

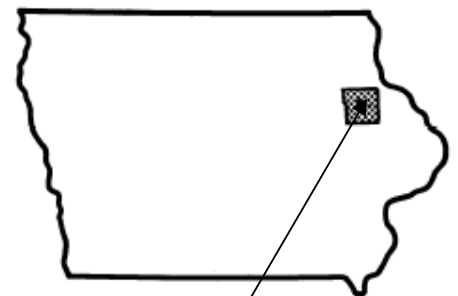
FLOOD INSURANCE STUDY



DELAWARE COUNTY, IOWA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
* COLESBURG, CITY OF	190717
DELAWARE, CITY OF	190594
DELAWARE COUNTY UNINCORPORATED AREAS	190863
DELHI, CITY OF	190566
DUNDEE, CITY OF	190363
EARLVILLE, CITY OF	190571
GREELEY, CITY OF	190739
HOPKINTON, CITY OF	190364
MANCHESTER, CITY OF	190112
MASONVILLE, CITY OF	190365
RYAN, CITY OF	190801

*Non-flood prone community



Delaware County

August 3, 2009

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
19055CV000A



NOTICE TO FLOOD INSURANCE STUDY USERS

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

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

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

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

TABLE OF CONTENTS

	Page
1.0	<u>INTRODUCTION</u>1
1.1	Purpose of Study1
1.2	Authority and Acknowledgments.....1
1.3	Coordination.....2
2.0	<u>AREA STUDIED</u>3
2.1	Scope of Study3
2.2	Community Description3
2.3	Principal Flood Problems4
2.4	Flood Protection Measures.....4
3.0	<u>ENGINEERING METHODS</u>4
3.1	Hydrologic Analyses5
3.2	Hydraulic Analyses5
3.3	Vertical Datum8
4.0	<u>FLOODPLAIN MANAGEMENT APPLICATIONS</u>8
4.1	Floodplain Boundaries9
4.2	Floodways9
5.0	<u>INSURANCE APPLICATIONS</u>10
6.0	<u>FLOOD INSURANCE RATE MAP</u>15
7.0	<u>OTHER STUDIES</u>15
8.0	<u>LOCATION OF DATA</u>17
9.0	<u>BIBLIOGRAPHY AND REFERENCES</u>17

TABLE OF CONTENTS
(continued)

Page

FIGURES

Figure 1 - Floodway Schematic10

TABLES

Table 1 - Initial and Final CCO Meetings 2
Table 2 - Maquoketa River Peak Discharges near Manchester, Iowa 4
Table 3 - Summary of Discharges 6
Table 4 - Floodway Data Table 11
Table 5 - Community Map History 16

EXHIBITS

Exhibit 1 - Flood Profiles

Maquoketa River 01P-03P
Tributary A 04P-06P

PUBLISHED SEPERATELY

Flood Insurance Rate Map Index
Flood Insurance Rate Map

**FLOOD INSURANCE STUDY
DELAWARE COUNTY, IOWA AND INCORPORATED AREAS**

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Delaware County, including the Cities of Colesburg, Delaware, Delhi, Dundee, Earlville, Greeley, Hopkinton, Manchester, Masonville, and Ryan, and unincorporated areas of Delaware County (referred to collectively herein as Delaware County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the City of Edgewood is geographically located in Delaware and Clayton Counties. The flood-hazard information for the City of Edgewood is for information purposes only. See separately published FIS report and Flood Insurance Rate Map (FIRM) for Clayton Counties for data concerning the City of Edgewood.

Please note that the City of Dyersville is geographically located in Delaware and Dubuque Counties. The flood-hazard information for the City of Dyersville is for information purposes only. See separately published FIS and FIRM for Dubuque County for data concerning the City of Dyersville.

Please note that the City of Colesburg is non-floodprone.

Please note that the City of Oneida has been disassembled and is now considered a part of the unincorporated area of Delaware County.

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

1.2 Authority and Acknowledgements

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

This countywide study was prepared in January 2009, to combine all communities within Delaware County into a countywide FIS. Information concerning the authority and acknowledgements for each jurisdiction included in this countywide FIS, compiled from previously printed FIS reports, is detailed below.

City of Manchester

The hydrologic and hydraulic analyses for the previous study, dated April 15, 1982, were created by Wallace Holland Kastler Schmitz and Co. and Kirkham Michael and Associates, a Joint Venture for FEMA, under Contract No. H-4738.

Base map information shown on FIRMs for Delaware County, Iowa was derived from multiple sources. Some base map files were provided in digital format by the Iowa Department of Natural Resources, as well as a 2002 digital orthophotograph of Delaware County. This is used as the base map as well as comparing data provided and to make minor adjustments to specific areas of base map features as needed. Other information compiled includes political boundaries and Public Land Survey System data. U.S. Geological Survey (USGS) provided 7.5-Minute Series Quadrangle. Delaware County transportation features were taken from a digital file provided by the Iowa Department of Transportation and benchmarks were collected from the National Geodetic Survey Dataset.

The projection system and horizontal datum used for the production of the FIRMs is Universal Transverse Mercator (UTM), Zone 15N, North American Datum of 1983 (NAD83) GRS80 spheroid.

The following communities did not have a previously printed FIS report: the Cities of Colesburg, Delhi, Dundee, Earlville, Greeley, Hopkinton, Masonville, and Ryan; and unincorporated areas of Delaware County. This Countywide study was based on information from the previous FIS for the City of Manchester.

This countywide FIS was prepared by Black & Veatch, under Contract No. EMK-2001-CO-2019.

1.3 Coordination

Consultation Coordination Officer’s (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, the state, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for Delaware County and the incorporated communities within its boundaries are shown in Table 1, “Initial and Final CCO Meetings.”

Table 1. Initial and Final CCO Meetings

<u>Community</u>	<u>Initial CCO Date</u>	<u>Final CCO Date</u>
Manchester, City of	April 1978	October 29, 1981

For this countywide FIS an informational meeting was held August 25, 2005. This meeting was attended by representatives of FEMA; Black & Veatch Engineering; the following communities: The Cities of Delhi, Manchester, and Ryan; Delaware County representatives.

