5 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 5: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
South Skunk	07080105	Skunk River	The watershed covers the northeast portion of the county	1,884
Middle Des Moines	07100004	Des Moines River	The watershed covers the northwest portion of the county	1,708
North Raccoon	07100006	Raccoon River	The watershed covers the southwest portion of the county	2,480
Lake Red Rock	07100008	Des Moines River	This watershed covers the southeast and a portion of the middle of the county.	2,401

4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for Polk County by flooding source.

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
All sources	The history of flooding of the streams in Polk County indicates that flooding usually occurs during the spring and summer months of the year. The area is particularly susceptible to flooding caused by a combination of rainfall and snowmelt. Major flooding in Polk County has occurred in 1954, 1973, 1993, 2008, and 2010.
Beaver Creek	Significant flooding occurred on Beaver Creek on June 13, 1966, May 19, 1974, July 10, 1993, June 1, 2008, and August 11, 2010. Discharges associated with these events are 5,470 cfs, 7,340, 14,300 cfs, 7,800 cfs, and 7,960 cfs, respectively, at the Beaver Creek near Grimes, Iowa stream gage (USGS Gage No. 05481950).

Table 6: Principal Flood Problems (continued)

Flooding Source	Description of Flood Problems
Des Moines River	<p>Major flooding occurred on the Des Moines River near Saylorville in June 1954, April 1965, July 1993, June 2008, and July 2010. Discharges associated with these events are 60,000 cubic feet per second (cfs), 47,400 cfs, 45,700 cfs, 50,500 cfs, and 37,900 cfs, respectively. Peak discharges were taken from the Des Moines River near Saylorville, Iowa stream gage (USGS Gage No. 05481650).</p> <p>During the Great Flood of 1993, Polk County suffered more than \$152,000,000 in flood damages, mostly in the Des Moines metropolitan area. In addition, Des Moines was without water service for more than a week causing the closure of most of the businesses and industry in the city. More than 3,000 properties were inundated. In 2008, residents and business were evacuated as flows exceeded the 1% annual chance flood estimate. Birdland levee on the Des Moines River failed and inundated the area behind it.</p> <p>The Des Moines River has two USGS gaging stations within the City of Des Moines, the Des Moines River at 2nd Avenue (Gage No. 05482000) and the Des Moines River below Raccoon River (Gage No. 05485500). Significant floods occurred at the 2nd Avenue gage in 1954, 2008, and 2010 which resulted in a peak discharge of 60,200 cfs, 47,300 cfs, and 37,300 cfs respectfully. The gage was not in service between 1961 and 1997. The peak flows at the gage on the Des Moines River below Raccoon River occurred in June 1947, April 1960, July 1993, and June 2008. The peak discharges were 77,000 cfs, 68,900 cfs, 116,000 cfs and 104,000 cfs respectfully.</p>
Fourmile Creek	<p>The greatest flood on Fourmile Creek since 1947, at the time of the previous FIS, occurred in June 1966 and had a discharge of 7,430 cfs. The second greatest flood of 5,900 cfs occurred in June 1947. Estimated flood damage for the City of Des Moines was \$116,000 for the 1947 flood and \$43,000 for the 1966 flood. A USGS stream gage is located at Easton Boulevard on Fourmile Creek (Gage No. 05485640) since 1972. The peak flow recorded by the gage was in 5,600 cfs in June 1998. There have been two significant flood events since 1998, the first occurred in June 2008 and the second in August 2010. The peak flows recorded were 6,810 cfs and 9,620 cfs, respectively.</p> <p>Five hundred people were displaced from their homes and two lost their lives during the June 1947 flood. Damages to the city amounted to \$850,000 plus \$150,000 spent for emergency flood fighting. The June 1954 flood forced 1,800 people to evacuate their homes and cost the city \$1,193,000 in damages and another \$375,000 for flood fighting.</p>
Little Beaver Creek	<p>Little Beaver Creek and Little Beaver Creek Tributary A within the City of Grimes are both subject to flooding. No USGS gaging stations are located in the city, and no high water marks are known to exist on either of these streams in Grimes.</p>
Little Beaver Creek Tributary A	<p>Little Beaver Creek and Little Beaver Creek Tributary A within the City of Grimes are both subject to flooding. No USGS gaging stations are located in the city, and no high water marks are known to exist on either of these streams in Grimes.</p>
Little Fourmile Creek	<p>Little Fourmile Creek is subject to flooding hazards although there are no USGS gaging stations near the city. A 1% annual chance flood is estimated to have a peak discharge of 5,720 cfs. No high water marks are known to exist on Little Fourmile Creek in the study area.</p>

Table 6: Principal Flood Problems (continued)

Flooding Source	Description of Flood Problems
North Walnut Creek	<p>The greatest flood problems in Clive are in the southeastern part of the city where commercial businesses have encroached upon the floodplains of Walnut Creek and North Walnut Creek. The greatest flood damages incurred, as of the previous FIS, in the City of Clive were from the flood of July 1, 1973 on Walnut Creek. The same storm system that produced the storm on Walnut Creek also caused a major flood on the Raccoon River. Flood damages from these floods in Polk County were estimated at approximately \$1,354,000 by the Civil Defense Division, Iowa Department of Public Defense.</p>
Raccoon River	<p>A USGS gaging station is located on the Raccoon River near Van Meter, Iowa, (Gage No. 05484500) 15 miles upstream of the City of Des Moines. The gage has been active since 1915 and indicated that the July 1973 event had a peak flow of 35,600 cfs. Other flooding events included July 1993, June 1998, and June 2008. The peak discharges for these events were 70,100 cfs, 47,400 cfs, and 43,500 cfs, respectfully. A USGS Gaging station on Raccoon River at Fleur Street (Gage No. 05484900) has been in place since 1984. Peak discharges within the period of record occurred in July 1993 and June 2008. Peak discharges were 67,900 cfs and 56,300 cfs, respectfully.</p>
South Ward Ditch	<p>In many areas of the Seventh Ward Ditch, floodplain development has taken place near the stream channel with little consideration given to the flood potential of the stream. The stream channel itself is small and overgrown with vegetation in many areas, and many culverts are partially or almost completely filled with sediment. These factors, combined with the increasing urbanization of the watershed, have combined to cause increasingly frequent flooding problems.</p>
Walnut Creek	<p>The greatest flood problems in Clive are in the southeastern part of the city where commercial businesses have encroached upon the floodplains of Walnut Creek and North Walnut Creek. The greatest flood damages incurred, as of the previous FIS, in the City of Clive were from the flood of July 1, 1973 on Walnut Creek. The same storm system that produced the storm on Walnut Creek also caused a major flood on the Raccoon River. Flood damages from these floods in Polk County were estimated at approximately \$1,354,000 by the Civil Defense Division, Iowa Department of Public Defense.</p> <p>A USGS stream gaging station (Gage No. 05484800) on Walnut Creek at the 63rd Street Bridge was established in October 1971. Fragmentary flood peak records prior to 1971 indicate that significant floods occurred in 1947, 1958, and 1964. The greatest of the known floods on Walnut Creek, at the time of the previous FIS, was the flood of May 10, 1986, but the 1947 flood may have been nearly equivalent. The recorded annual flood peaks for 1974 and 1986 were also relatively high and may have been greater than the 1958 and 1964 floods; however, flood peak data are not available at the same locations for direct comparisons. The 1986 flood peak was 12,500 cfs. Other significant flooding events on Walnut Creek include 1973, 1993, and 2010 which resulted in 9,000 cfs, 6,460 cfs, and 11,700 cfs, respectfully.</p> <p>The Raccoon River and Walnut Creek inflicted flood damages on the City of Des Moines in the floods of 1973. Even though the flooding on the two streams resulted from the same storm system, the Walnut Creek flood crested on July 1, whereas, flood flows on the Raccoon River were relatively high during the period of July 1 through July 5, with the flood peak occurring on July 4.</p>

Table 7 contains information about historic flood elevations in the communities within Polk County.

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Beaver Creek	USGS 05481950, Beaver Creek near Grimes, IA	823.66	1993	*	NOAA Historic Crests
Beaver Creek	USGS 05481950, Beaver Creek near Grimes, IA	821.98	2010	*	NOAA Historic Crests
Beaver Creek	USGS 05481950, Beaver Creek near Grimes, IA	821.81	1986	*	NOAA Historic Crests
Beaver Creek	USGS 05481950, Beaver Creek near Grimes, IA	821.77	1974	*	NOAA Historic Crests
Beaver Creek	USGS 05481950, Beaver Creek near Grimes, IA	821.67	2004	*	NOAA Historic Crests
Des Moines River	USGS Gage 05481650, Des Moines River near Saylorville, IA	812.02	1954	*	NOAA Historic Crests
Des Moines River	USGS Gage 05481650, Des Moines River near Saylorville, IA	811.74	1993	*	NOAA Historic Crests
Des Moines River	USGS Gage 05481650, Des Moines River near Saylorville, IA	811.55	2008	*	NOAA Historic Crests
Des Moines River	USGS Gage 05481650, Des Moines River near Saylorville, IA	811.54	1965	*	NOAA Historic Crests
Des Moines River	USGS Gage 05481650, Des Moines River near Saylorville, IA	808.40	2010	*	NOAA Historic Crests
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	805.55	1993	*	NOAA Historic Crests
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	805.41	2008	*	NOAA Historic Crests

*Not calculated for this FIS project

Table 7: Historic Flooding Elevations (continued)

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	804.00	1954	*	NOAA Historic Crests
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	801.14	1903	*	NOAA Historic Crests
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	800.34	1947	*	NOAA Historic Crests
Des Moines River	USGS 05482000, Des Moines River at 2nd Avenue at Des Moines, IA	799.92	2010	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	798.17	2008	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	796.91	1993	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	792.45	2010	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	792.40	1965	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	791.48	1960	*	NOAA Historic Crests
Des Moines River	USGS 05485500, Des Moines River below Raccoon River at Des Moines, IA	791.27	1998	*	NOAA Historic Crests

*Not calculated for this FIS project

Table 7: Historic Flooding Elevations (continued)

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Fourmile Creek	USGS 05485640, Fourmile Creek at Des Moines, IA	812.11	2010	*	NOAA Historic Crests
Fourmile Creek	USGS 05485640, Fourmile Creek at Des Moines, IA	811.35	2008	*	NOAA Historic Crests
Fourmile Creek	USGS 05485640, Fourmile Creek at Des Moines, IA	811.11	2008	*	NOAA Historic Crests
Fourmile Creek	USGS 05485640, Fourmile Creek at Des Moines, IA	810.97	1998	*	NOAA Historic Crests
Fourmile Creek	USGS 05485640, Fourmile Creek at Des Moines, IA	810.81	1974	*	NOAA Historic Crests
Raccoon River	USGS 05484500, Raccoon River at Van Meter, IA	867.60	1993	*	NOAA Historic Crests
Raccoon River	USGS 05484500, Raccoon River at Van Meter, IA	864.55	1998	*	NOAA Historic Crests
Raccoon River	USGS 05484500, Raccoon River at Van Meter, IA	863.95	1986	*	NOAA Historic Crests
Raccoon River	USGS 05484500, Raccoon River at Van Meter, IA	863.93	2008	*	NOAA Historic Crests
Raccoon River	USGS 05484500, Raccoon River at Van Meter, IA	863.03	1958	*	NOAA Historic Crests
Raccoon River	USGS 05484900, Raccoon River at Fleur Drive at Des Moines, IA	807.60	1993	*	NOAA Historic Crests
Raccoon River	USGS 05484900, Raccoon River at Fleur Drive at Des Moines, IA	805.46	2008	*	NOAA Historic Crests
Raccoon River	USGS 05484900, Raccoon River at Fleur Drive at Des Moines, IA	801.25	1998	*	NOAA Historic Crests