The results of this study were reviewed at the final CCO meeting held on November 27, 2007, and attended by representatives of FEMA; Black & Veatch Engineering; the cities of Delhi, Manchester, Hopkinton and the Delaware County. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

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

Approximate analyses were used to study those areas having low development potential or minimum flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and officials of each affected community.

City of Manchester

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through March 1986.

The Maquoketa River from 2,350 feet downstream of U.S. Highway 520 to the northwestern corporate limit for the City of Manchester and Tributary A from its mouth at the Maquoketa River to the eastern corporate limit for the City of Manchester were studied in detail.

2.2 Community Description

Delaware County, located in northeastern Iowa, has an area of 578 square miles. Major cities in Delaware County are the Cities of Manchester and Earlville.

The estimated population in 2004 was 18,067. This was a decrease of -1.83 percent from the 2000 census (Reference 1). The county is typically rural.

The climate of the area is characterized by large seasonal variations in temperature ranging from less than -30 degrees Fahrenheit (F.) to more than 100 degrees F. The normal annual precipitation is about 33 inches (Reference 2).

City of Manchester

The City of Manchester is located in the west central portion of the County and has a population of 5,257 as of the 2000 Census (Reference 3).

The Maquoketa River flows southeast through Manchester and drains into the Mississippi River in Jackson County, Iowa. Tributary A is an unnamed tributary flowing generally south through Manchester to the Maquoketa River near the southern Manchester corporate limit. Manchester is located in the Iowan drift area. The streams in this region flow in broad "sags" bordered by irregular hills. The land is gently rolling and well drained. There are no natural lakes in this area; however, small ponds are formed in depressions after heavy or prolonged rains (Reference 4).

The flood plain development is mainly residential and commercial in the center of the city and rural in the outer reaches.

2.3 Principal Flood Problems

Floods can occur at any time during the year, but are especially likely during spring rains. The ten worst floods on the Maquoketa River recorded at the Manchester gaging station as indicated in Table 2 (Reference 5).

Table 2. Maquoketa River Peak Discharges near Manchester, Iowa

<u>Date</u>	<u>Peak Discharge, cfs</u>
June 15, 1925	25,400 ¹
June 13, 1947	20,000
July 9, 1951	16,800
March 30, 1960	11,600
July 18, 1969	11,200
March 19, 1979	10,900
January 6, 1946	9,130
March 7, 1950	8,920
September 8, 1941	8,880
August 30, 1981	8,830

cfs = cubic feet per second

¹ = Historic Peak Discharge

No high water marks are known to exist on Tributary A. Some of the culverts along Tributary A are not adequate to handle the larger discharges and residential building into the natural floodway and even on top of one of the culverts have added further complications to the flooding of Tributary A.

2.4 Flood Protection Measures

No specific flood protection measures presently exist within Delaware County. Future efforts to reduce flood damage will be primarily through the use of these studies to promote sound land use and flood plain management.

A dam, which was built by the Iowa Electric Company across the Maquoketa River at Marion Street, within the City of Manchester, provides no flood protection.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the

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

3.1 Hydrologic Analyses

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

Discharge-frequency relationships for the Maquoketa River were developed from a log-Pearson Type II statistical analysis of stream gage records from 1933 through 1973 (gage No. 05-4170.00 at gage station 2.3 miles below dam at Marion Street) plus computed and estimated peak discharges for 1925, 1928, 1929, and 1930 (Reference 6 and 7).

The peak frequency discharges for Tributary A were developed using the Natural Resource Conservations Service (NRCS), formerly the Soil Conservation Service (SCS), procedures for small watersheds (Reference 8). These procedures are based on local characteristics including peak rainfalls for the 10-, 2-, 1-, and 0.2-percent-annual-chance storms, soil types, stream slopes, type of soil cover, vegetation, land use and drainage area.

Peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods of the flooding source studied in detail in the community are shown in Table 3, "Summary of Discharges".

Discharges (1-percent-annual-chance flood) for the streams to be redelineated by approximate methods were calculated using the State of Iowa Regression Equations (Reference 9) as a component of the Nebraska Department of Natural Resources N-FECT tool (Reference 10).

3.2 Hydraulic Analyses

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

Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (mi ²)	Peak Discharges (cubic feet per second)			
		10-Percent- Annual-Chance	2-Percent- Annual-Chance	1-Percent- Annual-Chance	0.2-Percent- Annual-Chance
MAQUOKETA RIVER At gage No. 05417000 located 2.3 miles below dan in Manchester	305	11,410	17,540	20,240	26,670
TRIBUTARY A					
At confluence with Maquoketa River	4.4	1,560	2,230	2,640	4,830
Just north of Illinois Central Gulf Railroad	2.4	890	1,280	1,510	2,770
At East Prospect Street	2.2	860	1,230	1,450	2,640
At East Acers Street	1.6	810	1,160	1,370	2,480

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

Cross sections for the backwater analyses of the Maquoketa River and Tributary A were obtained from aerial photographs flown in April 1979 at a negative scale of approximately 1:9600 (Reference 11). The streambed, bridges, dams and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. Distances between cross sections as shown on the Floodway Data Table were measured based upon the hydraulic rather than the stream center line.

For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM.

Channel roughness factors (Manning's "n"), used in the hydraulic computations, were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the main channel of the Maquoketa River range from 0.025 to 0.033 with flood plain roughness values ranging from 0.045 to 0.100 for all floods. Roughness values for the main channel of Tributary A range from 0.012 to 0.038 with flood plain roughness values ranging from 0.050 to 0.080.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program (Reference 12). Starting water-surface elevations for the Maquoketa River and Tributary A were developed using a slope-area method to model free flow conditions.

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

Detailed-studied streams that were not re-studied as part of this map update may include a "profile base line" on the maps. This "profile base line" provides a link to the flood profiles included in the FIS report. The detail-studied stream centerline may have been digitized or redelineated as part of this revision. The "profile base lines" for these streams were based on the best available data at the time of their study and are depicted as they were on the previous FIRMs.