*Not calculated for this FIS project

Table 7: Historic Flooding Elevations (continued)

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Raccoon River	USGS 05484900, Raccoon River at Fleur Drive at Des Moines, IA	800.63	1947	*	NOAA Historic Crests
Raccoon River	USGS 05484900, Raccoon River at Fleur Drive at Des Moines, IA	800.32	1947	*	NOAA Historic Crests
Walnut Creek	USGS 05484800, Walnut Creek at Des Moines, IA	819.73	2010	*	NOAA Historic Crests
Walnut Creek	USGS 05484800, Walnut Creek at Des Moines, IA	819.46	1986	*	NOAA Historic Crests
Walnut Creek	USGS 05484800, Walnut Creek at Des Moines, IA	819.14	1990	*	NOAA Historic Crests
Walnut Creek	USGS 05484800, Walnut Creek at Des Moines, IA	818.86	1973	*	NOAA Historic Crests
Walnut Creek	USGS 05484800, Walnut Creek at Des Moines, IA	818.70	1993	*	NOAA Historic Crests

*Not calculated for this FIS project

4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within Polk County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 8: Non-Levee Flood Protection Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Des Moines River	Saylorville Lake Dam	Dam	2.3 miles upstream of NW 66 th Avenue	Flood control dam, Saylorville Lake is located in parts of Polk, Dallas and Boone Counties in Iowa. At full flood control pool, elevation 890 feet, the lake extends 54 miles above the dam and occupies 5,400 acres of land. A reserve of 74,000 acre-feet has been allocated in the reservoir for conservation purposes. The effect of Saylorville Reservoir on flooding on the Des Moines River is to lower the 1% annual chance flood discharge from 145,000 to 59,000 cfs at SE 14th Street in Des Moines.
Big Creek	Big Creek Lake	Dam	At N Broadway Street	Flood control dam
South Walnut Creek	Clive Lake Dam	Dam	At Country Club Boulevard on South Walnut Creek	Residential dam

4.4 Levees

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the risk from the 1% annual chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate FIRM flood zone.

Levee systems that are determined to reduce the risk from the 1% annual chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with Section 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee's certification status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3 and in Table 9. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets Section 65.10, FEMA will de-accredit the levee system and issue an effective FIRM showing the levee-impacted area as a SFHA.

FEMA coordinates its programs with USACE, who may inspect, maintain, and repair levee systems. The USACE has authority under Public Law 84-99 to supplement local efforts to repair flood control projects that are damaged by floods. Like FEMA, the USACE provides a program to allow public sponsors or operators to address levee system maintenance deficiencies. Failure to do so within the required timeframe results in the levee system being placed in an inactive status in the USACE Rehabilitation and Inspection Program. Levee systems in an inactive status are ineligible for rehabilitation assistance under Public Law 84-99.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levees that exist within Polk County. Table 9, "Levees," lists all accredited levees, PALs, and de-accredited levees shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levees identified as PALs in the table are labeled on the FIRM to indicate their provisional status.

Please note that the information presented in Table 9 is subject to change at any time. For that reason, the latest information regarding any USACE structure presented in the table should be obtained by contacting USACE and accessing the USACE national levee database. For levees owned and/or operated by someone other than the USACE, contact the local community shown in Table 31.

Please note that FEMA has identified levees in this jurisdiction that have not been demonstrated by the community or levee owner to meet the requirements of 44CFR Part 65.10 of the NFIP regulations as it relates to the levee's capacity to provide 1-percent-annual-chance flood protection. As such, the existing flood hazard analysis in the affected areas has been carried forward from the previously-printed effective FIRM panel(s) and the area has been clearly identified on the FIRM panel with notes and bounding lines. This has been done to inform users that a temporary mapping action has been put in place until such time as FEMA is able to initiate a new flood risk project to apply new flood hazard mapping procedures for leveed areas. These levees occur on FIRM panel(s) 19153C0195F, 19153C0335F, 19153C0355F, 19153C0360F, 19153C0370F, and 19153C0370F, on the Des Moines River, Raccoon River, and Fourmile Creek and are identified on the FIRM panel(s) as potential areas of flood hazard data changes based on further review. Levees and their accreditation status are listed in Table 9 of this FIS report.

Table 9: Levees

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84-99 Program?	FIRM Panel(s)	Levee Status
City of Des Moines	Des Moines River	Left Bank	City of Des Moines	N	N/A	N/A	19153C0335F, 19153C0355F	Accredited
City of Des Moines	Raccoon River	Right Bank	City of Des Moines	N	N/A	N/A	19153C0335F, 19153C0345F	Accredited
City of Des Moines	Raccoon River	Right Bank	City of Des Moines	N	N/A	N/A	19153C0335F	Secluded
City of Des Moines, City of West Des Moines	Raccoon River	Left Bank	City of West Des Moines	N	N/A	N/A	19153C0328F, 19153C0329F, 19153C0340F	Accredited
City of Des Moines	Des Moines River	Right Bank	City of Des Moines	N	N/A	N/A	19153C0355F	Accredited
City of Des Moines	Des Moines River	Left Bank	City of Des Moines	N	N/A	N/A	19153C0355F	Secluded
City of Des Moines	Des Moines River and Raccoon River	Right Bank	City of Des Moines	N	N/A	N/A	19153C0355F	Secluded
City of Des Moines	Des Moines River	Left Bank	N/A	N/A	N/A	N/A	19153C0195F	N/A
City of Des Moines	Des Moines River and Raccoon River	Right Bank Des Moines River, Left Bank Raccoon River	City of Des Moines	N	N/A	N/A	19153C0335F, 19153C0355F	Secluded
Polk County Unincorporated Areas	Des Moines River, Lake Red Rock	Right Bank	US Army Corps of Engineers, Rock Island District	Y	N/A	N/A	19153C0370F, 19153C0390F	Secluded
City of Des Moines, City of Pleasant Hill	Des Moines River and Fourmile Creek	Left Bank	US Army Corps of Engineers, Rock Island District	Y	N/A	N/A	19153C0355F, 19153C0360F, 19153C0370F	Secluded

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources 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 at least once on the average during any 10-, 25-, 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-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 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.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 17.) Stream gage information is provided in Table 12.

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Beaver Creek	Just Upstream of Northwest 70 th Avenue	358	6,370	*	10,700	12,800	*	18,500
Beaver Creek	At Gage Station at Highway 44 Crossing	358	5,850	*	7,940	8,770	*	10,580
Beaver Creek	Above Little Beaver Creek	345	5,710	*	7,750	8,560	*	10,300
Des Moines River	At SE 6 th Street	9,879	44,100	*	83,300	107,500	*	142,000
Des Moines River	At 2 nd Avenue	6,245	19,470	*	48,510	57,220	*	78,900
Des Moines River ¹	At the Upstream Corporate Limit of the City of Des Moines	6,245	19,000	*	30,000	37,000	*	52,000
Dovetail	At confluence with Meadowlark Creek	0.37	145	192	233	278	*	380
Dovetail	At SE Grimes Boulevard	0.25	96	126	153	183	*	248
Dovetail	Upstream of SE Grimes Boulevard	0.05	8	9	10	10	*	16
Fourmile Creek	At confluence with Des Moines River	115.99	4,882	*	8,999	11,150	*	15,678
Fourmile Creek	At Vandalia Road	114.14	4,885	*	9,051	11,194	*	15,642
Fourmile Creek	Below Leetown Creekway	114.05	4,883	*	9,050	11,194	*	15,643
Fourmile Creek	Above Scott Avenue	107.52	5,081	*	9,992	12,583	*	17,268
Fourmile Creek	At Dean / Fairview	107.13	5,077	*	9,992	12,587	*	17,252
Fourmile Creek	3,490 ft below University Avenue /below Little Fourmile Creek	106.61	5,068	*	9,987	12,582	*	17,228

*Not calculated for this FIS project

¹This discharge lies within an area that has not been updated on the FIRM at this time due to the presence of levees that have not been demonstrated to meet the requirements of NFIP Regulation 44CFR 65.10. Please refer to the Section 4.4 of this FIS report for more information.

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Fourmile Creek	Below Williams Street	94.47	4,635	*	8,880	11,109	*	15,158
Fourmile Creek	Hubble Avenue	90.38	4,711	*	9,033	11,264	*	15,856
Fourmile Creek	3,000 ft below NE Broadway Avenue/NE 46 th Avenue	88.00	4,571	*	8,771	10,936	*	15,370
Fourmile Creek	2,610 ft below NE Broadway Avenue/NE 46 th Avenue	87.20	4,533	*	8,701	10,848	*	15,243
Fourmile Creek	870 ft below NE Broadway Avenue/NE 46 th Avenue	87.15	4,535	*	8,704	10,852	*	15,248
Fourmile Creek	Above NE Broadway Avenue/NE 46 th Avenue	85.40	4,653	*	8,431	10,462	*	14,638
Fourmile Creek	At NE 54 th Avenue	83.91	4,301	*	8,220	10,189	*	14,233
Fourmile Creek	Below Muchikinock Creek	82.10	4,166	*	7,967	9,882	*	13,794
Fourmile Creek	3,950 below NE 62 nd Avenue	69.94	3,336	*	5,765	7,070	*	9,658
Fourmile Creek	Above NE 62 nd Avenue	66.15	3,206	*	5,305	6,378	*	8,587
Fourmile Creek	Above railroad 3,600 ft above NE 62 nd Ave.	65.84	3,197	*	5,298	6,369	*	8,575
Fourmile Creek	8,630 below NE 78 th Avenue/SE Oralabor Road	64.47	3,152	*	5,237	6,296	*	8,490
Fourmile Creek	Above NE 78 th Avenue/SE Oralabor Road	63.05	3,118	*	5,190	6,238	*	8,420

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Fourmile Creek	2,720 above NE 78 th Avenue/SE Oralabor Road	62.15	3,098	*	5,160	6,202	*	8,376
Fourmile Creek	At NE 86 th Avenue	60.13	3,032	*	5,075	6,101	*	8,258
Fourmile Creek	2,700 above NE 86 th Avenue	59.90	3,028	*	5,074	6,095	*	8,262
Fourmile Creek	4,400 ft below E 1 st Street	59.14	3,006	*	5,043	6,059	*	8,219
Fourmile Creek	3,520 ft below E 1 st Street	58.23	2,970	*	4,995	6,004	*	8,155
Fourmile Creek	At E 1 st Street	57.33	2,944	*	4,959	5,960	*	8,102
Fourmile Creek	3,820 ft above E 1 st Street	47.51	2,693	*	4,418	5,279	*	7,214
Fourmile Creek	At Interstate 35	44.93	2,615	*	4,302	5,141	*	7,057
Fourmile Creek	Below Otter Creek	44.88	2,615	*	4,304	5,141	*	7,069
Fourmile Creek	At NE Delaware Avenue	38.66	2,138	*	3,482	4,205	*	5,885
Fourmile Creek	6,610 ft above NE Delaware Avenue	38.08	2,118	*	3,453	4,176	*	5,852
Fourmile Creek	At NE 36 th Avenue	37.43	2,097	*	3,426	4,161	*	5,867
Fourmile Creek	At NE 47 th Street	35.16	1,994	*	3,266	3,980	*	5,624
Fourmile Creek	At NE 118 th Avenue	30.97	1,694	*	2,720	3,335	*	4,701
Fourmile Creek	Highway 69: 3/4 mile South of NE 126 th Avenue (North of 118 th Avenue)	29.56	1,635	*	2,631	3,237	*	4,572
Fourmile Creek	1,960 ft above Highway 69 North of NE 118 th Avenue	29.49	1,630	*	2,627	3,240	*	4,601

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Fourmile Creek	Highway 69: 1/4 mile South of NE 126 th Avenue	24.66	1,429	*	2,315	2,873	*	4,119
Fourmile Creek	Highway 69: 1/4 mile North of NE 126 th Avenue	24.10	1,418	*	2,291	2,848	*	4,084
Fourmile Creek	5,580 ft above Highway 69 North of NE 126 th Avenue	23.81	1,412	*	2,282	2,849	*	4,121
Fourmile Creek	At NW 134 th Avenue	22.78	1,380	*	2,233	2,789	*	4,038
Fourmile Creek	1,350 ft above NW 134 th Avenue	22.66	1,380	*	2,237	2,805	*	4,075
Fourmile Creek	800 ft below NW 142 nd Avenue	20.49	1,224	*	1,984	2,477	*	3,571
Fourmile Creek	At NW 142 nd Avenue	17.95	997	*	1,588	2,002	*	2,872
Fourmile Creek	At NW 16 th Avenue	17.44	1,016	*	1,817	2,283	*	3,217
Fourmile Creek	At NW 150 th Avenue	7.88	617	*	1,201	1,494	*	2,106
Fourmile Creek	Above NW 150 th Avenue	7.00	566	*	1,094	1,387	*	1,929
Fourmile Creek	At NW 158 th Avenue	5.88	502	*	1,007	1,283	*	1,802
Fourmile Creek	Above NW 166 th Avenue Story/Polk County Line	4.60	354	*	747	929	*	1,397
Frink Creek	At Park Avenue	6.1	1,430	*	2,810	3,560	*	5,800
Frink Creek	At Station 1200	6	1,430	*	2,810	3,560	*	5,800
Jordan Creek	0.9 meters upstream of confluence with Raccoon River.	12.39	1,599	2,216	2,705	3,230	*	4,584
Jordan Creek	At the confluence of 07100006000373.	12.39	1,599	2,215	2,705	3,230	*	4,584

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Jordan Creek	0.5 meters upstream of confluence with 07100006000373.	10.12	1,425	1,982	2,425	2,901	*	4,584
Jordan Creek	43.7 meters upstream of confluence with 07100006000373.	10.12	1,425	1,982	2,425	2,901	*	4,584
Jordan Creek	351.0 meters upstream of confluence with 07100006000373.	10.08	1,425	1,982	2,425	2,901	*	4,126
Jordan Creek	4790.0 meters upstream of confluence with 07100006000373.	8.34	1,276	1,782	2,425	2,901	*	4,126
Jordan Creek	5018.2 meters upstream of confluence with 07100006000373.	8.32	1,276	1,782	2,182	2,901	*	4,126
Jordan Creek	5376.3 meters upstream of confluence with 07100006000373.	8.29	1,276	1,782	2,182	2,611	*	4,126
Jordan Creek	5504.1 meters upstream of confluence with 07100006000373.	8.20	1,276	1,782	2,182	2,611	*	4,126
Jordan Creek	5533.4 meters upstream of confluence with 07100006000373.	8.19	1,276	1,782	2,182	2,611	*	3,711
Jordan Creek	5691.8 meters upstream of confluence with 07100006000373.	8.17	462	669	835	1,019	*	1,510

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Jordan Creek	At the confluence of 07100006001153.	5.22	462	669	835	1,019	*	1,510
Jordan Creek	5244.0 meters upstream of confluence with 07100006001153.	1.33	448	649	810	989	*	1,468
Little Beaver Creek	At Confluence with Beaver Creek	12.55	3,470	4,860	6,100	7,470	*	10,570
Little Beaver Creek	Approximately 0.73 miles upstream of confluence with Beaver Creek	12.17	3,420	4,780	5,990	7,340	*	10,370
Little Beaver Creek	Approximately 1.1 miles upstream of confluence with Beaver Creek	11.33	3,250	4,530	5,670	6,950	*	9,800
Little Beaver Creek	Approximately 0.1 miles downstream of NE Park Drive	9.21	2,531	3,483	4,305	5,258	*	7,340
Little Beaver Creek	Directly upstream of confluence with Little Beaver Creek Tributary A	5.81	1,687	2,307	2,851	3,495	*	4,910
Little Beaver Creek	Approximately 0.10 miles upstream of confluence with Little Beaver Creek Tributary A	5.8	1,685	2,305	2,848	3,492	*	4,904
Little Beaver Creek	Directly upstream of confluence with Little Beaver Creek Tributary North	2.61	798	1,104	1,370	1,657	*	2,306

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Little Beaver Creek	Directly upstream of confluence with Prairie Creek	1.18	329	462	579	705	*	991
Little Beaver Creek	Approximately 0.02 miles upstream of NW 142 nd Street/Y Avenue	0.66	200	276	342	412	*	572
Little Beaver Creek Split	At confluence with Little Beaver Creek	0.83	190	270	350	430	*	640
Little Beaver Creek Tributary A	At confluence with Little Beaver Creek	3.02	789	1,093	1,356	1,641	*	2,286
Little Beaver Creek Tributary A	Approximately 0.46 miles downstream of NW 142 nd Street/Y Avenue	2.67	704	973	1,206	1,458	*	2,026
Little Beaver Creek Tributary A	Approximately 0.48 miles downstream of NW 142 nd Street/Y Avenue	2.06	538	742	919	1,111	*	1,542
Little Beaver Creek Tributary A	Approximately 0.03 miles upstream of NW 142 nd Street/Y Avenue	1.92	509	702	869	1,049	*	1,456
Little Beaver Creek Tributary North	At confluence with Little Beaver Creek	2.6	729	987	1,207	1,517	*	2,122
Little Beaver Creek Tributary North	Approximately 0.33 miles upstream of confluence with Little Beaver Creek	2.54	708	959	1,171	1,474	*	2,057

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Little Beaver Creek Tributary North	Approximately 0.34 miles upstream of confluence with Little Beaver Creek	2.27	644	872	1,059	1,336	*	1,856
Little Beaver Creek Tributary North	Approximately 0.02 miles upstream of E 1st Street	1.83	520	704	858	1,067	*	1,472
Little Beaver Creek Tributary South	Approximately 0.73 miles downstream of SE Little Beaver Drive	0.94	267	368	455	549	*	760
Little Beaver Creek Tributary South	Approximately 0.16 miles upstream of S James Street	0.51	155	211	259	310	*	425
Little Fourmile Creek	At confluence with Fourmile Creek	12.4	2,550	*	4,660	5,720	*	8,750
Little Walnut Creek	At confluence with Walnut Creek	13.5	*	*	*	5,810	*	7,580
Little Walnut Creek	At Warrior Lane	8.1	*	*	*	4,170	*	5,430
Meadowlark Creek	Approximately 0.01 miles downstream of SE 3 rd Street	0.86	313	420	511	610	*	837
Meadowlark Creek	Directly upstream of confluence with Dovetail	0.43	147	201	247	296	*	411
Meadowlark Creek	At SE 11 th Street	0.3	101	138	170	205	*	283
Middle Creek	At 40 th Avenue	3.7	910	1,230	1,500	1,770	*	2,200
Muchikinock Creek	At confluence with Fourmile Creek	11.2	*	*	*	5,300	*	*

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Muchikinock Creek	About 2,000 feet upstream of NE 62 nd Avenue	4.8	*	*	*	2,585	*	*
Mud Creek	At confluence with Des Moines River	41.7	3,600	*	6,530	8,000	*	12,200
Mud Creek	At NE 38 th Avenue	19.62	3,480	*	6,420	7,895	*	10,915
Mud Creek	Upstream of Left Bank Tributary	17.16	2,970	*	5,425	6,650	*	9,160
Mud Creek	At NE 46 th Avenue	16.24	2,765	*	5,035	6,165	*	8,485
Mud Creek	Upstream of Right Bank Tributary	14.68	2,375	*	4,320	5,295	*	7,300
Mud Creek	At NE 50 th Avenue	14.20	2,305	*	4,185	5,125	*	7,055
Mud Creek	Upstream of Left Bank Tributary 2	12.99	2,040	*	3,685	4,510	*	6,200
Mud Creek	At Railroad	12.92	2,035	*	3,680	4,505	*	6,190
Mud Creek	At NE 54 th Avenue	12.32	1,935	*	3,485	4,260	*	5,840
Mud Creek	At NE 80 th Street	12.18	1,925	*	3,470	4,240	*	5,810
Mud Creek	At Interstate 80	10.52	1,660	*	2,985	3,645	*	4,990
Mud Creek	At NE 62 nd Avenue	10.34	1,640	*	2,950	3,600	*	4,930
North Walnut Creek	At confluence with Walnut Creek	14.07	3,240	4,558	5,698	6,911	*	9,424
North Walnut Creek	Approximately 0.2 miles upstream of University Avenue	13.84	3,205	4,503	5,625	6,827	*	9,296
North Walnut Creek	Upstream of confluence with Rocklyn Creek	10.96	2,239	3,140	3,929	4,772	*	6,637
North Walnut Creek	Upstream of confluence with Karen Acres	9.28	1,793	2,529	3,181	3,887	*	5,469

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
North Walnut Creek	Upstream of 86 th Street	8.99	1,711	2,424	3,046	3,723	*	5,281
North Walnut Creek	Upstream of Douglas Avenue	8.36	1,537	2,177	2,738	3,396	*	4,885
North Walnut Creek	Upstream of Aurora Avenue	7.64	1,322	1,879	2,405	3,053	*	4,398
North Walnut Creek	Upstream of Meredith Drive	6.58	1,005	1,524	1,960	2,435	*	3,432
North Walnut Creek	Upstream of Plum Drive	5.10	796	1,166	1,465	1,781	*	2,419
Otter Creek	At N.E. 36th Street	6.13	*	*	*	2,823	*	*
Otter Creek	Approximately 1,900 feet upstream of the confluence with Fourmile Creek	6.58	*	*	*	3,323	*	*
Prairie Creek	At confluence with Little Beaver Creek	1.17	400	544	668	800	*	1,100
Prairie Creek	Approximately 0.76 miles upstream of W 1 st Street	0.72	256	346	422	504	*	689
Raccoon River	At Fluor Street	3,625	32,400	*	51,900	61,300	*	85,900
Raccoon River	Just downstream of the confluence of Jordan Creek	3,511	31,900	*	51,100	60,400	*	84,600
Raccoon River	At the Dallas-Polk County Line	3,498	31,615	*	50,710	59,940	*	83,900
Raccoon River	USGS Stream Gage at Van Meter	3,441	31,300	*	50,200	59,300	*	83,100

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Rock Creek	At Des Moines River confluence	14.4	620	*	990	1,170	*	1,610
Rock Creek	At South Edge of Section 21, Crocker Township	12.5	560	*	910	1,070	*	1,480
Saylor Creek	At Downstream Corporate Limits of City of Ankeny	4.34	2,250	*	3,650	4,300	*	6,000
Saylor Creek	At confluence of Unnamed Tributary	2.3	1,120	*	1,770	2,090	*	2,900
Saylor Creek Tributary	At confluence with Saylor Creek	2	1,280	*	2,000	2,350	*	3,250
Saylor Creek Tributary	Upstream of Southwest Oralabor Road	0.3	950	*	1,580	1,870	*	2,580
Seventh Ward Ditch	At Easton Boulevard	N/A	757	*	1,005	1,304	*	*
Spring Creek	North Edge of Section 30, Camp Township	15.4	2,710	*	4,920	6,070	*	9,300
Spring Creek	Below Tributary confluence in Center of North Half of Section 1, Four Mile Township	4.9	1,530	*	2,950	3,690	*	5,860
South Walnut Creek	At confluence with Walnut Creek	6.4	2,350	*	4,220	5,160	*	7,700
Tributary A	At confluence with Fourmile Creek	5.7	1,100	*	2,100	2,700	*	4,200
Tributary A	At Interstate Highway 35	2.2	*	*	*	2,100	*	2,750
Tributary A	At Fountain View Estates Lake	1.3	*	*	*	1,300	*	1,700