Delineation of the approximate 1-percent-annual-chance flood boundaries was based on 1-percent-annual-chance flood depths. Hydraulic analyses for the streams to be redelineated by approximate methods were performed using the Nebraska Department of Natural Resources N-FECT tool (Reference 10). Regional regression equations and a normal depth calculation based on Manning's equation are used in the Nebraska Program. To assist in mapping, a set of software tools called the Nebraska Flood Elevation Calculation Tools (N-FECT) has been developed, N-FECT is an extension to ArcView and was written by members of the mapping team and modified to be applied to areas of Iowa. The Manning's "n" values used were based on field observations of the streams. Values ranged from 0.050 to 0.070. The use of a 10 meter digital elevation model was the basis of the existing grade elevations.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid

only if hydraulic structures, in general, remain unobstructed and if channel and over bank conditions remain essentially the same as ascertained during this study.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the 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.

To accurately convert flood elevations for Delaware County from the current NGVD29 datum to the newer NAVD88 datum, the following procedures were implemented. Locations at the quadrangle corners within the county and outside the county within 2.5 miles were evaluated using the USACE's CORPSCON (Reference 13) datum conversion software. The final NAVD88 elevation provided for Delaware County was computed by adding -0.11 feet to the existing NGVD29 data.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD29 and NAVD88, or to obtain current elevation, description, and/or location information for benchmarks shown on this map, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

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

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

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent-annual-chance floodplain data, which may include a combination of this following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the

FIRM and in many components of the FIS, including Flood Profiles and Floodway Data tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated from maps using predetermined contour lines, estimated to bracket the 1- and 0.2-percent-annual-chance floods, developed by photogrammetric methods from aerial photographs, at a scale of 1:9600 (Reference 11), and supplemented with U.S. Geological Survey (USGS) topographic maps at a scale of 1:24000 with a contour interval of 10 feet (Reference 14).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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

Small areas within the flood boundaries may lie above the flood elevations and therefore not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as

minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed and are presented in Table 4, "Floodway Data."

As shown on the FIRM, the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 1-percent-annual-chance flood are either close together or collinear, only the floodway boundary has been shown.

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

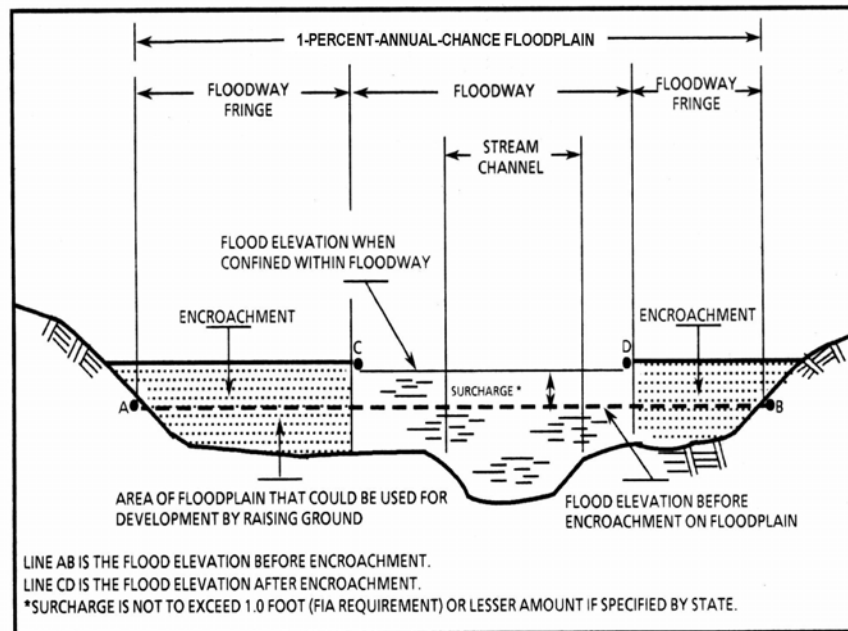


Figure 1. Floodway Schematic

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MAQUOKETA RIVER								
A	2,280	347	4,134	4.9	919.8	919.8	920.6	0.8
B	2,430	772	9,872	2.1	919.8	919.8	920.7	0.9
C	2,870	437	4,604	4.4	920.1	920.1	920.8	0.7
D	3,790	306	4,218	4.8	920.7	920.7	921.4	0.7
E	4,450	1,026	9,627	2.1	921.4	921.4	922.2	0.8
F	5,510	1,150	11,630	1.7	921.6	921.6	922.4	0.8
G	6,530	696	7,468	2.7	921.9	921.9	922.7	0.8
H	6,990	301	4,001	5.1	922.0	922.0	922.8	0.8
I	7,470	236	2,948	6.9	922.2	922.2	923.1	0.9
J	7,780	237	2,858	7.1	922.4	922.4	923.3	0.9
K	7,815	237	2,868	7.1	922.5	922.5	923.3	0.8
L	7,955	191	2,574	7.9	922.6	922.6	923.4	0.8
M	8,085	219	2,748	7.4	922.9	922.9	923.7	0.8
N	8,195	212	2,909	7.0	932.2	932.2	932.2	0.0
O	8,260	212	2,916	6.9	932.3	932.3	932.3	0.0
P	8,390	283	3,695	5.5	932.8	932.8	932.8	0.0
Q	8,790	247	3,179	6.4	932.9	932.9	932.9	0.0
R	9,170	163	2,047	9.9	933.1	933.1	933.1	0.0
S	9,690	230	2,766	7.3	933.7	933.7	934.1	0.4
T	10,010	399	4,736	4.3	934.2	934.2	934.9	0.7
U	10,075	399	4,747	4.3	934.2	934.2	934.9	0.7
V	10,465	611	7,976	2.5	934.4	934.4	935.2	0.8
W	10,885	518	6,184	3.3	934.4	934.4	935.2	0.8
X	11,465	661	7,282	2.8	934.6	934.6	935.4	0.8
Y	12,105	1,050	13,442	1.5	934.9	934.9	935.8	0.9
Z	12,835	1,312	17,011	1.2	934.9	934.9	935.8	0.9