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Tributary D	At Downstream Corporate Limits of the City of Ankeny	1.9	830	*	1,280	1,570	*	2,300
Tributary E	At confluence with Tributary D	0.7	570	*	840	970	*	1,280
Walnut Creek	At confluence with Raccoon River	83.8	7,300	*	13,450	17,000	*	27,000
Walnut Creek	Above North Walnut Creek	62.24	7,140	*	13,445	16,630	*	23,320
Walnut Creek	At NW 100 th Street	62.24	7,105	*	13,340	16,570	*	23,245
Walnut Creek	Upstream of Walnut Cr Trib 11	55.92	6,890	*	13,020	16,110	*	22,605
Walnut Creek	At NW 128 th Street	52.68	6,795	*	12,910	15,990	*	22,460
Walnut Creek	At Hickman Road	48.00	6,315	*	11,975	14,810	*	20,755
Walnut Creek	At NW 142 nd Street	45.64	6,285	*	11,905	14,715	*	20,590
Walnut Creek	Above Little Walnut Creek	31.33	4,650	*	8,800	10,875	*	15,205
Walnut Creek	At NW 156 th Street	29.55	4,650	*	8,775	10,830	*	15,115
Walnut Creek	Approximately 0.33 miles upstream of Waterford Road	26.78	4,400	*	8,265	10,190	*	14,195
Walnut Creek	Above Right Bank Tributary	13.31	2,345	*	4,400	5,415	*	7,520
Walnut Creek Tributary	At mouth, NE Corner of Section 31, Webster Township	6.4	2,350	*	4,220	5,160	*	7,700

*Not calculated for this FIS project

Table 10: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Yeader Creek	Just upstream of Confluence with Easter Lake	5.5	*	*	*	5,400	*	*
Yeader Creek	Just upstream of Southeast 14th Street	4.3	*	*	*	4,600	*	*
Yeader Creek	Just upstream of Southeast 5th Street	3.5	*	*	*	4,180	*	*
Yeader Creek	Just upstream of Southwest 8th Street	2.4	*	*	*	3,450	*	*
Yeader Creek	Just upstream of Southwest 18th Street	1.1	*	*	*	1,930	*	*

*Not calculated for this FIS project

**Figure 7: Frequency Discharge-Drainage Area Curves
[Not Applicable to this FIS Project]**

Table 11: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Barrier Dam Pond	Upstream of NW Polk City Drive	*	*	*	845.6	*
Big Creek Lake	Upstream of Saylorville Lake	*	*	*	925.5	*
Easter Lake	Upstream of Evergreen Dr along Yeader Creek	*	*	*	817.9	*
Red Rock Lake	Southeast of the City of Des Moines	*	*	*	780.7	*
Saylorville Lake	Northwest of the City of Des Moines	*	*	*	889.7	*

*Not calculated for this Flood Risk Project

Table 12: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (square kilometers)	Period of Record	
					From	To
Beaver Creek	05481950	United States Geological Survey	Beaver Creek near Grimes, IA	932	5/26/1960	5/7/2012
Bluff Creek	05481510	United States Geological Survey	Bluff Creek at Pilot Mound, IA	56	11/30/1965	11/30/2011

Table 12: Stream Gage Information used to Determine Discharges (continued)

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (square kilometers)	Period of Record	
					From	To
Des Moines River	05482000	United States Geological Survey	Des Moines River at 2 nd Avenue at Des Moines, IA	16,123	7/10/1902	5/7/2012
Des Moines River	05480500	United States Geological Survey	Des Moines River at Fort Dodge, IA	10,830	5/17/1905	5/28/2012
Des Moines River	05481650	United States Geological Survey	Des Moines River near Saylorville, IA	15,082	6/24/1954	5/5/2012
Des Moines River	05481300	United States Geological Survey	Des Moines River near Stratford, IA	14,082	7/19/1968	5/8/2012
Hardin Creek	05482900	United States Geological Survey	Hardin Creek near Farlin, IA	258	3/29/1951	10/26/2010
North Raccoon River	05482300	United States Geological Survey	North Raccoon River near Sac City, IA	1,796	6/21/1954	6/16/2012
North Raccoon River	05482500	United States Geological Survey	North Raccoon River near Jefferson, IA	4,156	8/28/1940	6/18/2012
Raccoon River	05484500	United States Geological Survey	Raccoon River at Van Meter, IA	8,790	5/29/1915	5/6/2012

Table 12: Stream Gage Information used to Determine Discharges (continued)

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (square kilometers)	Period of Record	
					From	To
Raccoon River	05484650	United States Geological Survey	Raccoon River at 63 rd Street at Des Moines, IA	8,996	9/16/1992	4/15/2012
Walnut Creek	05484800	United States Geological Survey	Walnut Creek at Des Moines, IA	200	6/20/1972	4/14/2012

5.2 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. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. 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. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 13: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
All Zone A's unless otherwise noted	Stream specific	Stream specific	Regression Equations	HEC-RAS	05/21/2013	A	
Beaver Creek	Confluence with Des Moines River; Approximately 100 ft downstream of 114 th Street	City of Johnston corporate limits; Approximately 260 ft downstream of State Route 141	Gage Analysis	HEC-RAS	9/1/1997	AE w/ Floodway	
Beaver Creek Tributary 14	Confluence with Beaver Creek	450 ft below Meredith Drive	HEC-HMS 3.4	HEC-RAS 4.0	2014	A	
Des Moines River	At Interstate 80 Bridge	Saylorville Dam	Frequency Curves - Regulated	HEC-RAS	2005	AE w/ Floodway	
Des Moines River	Approximately 5 miles downstream of I-65	At Interstate 80 Bridge	Frequency Curves - Regulated	HEC-RAS 4.1.0 and Tuflow	2014	AE w/ Floodway	
Dovetail	Confluence with Meadowlark Creek	At SE Grimes Boulevard	HEC-HMS 3.5	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Fourmile Creek	Confluence with Des Moines River	At Fairview Drive	HEC-HMS 3.5	HEC-RAS 5.0.1	2016	AE w/ Floodway	
Fourmile Creek	At Fairview Drive	At Northern Polk County boundary	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE w/ Floodway	
Frink Creek	Confluence with Raccoon River	1,200 ft upstream of Park Avenue	Regression Equations	USGS E-431 (Standard step-backwater)	1978	AE w/ Floodway	
Gulf Creek	600 ft upstream of confluence with Walnut Creek	At Interstate 235	HEC-HMS 3.4	HEC-RAS 4.0	2014	A	

Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Jordan Creek	Approximately 0.02 miles downstream of 81 st Street	Confluence with Raccoon River	Regression Equations	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Karen Acres	Confluence with North Walnut Creek	At Douglas Avenue	HEC-HMS 3.4	HEC-RAS 4.1.0	2014	A	
Little Beaver Creek	Confluence with Beaver Creek	Approximately 0.02 miles upstream of NW 142 nd Street/Y Avenue	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE w/ Floodway	
Little Beaver Creek Split	Confluence with Little Beaver Creek	Split from Little Beaver Creek	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE	
Little Beaver Creek Tributary A	Confluence with Little Beaver Creek	Approximately 0.03 miles upstream of NW 142 nd Street/Y Avenue	HEC-HMS 3.5	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Little Beaver Creek Tributary North	Confluence with Little Beaver Creek	Approximately 0.02 miles upstream of E 1 st Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2016	AE w/ Floodway	
Little Beaver Creek Tributary South	Approximately 0.73 miles downstream of SE Little Beaver Drive	Approximately 0.16 miles upstream of S James Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Little Fourmile Creek	Approximately 1.5 miles upstream of confluence with Fourmile Creek	At Interstate 80	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE w/ Floodway	

Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Little Fourmile Creek Tributary 1	Confluence with Little Fourmile Creek	At SW 8 th Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	A	
Little Fourmile Creek Tributary 2	Confluence with Little Fourmile Creek	Evans Boulevard	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	A	
Little Walnut Creek	Confluence with Walnut Creek	At Western Clive Corporate Limits	N/A	N/A	N/A	AE w/ Floodway	Historical FIS lacked model/method information.
Meadowlark Creek	Approximately 0.01 miles downstream of SE 3 rd Street	At SE 11 th Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Middle Creek	Approximately 0.77 miles upstream of 40 th Avenue	Approximately 0.56 miles upstream of N 35 th Street	Regression Equations	HEC-RAS	1997	AE w/ Floodway	
Muchikinock Creek	Confluence with Fourmile Creek	At NE 78 th Avenue	HEC-1	HEC-2	1992	AE w/ Floodway	
Mud Creek	Confluence with Des Moines River	At 0.28 miles upstream of NE 3 rd Avenue	Regression Equations	HEC-2	1980	AE w/ Floodway	
Mud Creek	At 0.28 miles upstream of NE 3 rd Avenue	At 900 ft upstream of NE 62 nd Avenue	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE w/ Floodway	
Mud Creek	At 900 ft upstream of NE 62 nd Avenue	At 0.47 miles upstream of NW 2 nd Street	Regression Equations	HEC-2	1980	A	

Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Mud Creek	At 0.47 miles upstream of NW 2 nd Street	At NE 94 th Avenue	Regression Equations	HEC-2	1980	AE w/ Floodway	
Mud Creek Tributary 11	At NE 80 th Street	At N 9 th Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	A	
North Walnut Creek	Confluence with Walnut Creek	At Northern Urbandale Corporate Limits	HEC-HMS 3.4	HEC-RAS 4.1.0	2013	AE	
Otter Creek	Confluence with Fourmile Creek	Approximately 700 ft upstream of 36 th Street	N/A	N/A	N/A	AE w/ Floodway	Historical FIS lacked model/method information.
Prairie Creek	Confluence with Little Beaver Creek	Approximately 0.76 miles upstream of W 1 st Street	HEC-HMS 3.5	HEC-RAS 4.1.0	2013	AE w/ Floodway	
Raccoon River	Confluence with Des Moines River	At 63 rd Street	Gage Analysis	HEC-RAS 3.1.3	2005	AE w/ Floodway	
Raccoon River	At 63 rd Street	Approximately 6.1 miles upstream of Interstate 35	Gage Analysis	HEC-RAS 2.2	1999	AE w/ Floodway	
Raccoon River	Approximately 6.1 miles upstream of Interstate 35	Approximately 10.5 miles upstream of Interstate 35	Peak FQ	HEC-2	1997	AE w/ Floodway	
Rock Creek	Confluence with Des Moines River	Approximately 3,300 ft upstream of Interstate 35	Regression Equations	HEC-2	1988	AE w/ Floodway	

Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Rocklyn Creek	Confluence with North Walnut Creek	At Douglas Avenue	HEC-HMS 3.4	HEC-RAS 4.1.0	2013	A	
Saylor Creek	Confluence with Des Moines River	Approximately 3,400 ft upstream of Oralabor Road	Rainfall Runoff	HEC-2	1988	AE w/ Floodway	
Saylor Creek Tributary	Confluence with Saylor Creek	Approximately 1,900 ft upstream of State Street	Rainfall Runoff	HEC-2	1988	AE w/ Floodway	
Saylor Creek Tributary 1	At Aurora Avenue	At 8 th Street	HEC-HMS 3.4	HEC-RAS 4.0	2014	A	
Seventh Ward Ditch	At Easton Boulevard	At Chicago & North Western Railroad	Colorado Urban Hydrograph	HEC-2	1978	AE w/ Floodway	
South Walnut Creek	Confluence with Walnut Creek	Approximately 7,850 ft upstream	Regression Equations	HEC-2	1992	AE w/ Floodway	
Spring Creek	Confluence with Des Moines River	Approximately 150 ft upstream of 80 th Street	Regression Equations	HEC-2	1980	AE w/ Floodway	
Tributary A	Confluence with Fourmile Creek	At 18 th Street	Rainfall Runoff	HEC-2	1998	AE w/ Floodway	
Tributary D	Approximately 40 ft downstream of Irvinedale Drive	Approximately 1,600 ft upstream of Greenwood Street	Rainfall Runoff	HEC-2	1988	AE w/ Floodway	
Tributary E	Confluence with Tributary D	Approximately 450 ft upstream of Greenwood Street	Rainfall Runoff	HEC-2	1988	AE w/ Floodway	

Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Walnut Creek	Confluence with Raccoon River	At Northern Urbandale Corporate Limits	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	AE w/ Floodway	
Walnut Creek Tributary 11	670 ft downstream of Douglas Avenue	At Meredith Drive	HEC-HMS 3.5	HEC-RAS 4.1.0	2014	A	
Yeader Creek	At Easter Lake	At Des Moines Municipal Airport	Regression Equations	HEC-2	1988	AE w/ Floodway	
Yeader Creek Tributary 1	1,600 ft above Easter Lake Drive	1,500 ft above Three Lakes Parkway	HEC-HMS 3.4	HEC-RAS 3.1.3	2014	A	

Table 14: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Beaver Creek	0.035-0.037	0.060-0.110
Beaver Creek Trib 14	0.035	0.060-0.100
Des Moines River	0.024-0.052	0.032-0.135
Dovetail	0.036-0.045	0.050
Fourmile Creek	0.038-0.0475	0.040-0.120
Frink Creek	0.050	0.035-0.060
Gulf Creek	0.035	0.100
Jordan Creek	0.030 to 0.080	0.045-0.065
Karen Acres	0.040	0.040-0.080
Little Beaver Creek	0.035-0.060	0.040-0.100
Little Beaver Creek Split	0.060-0.060	0.060-0.060
Little Beaver Creek Trib A	0.030-0.060	0.050-0.100
Little Beaver Creek Tributary North	0.030-0.080	0.050-0.080
Little Beaver Creek Tributary South	0.040-0.065	0.040-0.080
Little Four Mile Creek	0.040	0.080-0.120
Little Four Mile Creek Tributary 1	0.040	0.080-0.120
Little Four Mile Creek Tributary 2	0.040	0.080-0.120
Little Fourmile Creek	0.040	0.080-0.120
Little Walnut Creek	0.035	N/A
Meadowlark Creek	0.035-0.050	0.045-0.050
Middle Creek	0.040-0.065	0.040-0.075
Muchikinock Creek	0.035	N/A
Mud Creek	0.035	0.060-0.080
Mud Creek Tributary 11	0.040	0.080-0.120
North River	0.035	N/A
North Walnut Creek	0.045-0.080	0.050-0.090
Otter Creek	0.035	N/A
Prairie Creek	0.040-0.060	0.060-0.100
Raccoon River	0.035	0.050-0.080
Rock Creek	0.035	N/A
Rocklyn Creek	0.040	0.040-0.080
Saylor Creek	0.035	N/A

Table 14: Roughness Coefficients (continued)

Flooding Source	Channel “n”	Overbank “n”
Saylor Creek Trib 1	0.040	0.050
Saylor Creek Tributary	0.035	N/A
South Walnut Creek	0.030-0.040	0.060-0.150
Spring Creek	0.035	N/A
Tributary A	0.035	N/A
Walnut Creek	0.032-0.035	0.050-0.120
Walnut Creek Tributary 11	0.040	0.060-0.080
Yeader Creek	0.045-0.080	0.050-0.090
Yeader Creek Tributary 1	0.035	0.060

5.3 Coastal Analyses

This section is not applicable to this FIS project.

**Table 15: Summary of Coastal Analyses
[Not Applicable to this FIS Project]**

5.3.1 Total Stillwater Elevations

This section is not applicable to this FIS project.

**Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas
[Not Applicable to this FIS Project]**

**Table 16: Tide Gage Analysis Specifics
[Not Applicable to this FIS Project]**

5.3.2 Waves

This section is not applicable to this FIS project.

5.3.3 Coastal Erosion

This section is not applicable to this FIS project.

5.3.4 Wave Hazard Analyses

This section is not applicable to this FIS project.

Table 17: Coastal Transect Parameters
[Not Applicable to this FIS Project]

Figure 9: Transect Location Map
[Not Applicable in this FIS Report]

5.4 Alluvial Fan Analyses

This section is not applicable to this FIS project.

Table 18: Summary of Alluvial Fan Analyses
[Not Applicable to this FIS Project]

Table 19: Results of Alluvial Fan Analyses
[Not Applicable to this FIS Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

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

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

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

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 archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please contact information services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Polk County are provided in Table 20.

Table 20: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Granger	SE	41.750	-93.749	0.148
Polk City	SE	41.750	-93.625	0.144
Elkhart	SE	41.750	-93.500	0.098
Loring	SE	41.750	-93.374	0.089
Grimes	SE	41.626	-93.750	0.177
Des Moines NW	SE	41.626	-93.626	0.128
Des Moines NE	SE	41.625	-93.500	0.108
Altoona	SE	41.625	-93.376	0.131
Rising Sun	SE	41.500	-93.375	0.089
Commerce	SE	41.500	-93.749	0.148
Des Moines SW	SE	41.500	-93.625	0.085
Des Moines SE	SE	41.500	-93.499	0.085
Average Conversion from NGVD29 to NAVD88 = 0.1 feet				

Calculations for the vertical offsets on a stream by stream basis are depicted in Table 21.

Table 21: Stream-by-Stream Vertical Datum Conversion

[Not Applicable to this FIS Project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Mapping Partners*, Appendix L.

Base map information shown on the FIRM was derived from the sources described in Table 22.

Table 22: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
City Boundaries	Iowa Department of Natural Resources, GIS Section	2010	1:24,000	Incorporated City Boundaries in Iowa in 2010, as Derived from the Census Places Dataset
Levee Seclusion Method Areas	Federal Emergency Management Agency	2014	1:24,000	Areas impacted by non-accredited levee, dike, or other structure. Allows non-levee areas of a study to move forward while flood hazards associated with the on-hold levee remain in a static state as shown on the currently published FIRM.
PLSS Area	Iowa Department of Natural Resources, GIS Section	1998	1:24,000	Public Land Survey System of Iowa, Divided to Sections
Road Centerlines	Iowa Geological Survey of the Iowa Department of Natural Resources	2007	1:24,000	Road Centerlines of Polk County, Iowa, 2006 from Iowa DOT GIMS files
NAIP Orthophoto	USDA/FSA - Aerial Photography Field Office	2013	1:12,000	USDA-FSA-APFO National Agriculture Imagery Program (NAIP) MrSID Mosaic

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% 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.

The floodway widths 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. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data."

Table 23: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Scale	Contour Interval	Citation
Polk County	All	LiDAR	1:4,800	2 feet	Iowa Geological and Water Survey/DNR

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report.

Table 24: Floodway Data

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A ²	3,000	320	2,899	4.4	805.9	805.9	806.4	0.5
B ²	3,860	400	3,272	3.9	806.5	806.5	807.2	0.7
C	4,090	400	3,644	3.5	806.9	806.9	807.6	0.7
D	4,900	338	3,161	4.0	807.5	807.5	808.0	0.5
E	5,700	320	3,599	3.6	807.8	807.8	808.5	0.7
F	8,350	330	3,175	4.0	809.0	809.0	809.7	0.7
G	8,800	320	3,364	3.8	809.1	809.1	810.0	0.9
H	9,380	243	2,195	5.8	809.4	809.4	810.3	0.9
I	9,675	210	2,238	5.7	810.0	810.0	810.9	0.9
J	10,350	740	7,596	1.7	811.2	811.2	812.0	0.8
K	11,100	1,150	9,881	1.3	811.4	811.4	812.1	0.7
L	12,100	1,300	10,946	1.2	811.7	811.7	812.4	0.7
M	13,300	1,430	12,125	1.1	811.9	811.9	812.6	0.7
N	14,400	1,950	11,884	1.1	812.1	812.1	812.8	0.7
O	15,600	1,850	11,052	1.2	812.4	812.4	813.1	0.7
P	17,150	1,815	9,711	1.3	812.8	812.8	813.4	0.6
Q	17,900	1,770	9,307	1.4	813.1	813.1	813.7	0.6
R	19,900	1,750	6,714	1.9	813.9	813.9	814.4	0.5
S	20,800	1,590	8,065	1.6	814.6	814.6	815.0	0.4
T	22,000	1,336	4,774	2.7	815.3	815.3	815.6	0.3
U	23,100	910	4,659	2.8	816.6	816.6	816.7	0.1

¹ Feet above confluence with Des Moines River

² This cross-section lies within an area that has not been updated on the FIRM at this time due to the presence of levees that have not been demonstrated to meet the requirements of NFIP Regulation 44CFR 65.10. Please refer to the Section 4.4 of this FIS report for more information.

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	BEAVER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	23,600	390	2,629	4.9	816.9	816.9	817.1	0.2
W	23,825	500	3,670	3.5	817.2	817.2	817.7	0.5
X	24,600	1,120	7,597	1.8	818.1	818.1	818.4	0.3
Y	25,700	1,200	7,758	1.7	818.3	818.3	818.7	0.4
Z	26,800	1,250	6,229	2.1	818.5	818.5	818.9	0.4
AA	28,300	1,220	5,544	2.3	819.2	819.2	819.7	0.5
AB	29,700	1,100	6,201	2.1	820.3	820.3	820.7	0.4
AC	30,700	900	5,164	2.5	820.8	820.8	821.3	0.5
AD	32,000	733	3,944	3.3	821.6	821.6	822.3	0.7
AE	32,900	500	3,172	4.0	822.7	822.7	823.3	0.6
AF	33,250	300	2,857	4.5	822.9	822.9	823.6	0.7
AG	35,100	600	4,612	1.9	823.0	823.0	823.7	0.7
AH	53,125	688	4,536	1.9	832.2	832.2	833.2	1.0
AI	54,825	337	2,622	3.3	833.5	833.5	834.5	1.0
AJ	54,945	210	1,825	4.7	833.7	833.7	834.5	0.8
AK	55,145	200	1,996	4.3	834.4	834.4	835.1	0.7
AL	55,340	215	2,181	3.9	834.7	834.7	835.5	0.8
AM	58,460	536	3,658	2.3	837.0	837.0	837.8	0.8
AN	59,160	338	2,554	3.4	837.5	837.5	838.3	0.8
AO	60,120	807	5,394	1.6	838.5	838.5	839.4	0.9
AP	61,240	547	4,209	2.0	839.3	839.3	840.1	0.8

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	BEAVER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AQ	63,220	553	4,935	1.7	840.3	840.3	841.1	0.8
AR	64,120	487	4,289	2.0	840.7	840.7	841.5	0.8
AS	67,280	181	1,848	4.6	842.4	842.4	843.3	0.9

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	BEAVER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A ²	189.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	194.30	874	15,590	6.9	785.1	785.1	785.1	0.0
C	194.65	1,289	16,947	6.3	785.4	785.4	785.4	0.0
D	195.38	4,601	56,666	1.9	787.0	787.0	787.1	0.1
E	195.65	3,494	17,466	6.2	787.1	787.1	787.1	0.0
F	196.07	3,164	39,313	2.7	789.3	789.3	789.4	0.1
G	197.49	4,213	52,161	2.1	791.7	791.7	792.1	0.4
H	198.71	3,262	38,426	2.8	793.0	793.0	793.6	0.6
I	199.70	1,172	20,945	5.2	795.5	795.5	796.1	0.5
J	200.73	810	16,273	6.7	797.0	797.0	797.5	0.5
K	200.76	804	15,949	6.8	797.4	797.4	797.8	0.4
L	201.26	565	13,259	8.2	798.6	798.6	799.1	0.5
M	201.41	495	12,885	8.4	798.6	798.6	799.1	0.5
N	201.48	610	16,407	6.6	799.9	799.9	800.5	0.6
O	201.57	696	18,898	5.7	800.4	800.4	801.0	0.6
P	201.90	436	11,618	5.0	800.8	800.8	801.3	0.5
Q	202.46	387	11,492	5.1	802.9	802.9	803.5	0.6
R	202.58	486	10,828	5.4	803.5	803.5	804.0	0.5
S	202.92	417	9,419	6.2	804.0	804.0	804.5	0.5
T	203.10	460	9,671	6.0	804.3	804.3	804.8	0.5
U	204.54	272	6,991	8.3	806.5	806.5	807.2	0.7

¹ Miles above mouth

² No floodway generated at XS A

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	DES MOINES RIVER

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	205.32	2,369	40408	1.4	808.2	808.2	809.0	0.8
W	208.43	1,706	32,014	1.8	810.8	810.8	811.7	0.9
AA ²	209.49	3,160	23,698	1.4	805.3	805.3	806.3	1.0
AB ²	210.60	3,055	25,408	1.3	806.5	806.5	807.3	0.8
AC ²	211.87	1,170	10,438	3.1	809.0	809.0	810.0	1.0
AD ²	212.06	1,065	9,381	3.4	809.3	809.3	810.2	0.9
AE ²	213.01	522	6,907	4.6	811.8	811.8	812.4	0.6

¹ Miles above mouth

² This cross-section lies within an area that has not been updated on the FIRM at this time due to the presence of levees that have not been demonstrated to meet the requirements of NFIP Regulation 44CFR 65.10. Please refer to the Section 4.4 of this FIS report for more information.