¹Feet above Limit of Detailed Study (2350 feet downstream of US Highway 520)

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
DELAWARE COUNTY, IA
 AND INCORPORATED AREAS

FLOODWAY DATA

MAQUOKETA RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MAQUOKETA RIVER								
AA	14,205	768	9,225	2.2	935.0	935.0	935.9	0.9
AB	15,325	934	11,429	1.8	935.4	935.4	936.3	0.9
AC	16,915	1,264	12,238	1.7	935.7	935.7	936.6	0.9
AD	17,725	1,778	14,500	1.4	935.9	935.9	936.8	0.9

¹Feet above Limit of Detailed Study (2350 feet downstream of US Highway 520)

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
DELAWARE COUNTY, IA
 AND INCORPORATED AREAS

FLOODWAY DATA

MAQUOKETA RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TRIBUTARY A								
A	530	79	245	10.8	920.1	912.7 ²	913.1	0.4
B	970	24	192	13.8	920.1	917.5 ²	918.3	0.8
C	1,020	24	218	12.1	920.1	919.4 ²	919.4	0.0
D	1,160	70	625	4.2	922.4	922.4	922.4	0.0
E	2,250	231	1,166	2.3	922.6	922.6	923.4	0.8
F	2,910	216	1,073	2.5	923.0	923.0	924.0	1.0
G	3,610	173	687	3.8	923.7	923.7	924.7	1.0
H	4,150	74	250	10.6	927.5	927.5	927.5	0.0
I	4,190	80	324	8.1	928.4	928.4	928.4	0.0
J	4,500	172	877	1.7	929.9	929.9	930.1	0.2
K	5,000	82	212	7.1	930.7	930.7	931.4	0.7
L	5,300	89	286	5.3	932.9	932.9	933.6	0.7
M	5,420	140	490	3.1	935.1	935.1	935.1	0.0
N	5,520	170	951	1.6	937.1	937.1	937.4	0.3
O	5,670	225	824	1.8	937.3	937.3	937.7	0.4
P	6,020	220	302	3.5	939.5	939.5	939.5	0.0
Q	6,320	220	329	3.3	941.4	941.4	941.4	0.0
R	6,670	200	613	2.5	942.4	942.4	942.6	0.2
S	6,890	280	1,048	1.4	943.2	943.2	944.2	1.0
T	7,590	163	943	1.6	943.5	943.5	944.5	1.0
U	7,810	180	745	2.0	943.6	943.6	944.6	1.0
V	7,980	248	864	1.7	943.8	943.8	944.8	1.0
W	8,060	300	1,047	1.4	943.9	943.9	944.8	0.9
X	8,140	353	1,199	1.2	944.1	944.1	945.0	0.9
Y	8,280	310	728	2.0	944.2	944.2	945.1	0.9
Z	8,600	255	1,124	1.3	944.4	944.4	945.3	0.9

¹Feet above confluence with Maquoketa River

²Elevations without considering backwater effect from Maquoketa River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
DELAWARE COUNTY, IA
 AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY A

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TRIBUTARY A								
AA	9,010	190	644	2.3	944.6	944.6	945.5	0.9
AB	9,720	325	955	1.5	945.2	945.2	946.1	0.9
AC	10,780	225	505	2.7	946.4	946.4	947.2	0.8
AD	11,060	450	435	3.2	947.8	947.8	948.4	0.6
AE	11,100	450	686	2.0	948.2	948.2	948.9	0.7
AF	11,270	300	776	1.8	948.4	948.4	949.1	0.7
AG	12,120	86	257	5.3	949.1	949.1	949.7	0.6
AH	12,980	197	492	2.8	951.2	951.2	952.2	1.0

¹Feet above confluence with Maquoketa River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
DELAWARE COUNTY, IA
 AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY A

hydraulic analyses are not performed for such areas, no base 1-percent-annual-chance flood elevations (BFEs) or depths are shown within this zone.

Zone AE

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

Zone X

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

6.0 FLOOD INSURANCE RATE MAP

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

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

The countywide FIRM presents flooding information for the entire geographic area of Delaware County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, "Community Map History."

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each community within Delaware County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS reports, Flood Hazard Boundary Maps (FHBMs), Flood Boundary and Floodway Maps (FBFMs) and FIRMs for all of the incorporated and unincorporated jurisdictions within Delaware County and should be considered authoritative for purposes of the NFIP.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATES	FIRM EFFECTIVE DATES	FIRM REVISIONS DATES
Colesburg, City of *	None	NA	None	NA
Delaware, City of	August 3, 2009	NA	August 3, 2009	NA
Delaware County Unincorporated Areas	July 22, 1980	NA	August 3, 2009	NA
Delhi, City of	March 19, 1976	NA	August 3, 2009	NA
Dundee, City of	July 30, 1976	NA	August 1, 1986	NA
Earlville, City of	March 19, 1976	NA	August 3, 2009	NA
Greeley, City of	October 29, 1976	NA	August 3, 2009	NA
Hopkinton, City of	October 29, 1976	NA	July 2, 1987	NA
Manchester, City of	August 2, 1974	January 9, 1976	October 15, 1982	NA
Masonville, City of	August 13, 1976	October 31, 1978	July 1, 1997	NA
Ryan, City of	March 26, 1976	NA	August 3, 2009	NA

* Non Flood Prone

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY
DELAWARE COUNTY, IOWA
 AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

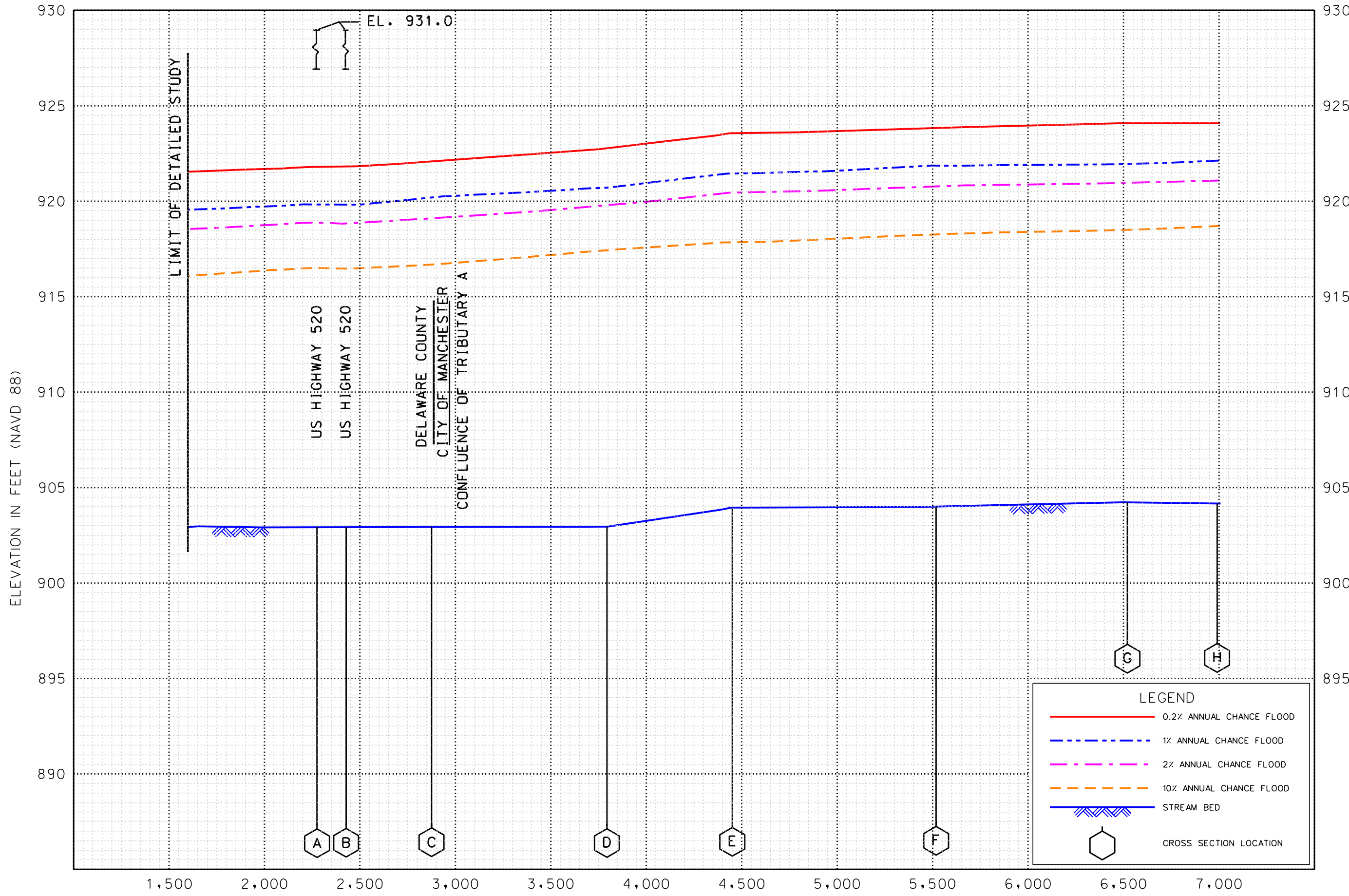
8.0 LOCATION OF DATA

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

9.0 BIBLIOGRAPHY AND REFERENCES

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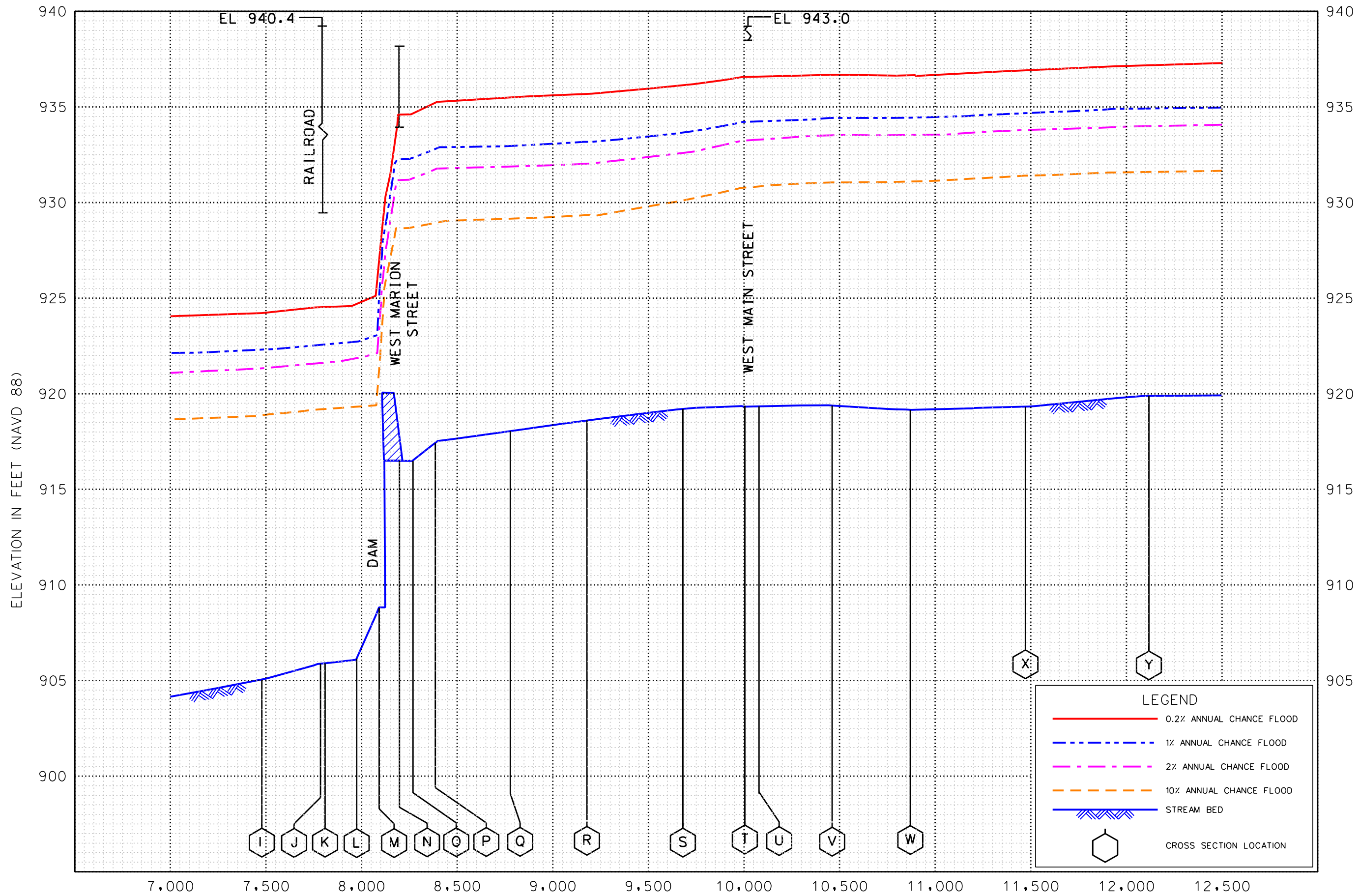
Federal Emergency Management Agency, Flood Insurance Study, City of Manchester,
Delaware County, Iowa, April 15, 1982.



STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY
 (LIMIT OF DETAILED STUDY IS 2,350 FEET DOWNSTREAM OF US HIGHWAY 520)

FEDERAL EMERGENCY MANAGEMENT AGENCY
 DELAWARE COUNTY, IA
 AND INCORPORATED AREAS

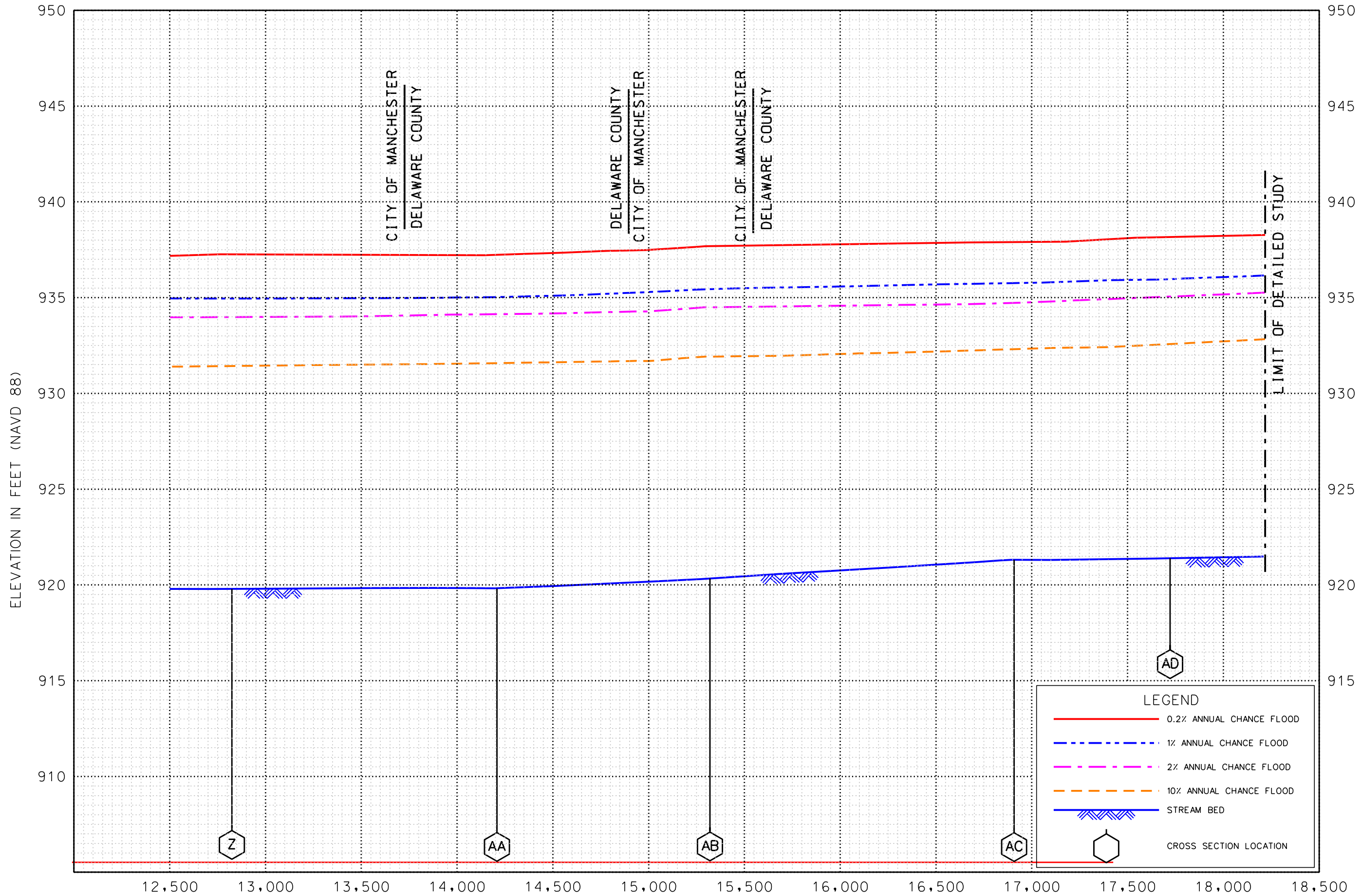
FLOOD PROFILES
 MAQUOKETA RIVER



STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY
 (LIMIT OF DETAILED STUDY IS 2,350 FEET DOWNSTREAM OF US HIGHWAY 520)