Note: Cross section W is the most upstream cross section before entering the seclusion area. Cross sections AA through AE are within the seclusion area and could not be re-lettered, per seclusion guidance.

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	DES MOINES RIVER

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	52	23	114	2.5	933.2	933.2	934.2	1.0
B	594	26	132	2.1	933.6	933.6	934.5	0.9
C	846	28	162	1.7	935.9	935.9	936.5	0.6
D	1,200	28	136	2.1	935.9	935.9	936.6	0.7
E	1,496	34	96	2.9	937.6	937.6	938.2	0.6
F	1,708	33	43	6.5	942.4	942.4	942.4	0.0

¹ Feet above confluence with Meadowlark Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	DOVETAIL

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,527	725	5,103	2.8	785.4	785.4	786.4	1.0
B	5,737	472	2,636	5.3	786.6	786.6	787.5	0.9
C	6,103	983	8,008	2.0	787.9	787.9	788.9	1.0
D	9,192	4,477	49,582	3.1	789.1	789.1	789.9	0.8
E	10,645	290	1,969	6.2	791.5	791.5	791.8	0.3
F	11,177	222	2,080	6.0	793.4	793.4	793.8	0.4
G	12,428	490	4,334	2.9	796.0	796.0	796.7	0.7
H	14,151	778	5,299	2.4	797.2	797.2	798.0	0.8
I	17,417	1,000	6,854	1.8	800.2	800.2	801.1	0.9
J	20,483	697	4,392	2.5	801.4	801.4	802.2	0.8
K	21,018	383	2,724	4.1	801.7	801.7	802.5	0.8
L	21,738	412	2,937	3.8	804.0	804.0	804.3	0.3
M	22,519	336	2,730	4.1	806.4	806.4	806.5	0.1
N	24,648	902	5,877	1.9	807.8	807.8	808.7	0.9
O	27,344	550	3,244	3.5	809.6	809.6	810.6	1.0
P	28,269	1,009	6,463	1.7	811.9	811.9	812.5	0.6
Q	29,813	532	3,792	3.0	813.5	813.5	813.9	0.4
R	30,091	574	4,635	2.4	814.5	814.5	814.9	0.4
S	32,712	619	3,808	3.0	817.2	817.2	817.7	0.5
T	34,723	429	2,205	5.1	819.4	819.4	820.3	0.9
U	35,166	417	2,920	3.7	820.6	820.6	821.2	0.6

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	36,992	665	4,790	2.3	822.8	822.8	823.7	0.9
W	38,724	586	4,588	2.4	824.1	824.1	824.6	0.5
X	39,850	817	5,116	2.1	824.7	824.7	825.3	0.6
Y	41,324	557	2,503	4.3	826.2	826.2	826.8	0.6
Z	42,026	660	3,682	2.9	827.8	827.8	828.4	0.6
AA	43,070	382	2,241	4.7	828.7	828.7	829.6	0.9
AB	43,560	376	3,123	3.4	830.6	830.6	831.1	0.5
AC	46,495	608	3,732	2.7	831.9	831.9	832.7	0.8
AD	48,606	499	2,512	4.1	834.3	834.3	835.1	0.8
AE	49,459	242	1,828	5.6	836.3	836.3	836.8	0.5
AF	49,603	234	1,472	6.9	836.5	836.5	836.8	0.3
AG	50,255	780	4,396	2.2	838.8	838.8	838.9	0.1
AH	51,764	426	2,563	3.9	839.5	839.5	839.7	0.2
AI	53,915	928	5,070	1.4	841.9	841.9	842.4	0.5
AJ	56,503	597	2,425	2.6	842.9	842.9	843.5	0.6
AK	58,024	124	1,003	6.4	845.5	845.5	846.3	0.8
AL	59,293	79	748	8.5	847.3	847.3	848.1	0.8
AM	60,043	93	1,137	5.6	849.4	849.4	850.3	0.9
AN	61,493	82	928	6.9	851.4	851.4	852.1	0.7
AO	62,362	116	1,321	4.8	852.8	852.8	853.5	0.7
AP	63,747	203	1,859	3.4	854.0	854.0	854.7	0.7

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AQ	64,900	289	2,415	2.6	854.8	854.8	855.6	0.8
AR	66,777	800	5,208	1.2	856.5	856.5	857.4	0.9
AS	67,411	251	1,354	4.6	856.6	856.6	857.4	0.8
AT	70,148	225	1,787	3.5	861.0	861.0	861.6	0.6
AU	72,444	157	1,242	5.0	862.6	862.6	863.3	0.7
AV	74,377	726	4,821	1.3	866.5	866.5	867.3	0.8
AW	75,150	188	1,379	4.5	866.8	866.8	867.4	0.6
AX	75,716	199	1,758	3.5	868.7	868.7	869.4	0.7
AY	76,618	106	896	6.9	869.5	869.5	870.2	0.7
AZ	77,462	443	4,116	1.5	871.5	871.5	872.3	0.8
BA	79,558	513	3,800	1.6	872.0	872.0	872.8	0.8
BB	82,380	346	2,082	2.9	873.4	873.4	874.2	0.8
BC	85,249	512	3,262	1.9	876.1	876.1	877.0	0.9
BD	87,497	639	3,108	2.0	878.5	878.5	879.2	0.7
BE	88,931	286	1,466	4.1	879.8	879.8	880.6	0.8
BF	90,740	351	2,085	2.9	883.0	883.0	883.9	0.9
BG	93,337	277	1,440	4.1	884.7	884.7	885.6	0.9
BH	94,125	454	3,336	1.6	887.3	887.3	887.9	0.6
BI	95,280	261	2,054	2.6	888.0	888.0	888.7	0.7
BJ	96,879	586	2,488	2.1	890.3	890.3	891.1	0.8
BK	98,247	253	1,177	4.4	891.7	891.7	892.3	0.6

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BL	99,707	605	3,118	1.6	894.3	894.3	895.1	0.8
BM	100,755	338	1,308	3.9	894.7	894.7	895.4	0.7
BN	102,226	194	1,486	3.5	897.6	897.6	898.0	0.4
BO	104,864	344	1,788	2.3	899.8	899.8	900.4	0.6
BP	107,827	218	1,102	4.3	902.7	902.7	903.4	0.7
BQ	108,519	325	1,651	2.6	905.0	905.0	905.7	0.7
BR	109,643	144	842	5.0	906.0	906.0	906.8	0.8
BS	110,445	408	1,986	2.8	907.8	907.8	908.8	1.0
BT	111,537	525	2,813	1.5	909.0	909.0	909.4	0.4
BU	113,067	334	1,565	2.7	909.3	909.3	909.7	0.4
BV	114,874	307	1,573	2.5	912.1	912.1	912.5	0.4
BW	117,193	430	2,022	2.0	915.4	915.4	916.0	0.6
BX	118,746	243	1,380	2.4	917.2	917.2	917.7	0.5
BY	121,892	99	562	5.9	918.4	918.4	918.7	0.3
BZ	122,903	145	901	3.7	920.4	920.4	920.8	0.4
CA	123,665	162	778	4.2	922.7	922.7	922.9	0.2
CB	125,266	126	694	4.7	924.4	924.4	925.4	1.0
CC	127,805	159	837	3.9	929.0	929.0	929.3	0.3
CD	130,642	80	446	6.4	933.1	933.1	933.4	0.3
CE	131,500	102	708	4.0	935.9	935.9	936.0	0.1
CF	133,275	203	734	3.9	938.0	938.0	938.4	0.4

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY POLK COUNTY, IOWA AND INCORPORATED AREAS	FLOODWAY DATA
		FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CG	133,989	190	814	3.5	940.3	940.3	940.4	0.1
CH	136,090	126	584	4.9	942.5	942.5	942.9	0.4
CI	138,550	234	1,183	2.4	948.5	948.5	949.4	0.9
CJ	140,970	198	1,140	2.4	952.2	952.2	952.9	0.7
CK	142,419	124	662	4.2	954.0	954.0	954.5	0.5
CL	144,286	117	516	5.4	956.1	956.1	956.9	0.8
CM	144,657	202	1,031	2.7	957.5	957.5	958.2	0.7
CN	145,549	206	1,176	2.4	959.4	959.4	960.0	0.6
CO	146,830	190	998	2.5	960.2	960.2	960.9	0.7
CP	148,121	112	609	4.1	961.4	961.4	962.1	0.7
CQ	149,976	139	868	2.9	965.1	965.1	965.8	0.7
CR	153,057	328	1,322	1.5	969.1	969.1	969.3	0.2
CS	154,538	306	1,810	1.3	971.3	971.3	972.0	0.7
CT	156,270	580	2,717	0.8	971.7	971.7	972.4	0.7
CU	157,858	408	1,243	1.8	972.3	972.3	973.0	0.7
CV	159,336	288	1,130	2.0	975.9	975.9	976.5	0.6
CW	160,909	532	2,309	0.6	978.9	978.9	979.4	0.5
CX	161,790	286	897	1.7	979.0	979.0	979.6	0.6
CY	162,919	242	676	2.1	980.8	980.8	981.4	0.6
CZ	164,267	121	330	4.2	982.5	982.5	983.1	0.6
DA	165,926	144	459	3.0	986.7	986.7	987.1	0.4

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
DB	167,434	92	299	4.3	989.0	989.0	989.7	0.7
DC	168,333	104	399	3.2	992.2	992.2	992.5	0.3
DD	170,032	87	380	3.4	994.4	994.4	994.7	0.3
DE	171,830	68	293	3.2	997.3	997.3	997.4	0.1
DF	173,130	159	438	2.1	998.3	998.3	998.7	0.4
DG	174,784	168	399	2.3	1,000.7	1,000.7	1,001.3	0.6
DH	176,100	220	504	1.8	1,002.7	1,002.7	1,003.4	0.7

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	4,980	75	592	6.0	813.9	813.9	814.4	0.5
B	5,350	90	700	5.1	814.8	814.8	815.5	0.7
C	5,790	80	424	8.4	815.7	815.7	816.4	0.7
D	6,180	59	573	6.2	817.8	817.8	818.7	0.9
E	7,100	71	668	5.3	820.8	820.8	821.3	0.5

¹ Feet above confluence with Raccoon River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	FRINK CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	5,534	77	706	4.1	820.1	820.1	820.7	0.6
B	6,293	40	300	9.7	821.6	821.6	821.9	0.3
C	9,449	75	366	7.9	834.9	834.9	835.1	0.2
D	9,687	72	500	5.8	836.8	836.8	837.2	0.4
E	18,505	45	363	7.2	869.2	869.2	870.0	0.8
F	18,889	137	563	5.2	870.6	870.6	871.2	0.6
G	19,859	59	565	4.6	873.3	873.3	873.4	0.1
H	20,118	57	434	6.0	873.5	873.5	873.6	0.1
I	21,548	244	1,139	2.3	880.0	880.0	880.0	0.0
J	23,708	265	816	3.2	883.8	883.8	884.2	0.4
K	26,786	96	573	4.6	891.9	891.9	892.2	0.3
L	28,638	47	363	7.2	896.7	896.7	896.7	0.0
M	29,504	57	497	2.0	899.1	899.1	899.2	0.1
N	31,621	19	92	11.0	902.7	902.7	902.9	0.2
O	35,468	20	123	8.3	916.9	916.9	917.3	0.4
P	35,646	86	289	3.5	920.5	920.5	920.5	0.0
Q	36,118	36	169	6.0	921.0	921.0	921.0	0.0
R	37,206	27	181	5.6	924.1	924.1	924.1	0.0
S	38,115	124	209	4.9	925.7	925.7	925.7	0.0
T	40,697	15	95	10.7	939.9	939.9	940.4	0.5
U	42,259	138	864	1.2	954.5	954.5	954.5	0.0

¹ Feet above confluence with Raccoon River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	JORDAN CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	44,025	170	1,197	0.9	964.3	964.3	964.3	0.0
W	44,840	150	689	1.5	964.4	964.4	964.4	0.0

¹ Feet above confluence with Raccoon River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	JORDAN CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	827	485	2,717	2.7	825.2	825.2	826.2	1.0
B	4,952	455	1,473	5.0	836.3	836.3	836.9	0.6
C	6,271	448	1,150	6.4	839.8	839.8	840.2	0.4
D	7,437	59	433	16.1	844.0	844.0	844.5	0.5
E	10,496	89	835	8.3	854.6	854.6	855.2	0.6
F	10,849	115	1,418	5.6	857.5	857.5	857.8	0.3
G	14,607	148	917	7.6	864.7	864.7	864.8	0.1
H	17,219	173	1,248	5.6	873.4	873.4	874.2	0.8
I	18,645	118	798	8.7	877.4	877.4	878.2	0.8
J	19,100	108	945	7.4	882.0	882.0	882.0	0.0
K	20,787	191	1,264	5.5	885.2	885.2	885.7	0.5
L	22,615	203	1,016	6.8	893.8	893.8	893.8	0.0
M	23,235	136	842	8.3	895.8	895.8	896.6	0.8
N	24,358	154	1,549	3.4	904.5	904.5	904.7	0.2
O	26,762	152	1,015	5.2	906.9	906.9	907.8	0.8
P	28,682	343	1,636	2.6	910.4	910.4	910.8	0.4
Q	28,862	343	1,697	2.2	910.3	910.3	910.9	0.6
R	30,913	66	516	6.8	915.9	915.9	915.9	0.0
S	31,517	49	225	7.4	917.5	917.5	917.9	0.4
T	32,122	59	299	5.5	922.3	922.3	922.3	0.0
U	32,350	45	237	7.0	923.2	923.2	923.3	0.1

¹ Feet above confluence with Beaver Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE BEAVER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	32,588	49	257	6.5	924.5	924.5	924.5	0.0
W	33,069	40	222	7.8	926.4	926.4	926.7	0.3
X	33,210	67	450	3.8	929.6	929.6	930.5	0.9
Y	33,697	60	315	5.3	931.3	931.3	931.7	0.4
Z	34,407	76	389	4.3	935.6	935.6	935.8	0.2
AA	34,968	46	245	2.9	937.0	937.0	937.7	0.7
AB	35,529	17	93	7.6	938.0	938.0	938.5	0.5
AC	36,143	24	192	3.7	941.3	941.3	941.5	0.2
AD	37,127	18	118	6.0	947.9	947.9	948.2	0.3
AE	38,138	20	69	10.3	953.1	953.1	953.1	0.0
AF	39,421	19	83	4.9	964.3	964.3	965.0	0.7

¹ Feet above confluence with Beaver Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE BEAVER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	73	123	402	4.1	909.9	906.4 ²	907.4	1.0
B	832	86	522	3.1	910.9	910.9	911.4	0.5
C	1,348	108	604	2.7	912.0	912.0	912.9	0.9
D	1,863	128	526	3.1	912.8	912.8	913.8	1.0
E	2,163	136	546	3.0	913.7	913.7	914.5	0.8
F	2,600	140	467	3.5	914.9	914.9	915.8	0.9
G	3,349	99	405	6.3	918.9	918.9	919.7	0.8
H	3,626	171	1,144	2.3	925.4	925.4	926.4	1.0
I	4,234	159	755	2.2	926.5	926.5	927.0	0.5
J	5,146	123	246	4.5	927.4	927.4	928.1	0.7
K	5,444	98	256	4.3	929.6	929.6	930.3	0.7
L	6,731	22	166	6.7	934.7	934.7	935.6	0.9
M	7,253	36	289	3.7	938.7	938.7	938.8	0.1

¹ Feet above confluence with Little Beaver Creek

² Elevation without considering backwater effect from Little Beaver Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE BEAVER CREEK TRIBUTARY A

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	135	68	591	3.0	916.2	916.2	917.2	1.0
B	406	74	623	2.4	917.6	917.6	918.3	0.7
C	739	74	629	2.4	917.6	917.6	918.4	0.8
D	1,853	73	288	4.7	918.8	918.8	919.3	0.5
E	2,155	63	379	3.5	919.5	919.5	919.9	0.4
F	2,454	70	346	3.9	919.7	919.7	920.1	0.4
G	2,606	41	182	7.4	920.0	920.0	920.3	0.3
H	2,860	224	332	4.0	922.5	922.5	922.5	0.0
I	3,518	76	265	5.1	923.4	923.4	923.8	0.4
J	4,417	47	248	5.4	926.5	926.5	927.2	0.7
K	4,707	31	251	5.3	929.0	929.0	929.1	0.1
L	4,893	31	282	4.8	932.1	932.1	933.0	0.9

¹ Feet above confluence with Little Beaver Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE BEAVER CREEK TRIBUTARY NORTH

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	139	31	200	2.8	932.1	932.1	933.1	1.0
B	298	27	174	3.2	932.2	932.2	933.2	1.0
C	504	42	205	2.7	934.9	934.9	935.6	0.7
D	830	43	121	4.8	936.4	936.4	937.0	0.6
E	1,079	52	297	1.9	940.8	940.8	941.7	0.9
F	1,274	34	144	3.8	940.9	940.9	941.7	0.8
G	2,044	21	85	6.5	944.1	944.1	944.7	0.6
H	2,142	20	89	6.2	945.9	945.9	946.7	0.8
I	2,183	22	70	8.0	946.7	946.7	946.8	0.1
J	2,333	42	202	2.7	949.2	949.2	950.1	0.9
K	2,490	42	147	3.7	949.3	949.3	950.2	0.9
L	2,831	43	240	2.3	954.1	954.1	955.0	0.9
M	3,071	37	123	4.5	954.6	954.6	955.3	0.7
N	3,313	36	132	4.2	956.7	956.7	957.5	0.8
O	3,806	32	132	4.2	961.1	961.1	961.5	0.4
P	4,481	32	110	5.0	966.0	966.0	966.0	0.0
Q	5,032	116	1,162	0.5	977.6	977.6	978.4	0.8
R	5,433	59	437	0.9	977.6	977.6	978.4	0.8
S	5,831	100	495	0.6	980.0	980.0	980.4	0.4

¹ Feet above mouth

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE BEAVER CREEK TRIBUTARY SOUTH

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	2,000	100	696	8.2	803.8	803.8	804.8	1.0
B	2,304	176	925	6.2	806.1	806.1	807.0	0.9
C	2,455	255	1,431	4.0	808.4	808.4	808.4	0.0
D	5,435	250	1,348	4.2	813.7	813.7	814.3	0.6

¹ Feet above confluence with Fourmile Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY POLK COUNTY, IOWA AND INCORPORATED AREAS	FLOODWAY DATA
		LITTLE FOURMILE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,656	249	1,647	3.5	897.5	897.5	898.5	1.0
B	4,220	208	844	6.9	903.1	903.1	903.6	0.5
C	7,687	95	621	9.4	913.5	913.5	914.1	0.6
D	10,319	255	1,698	3.4	923.1	923.1	924.0	0.9
E	12,968	367	4,401	1.3	940.9	940.9	940.9	0.0
F	15,656	115	828	7.0	946.7	946.7	947.1	0.4
G	18,384	126	975	6.0	952.9	952.9	953.5	0.6
H	21,134	133	946	6.1	961.1	961.1	962.0	0.9
I	22,940	248	1,335	3.1	965.9	965.9	966.9	1.0

¹ Feet above confluence with Walnut Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	LITTLE WALNUT CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	8	32	273	2.2	932.1	932.1	933.1	1.0
B	298	23	188	3.2	933.0	933.0	933.8	0.8
C	920	22	102	2.9	933.5	933.5	934.4	0.9
D	1,173	24	73	4.1	934.6	934.6	935.5	0.9
E	1,229	13	33	9.1	936.9	936.9	936.9	0.0
F	1,297	86	279	1.1	940.3	940.3	940.4	0.1
G	1,649	23	60	5.0	940.6	940.6	941.0	0.4
H	1,789	36	115	2.6	942.1	942.1	943.0	0.9
I	2,063	39	119	2.5	943.9	943.9	944.4	0.5
J	2,258	32	85	3.5	944.3	944.3	944.7	0.4
K	2,466	36	66	4.6	945.4	945.4	945.5	0.1

¹ Feet above mouth

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MEADOWLARK CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Q	55,085	33	134	4.8	898.8	898.8	898.9	0.1
R	57,073	30	105	6.1	905.4	905.4	905.6	0.2
S	58,517	38	143	4.5	913.1	913.1	913.3	0.2
T	59,632	44	122	5.3	917.4	917.4	917.4	0.0
U	59,990	38	511	1.3	930.9	930.9	930.9	0.0
V	60,214	224	1,781	0.6	930.9	930.9	930.9	0.0

¹ Feet above confluence with North River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MIDDLE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,500	160	1,359	3.9	845.8	845.8	845.8	0.0
B	2,300	200	1,031	5.1	847.8	847.8	848.0	0.2
C	3,800	200	933	5.7	850.8	850.8	851.7	0.9
D	5,100	180	1,093	4.9	854.4	854.4	854.8	0.4
E	6,500	97	704	7.5	856.7	856.7	857.1	0.4
F	8,600	90	708	7.5	862.8	862.8	863.5	0.7
G	11,000	80	585	6.0	869.2	869.2	870.1	0.9
H	12,600	80	456	7.7	872.7	872.7	873.1	0.4
I	14,000	85	411	8.5	877.7	877.7	877.7	0.0
J	15,400	100	855	4.1	884.7	884.7	885.2	0.5
K	17,800	108	450	5.7	889.5	889.5	889.7	0.2
L	18,700	55	437	5.9	898.6	898.6	898.6	0.0
M	19,500	70	585	4.4	902.8	902.8	902.8	0.0
N	20,000	120	711	3.6	905.4	905.4	905.5	0.1
O	21,500	22	198	9.1	911.9	911.9	912.3	0.4
P	22,900	50	220	8.2	919.4	919.4	920.2	0.8