FLOOD PROFILES
 MAQUOKETA RIVER

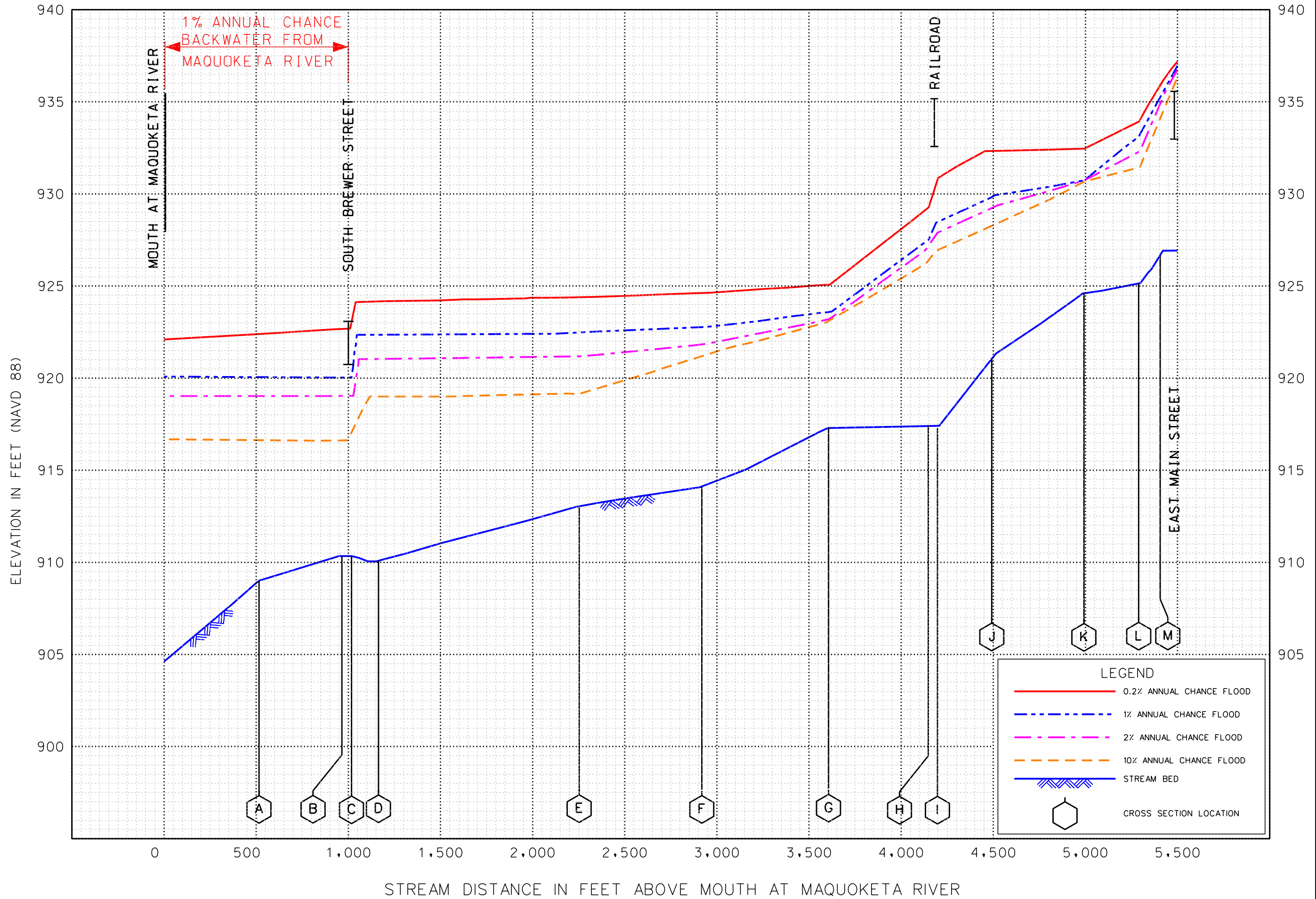
FEDERAL EMERGENCY MANAGEMENT AGENCY
 DELAWARE COUNTY, IA
 AND INCORPORATED AREAS



STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY
 (LIMIT OF DETAILED STUDY IS 2,350 FEET DOWNSTREAM OF US HIGHWAY 520)

FLOOD PROFILES
 MAQUOKETA RIVER

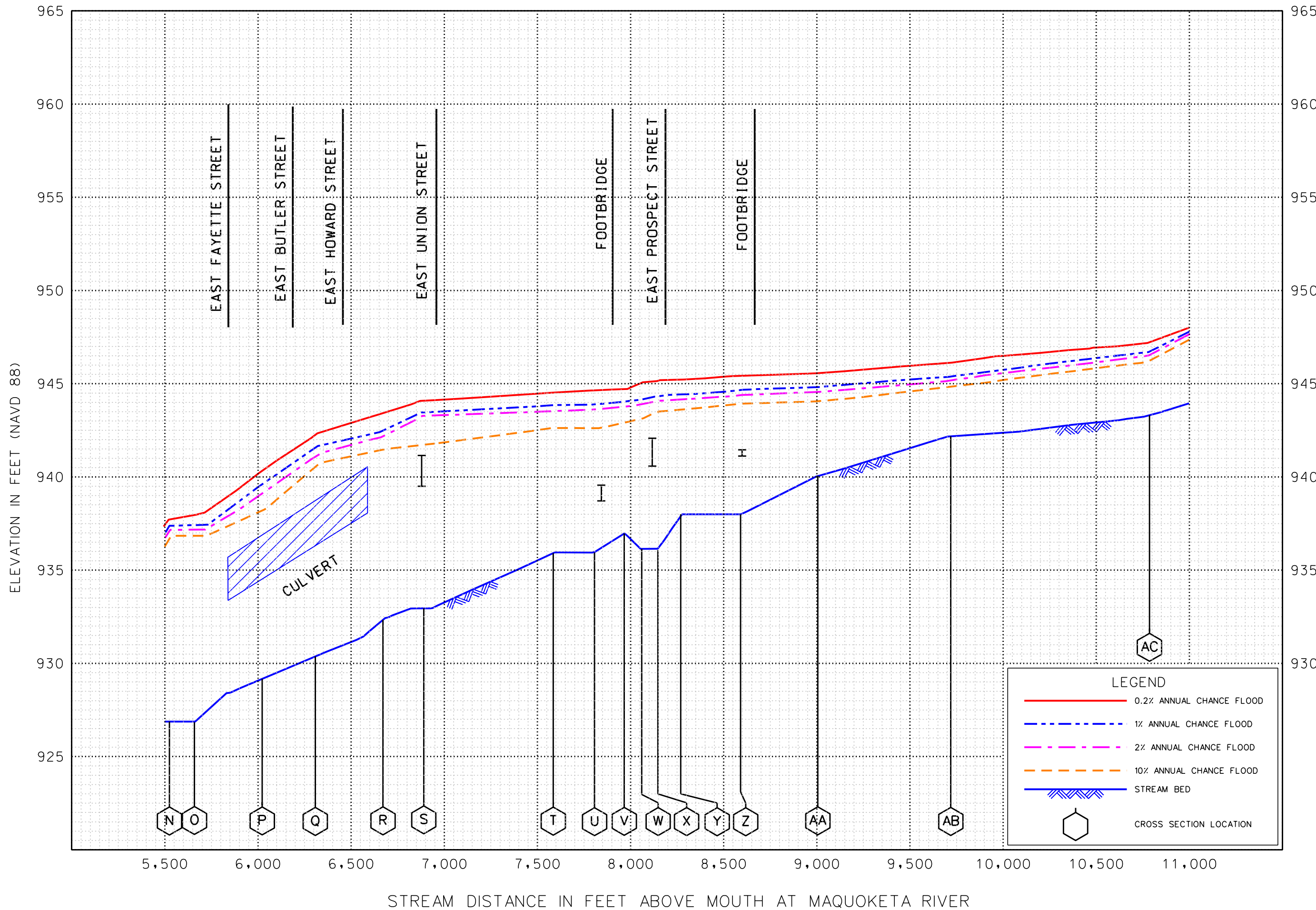
FEDERAL EMERGENCY MANAGEMENT AGENCY
 DELAWARE COUNTY, IA
 AND INCORPORATED AREAS