¹ Feet above confluence with Fourmile Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MUCHIKINOCK CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	16,133	245	1,393	5.7	780.7	780.7	780.7	0.0
B	16,853	423	1,401	5.7	782.3	782.3	782.4	0.1
C	20,293	750	4,552	1.8	786.0	786.0	786.9	0.9
D	21,613	550	3,574	2.2	787.2	787.2	787.9	0.7
E	23,813	500	3,343	2.4	788.7	788.7	789.5	0.8
F	24,453	500	3,555	2.3	789.1	789.1	789.9	0.8
G	25,083	473	2,221	3.6	789.5	789.5	790.4	0.9
H	25,219	385	1,983	4.0	789.9	789.9	790.5	0.6
I	25,959	102	769	10.1	791.9	791.9	792.3	0.4
J	26,103	120	980	8.2	793.2	793.2	793.5	0.3
K	27,143	761	4,389	1.8	795.1	795.1	795.7	0.6
L	29,543	734	4,178	1.9	796.1	796.1	796.7	0.6
M	31,813	358	1,171	6.8	797.5	797.5	797.9	0.4
N	32,413	66	787	10.2	799.3	799.3	799.9	0.6
O	32,613	170	1,757	4.6	802.9	802.9	803.3	0.4
P	33,413	599	3,785	2.1	803.5	803.5	804.0	0.5
Q	34,893	556	3,380	2.4	804.0	804.0	804.6	0.6
R	37,293	138	1,125	7.1	805.7	805.7	806.4	0.7
S	39,213	458	2,259	3.5	811.3	811.3	811.8	0.5
T	39,413	614	4,187	1.9	814.0	814.0	814.5	0.5
U	41,493	351	1,789	4.5	815.2	815.2	815.7	0.5

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MUD CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	44,093	570	2,637	3.0	818.6	818.6	819.1	0.5
W	44,289	620	3,432	2.3	819.9	819.9	820.4	0.5
X	45,009	597	4,803	1.7	820.6	820.6	821.2	0.6
Y	46,000	519	1,868	4.3	820.9	820.9	821.5	0.6
Z	46,693	673	2,850	2.8	822.4	822.4	822.9	0.5
AA	48,265	825	3,330	2.4	824.8	824.8	825.5	0.7
AB	49,502	309	1,660	4.8	826.3	826.3	826.7	0.4
AC	50,275	495	6,443	1.2	836.4	836.4	836.4	0.0
AD	52,157	390	2,776	2.9	836.6	836.6	836.6	0.0
AE	54,059	124	969	8.3	837.8	837.8	838.3	0.5
AF	54,576	170	1,423	5.6	839.7	839.7	840.3	0.6
AG	55,098	136	1,203	6.6	840.1	840.1	841.0	0.9
AH	55,644	372	3,256	2.5	842.2	842.2	843.2	1.0
AI	56,709	337	2,131	3.8	842.8	842.8	843.7	0.9
AJ	58,335	143	1,251	6.4	844.7	844.7	845.6	0.9
AK	59,850	212	1,371	5.8	847.6	847.6	848.5	0.9
AL	60,846	355	2,822	2.8	851.9	851.9	852.9	1.0
AM	62,489	388	2,431	3.3	853.1	853.1	853.9	0.8
AN	63,291	209	1,593	5.0	854.3	854.3	854.9	0.6
AO	65,523	357	1,891	4.2	856.8	856.8	857.5	0.7
AP	66,084	316	1,826	4.4	858.2	858.2	858.8	0.6

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MUD CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AQ	66,521	260	1,521	5.3	858.8	858.8	859.5	0.7
AR	67,221	495	3,661	2.2	864.0	864.0	864.0	0.0
AS	69,135	327	2,054	3.2	864.6	864.6	864.9	0.3
AT	70,064	285	1,456	4.6	865.2	865.2	865.9	0.7
AU	71,124	396	2,319	2.9	868.5	868.5	869.5	1.0
AV	72,376	283	1,516	4.4	870.5	870.5	870.9	0.4
AW	74,344	193	1,078	6.2	873.8	873.8	874.5	0.7
AX	75,196	150	792	8.4	875.3	875.3	875.8	0.5
AY	76,063	260	2,023	3.0	880.4	880.4	880.4	0.0
AZ	77,053	259	1,449	3.7	881.2	881.2	881.2	0.0
BA	77,841	252	1,288	5.1	882.0	882.0	882.2	0.2
BB	78,859	260	1,291	4.4	883.2	883.2	883.9	0.7
BC	79,456	121	1,089	4.7	887.3	887.3	887.7	0.4
BD	80,905	376	1,717	2.6	888.3	888.3	888.8	0.5
BE	81,233	298	1,314	3.4	888.4	888.4	888.9	0.5
BF	81,984	453	2,196	2.1	892.5	892.5	892.5	0.0
BG	84,305	127	524	8.6	894.4	894.4	894.7	0.3
BH	84,591	205	1,275	3.5	896.2	896.2	897.0	0.8
BI	85,906	108	454	9.4	899.5	899.5	899.7	0.2
BJ	86,737	135	913	4.6	905.5	905.5	905.7	0.2
BK	88,588	147	732	5.8	907.1	907.1	907.5	0.4

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MUD CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BL	89,538	97	515	8.2	908.6	908.6	909.3	0.7
BM	90,780	152	876	4.8	913.1	913.1	914.0	0.9
BN	91,206	212	1,202	3.5	913.8	913.8	914.7	0.9
BO	92,240	87	552	6.6	915.6	915.6	916.0	0.4
BP	92,858	140	764	4.8	916.9	916.9	917.8	0.9
BQ	93,417	210	1,953	1.8	923.5	923.5	923.6	0.1
BR	94,127	230	1,508	2.4	923.6	923.6	923.7	0.1
BS	108,690	458	1,648	2.3	947.5	947.5	948.5	1.0
BT	110,890	444	1,563	2.4	951.1	951.1	952.1	1.0
BU	113,350	85	705	5.3	954.8	954.8	955.7	0.9
BV	115,210	89	730	5.1	957.4	957.4	958.3	0.9
BW	117,910	334	1,375	2.7	961.6	961.6	962.5	0.9

¹ Feet above confluence with Des Moines River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	MUD CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,258	173	1,475	4.7	832.9	832.9	833.6	0.7
B	3,834	244	1,381	4.9	836.0	836.0	836.7	0.7
C	4,171	184	1,195	5.7	837.1	837.1	837.7	0.6
D	6,484	154	1,465	3.3	844.3	844.3	845.0	0.7
E	7,670	120	868	5.5	846.9	846.9	847.2	0.3
F	8,538	166	1,298	3.0	848.2	848.2	848.8	0.6
G	10,993	83	625	6.2	853.4	853.4	853.9	0.5
H	13,837	143	661	5.6	862.9	862.9	863.9	1.0
I	14,837	111	610	6.1	866.5	866.5	867.5	1.0
J	16,088	118	777	4.4	869.6	869.6	870.4	0.8
K	17,272	240	779	4.4	872.0	872.0	872.6	0.6
L	17,567	272	1,212	2.8	873.2	873.2	874.0	0.8
M	17,657	245	931	3.6	873.3	873.3	874.2	0.9
N	17,894	150	571	6.0	874.0	874.0	874.8	0.8
O	18,162	190	878	3.9	875.8	875.8	876.2	0.4
P	18,315	182	778	3.9	876.2	876.2	876.5	0.3
Q	18,522	162	616	5.0	876.6	876.6	877.0	0.4
R	18,918	144	726	4.2	877.9	877.9	878.4	0.5
S	19,623	117	561	5.4	879.3	879.3	879.7	0.4
T	22,824	111	673	4.5	887.4	887.4	888.1	0.7
U	23,769	97	512	4.8	888.7	888.7	889.4	0.7

¹ Feet above confluence with Walnut Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	NORTH WALNUT CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	26,404	41	253	7.0	893.8	893.8	894.6	0.8
W	27,294	129	625	2.8	899.3	899.3	899.3	0.0
X	28,129	45	300	5.9	901.6	901.6	901.7	0.1
Y	30,026	55	329	5.4	907.7	907.7	908.1	0.4

¹ Feet above confluence with Walnut Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY POLK COUNTY, IOWA AND INCORPORATED AREAS	FLOODWAY DATA
		NORTH WALNUT CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,900	91	466	7.1	900.4	900.4	901.4	1.0
B	2,500	161	1,002	3.3	905.2	905.2	905.9	0.7
C	4,000	127	763	4.4	912.1	912.1	913.0	0.9
D	4,900	98	530	5.3	916.3	916.3	917.0	0.7
E	5,800	196	783	3.6	919.8	919.8	920.8	1.0
F	6,920	320	3,823	0.7	932.0	932.0	932.0	0.0

¹ Feet above confluence with Fourmile Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	OTTER CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	183	31	197	4.1	936.3	936.3	937.3	1.0
B	804	19	107	7.5	938.5	938.5	939.1	0.6
C	930	16	99	8.1	940.6	940.6	940.7	0.1
D	1,024	16	108	7.4	942.0	942.0	942.6	0.6
E	1,391	30	170	4.7	944.1	944.1	944.5	0.4
F	1,749	32	115	6.9	946.1	946.1	946.4	0.3
G	2,422	72	420	1.9	955.7	955.7	955.7	0.0
H	2,686	110	388	2.1	956.0	956.0	956.0	0.0
I	2,927	78	202	4.0	956.1	956.1	956.1	0.0
J	3,241	65	185	4.3	957.9	957.9	958.0	0.1
K	3,561	39	135	5.9	960.3	960.3	960.5	0.2
L	3,858	61	220	3.6	962.7	962.7	962.8	0.1
M	4,613	45	131	6.1	966.5	966.5	967.2	0.7
N	4,949	66	216	3.7	971.0	971.0	971.9	0.9
O	6,151	74	146	5.5	979.6	979.6	979.6	0.0

¹ Feet above confluence with Little Beaver Creek

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	PRAIRIE CREEK

Table 24: Floodway Data (continued)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,296	578	6,735	9.1	800.4	796.1 ²	796.6	0.5
B	2,035	571	6,969	8.8	800.4	796.8 ²	797.2	0.4
C	3,420	468	6,540	9.4	800.4	797.4 ²	797.8	0.4
D	5,064	534	7,440	8.2	800.4	799.7 ²	799.9	0.3
E	7,201	1,653	18,334	3.3	801.4	801.4	801.6	0.2
F	8,989	2,418	30,223	2.0	802.5	802.5	802.6	0.1
G	16,251	632	7,701	5.4	804.9	804.9	805.0	0.1
H	19,350	3,124	24,112	2.5	806.0	806.0	806.1	0.2
I	28,809	2,680	27,027	2.2	809.1	809.1	809.6	0.4
J	41,160	2,096	18,594	3.3	814.0	814.0	814.6	0.6
K	45,033	600	9,045	6.7	816.0	816.0	816.4	0.4
L	46,381	2,278	35,350	1.7	817.4	817.4	818.4	1.0
M	47,881	2,099	17,710	3.4	817.5	817.5	818.4	0.9
N	48,981	2,730	21,596	2.8	818.2	818.2	819.1	0.9
O	49,681	2,915	29,804	2.0	819.0	819.0	819.7	0.7
P	50,281	2,785	33,318	1.8	819.1	819.1	819.9	0.8
Q	50,931	2,870	37,071	1.6	819.4	819.4	820.1	0.7
R	52,231	3,370	25,367	2.4	819.4	819.4	820.2	0.8
S	53,231	3,450	35,052	1.7	820.0	820.0	820.6	0.6
T	54,131	3,583	39,399	1.5	820.2	820.2	820.9	0.7
U	55,131	3,811	38,317	1.6	820.4	820.4	821.0	0.6

¹ Feet above confluence with Des Moines River

² Elevation computed without considering backwater effect from Des Moines River.

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	POLK COUNTY, IOWA AND INCORPORATED AREAS	RACCOON RIVER