FLOOD PROFILES

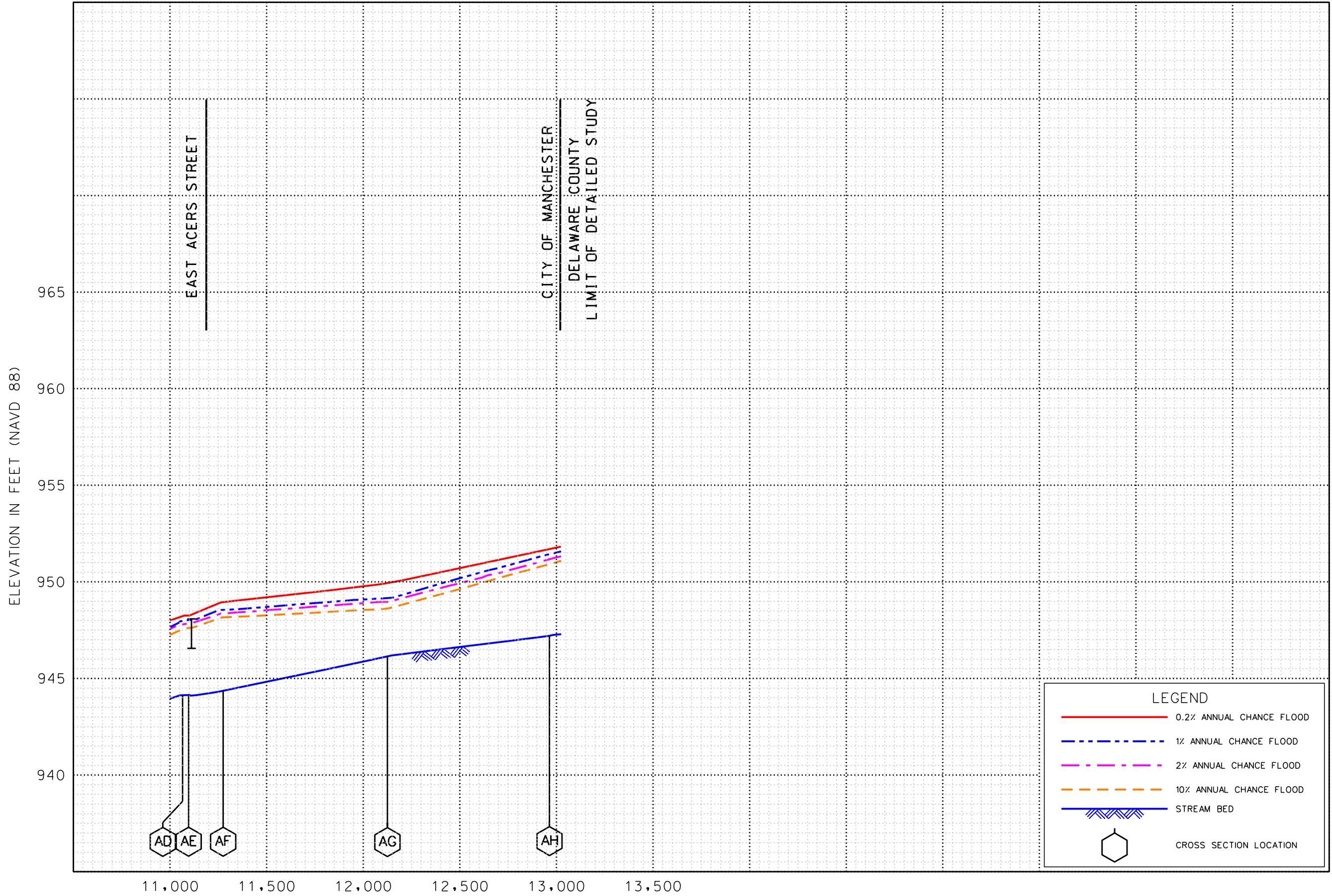
TRIBUTARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY
 DELAWARE COUNTY, IOWA
 AND INCORPORATED AREAS



FLOOD PROFILES
 TRIBUTARY A

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 DELAWARE COUNTY, IOWA
 AND INCORPORATED AREAS



FLOOD PROFILES

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 AND INCORPORATED AREAS