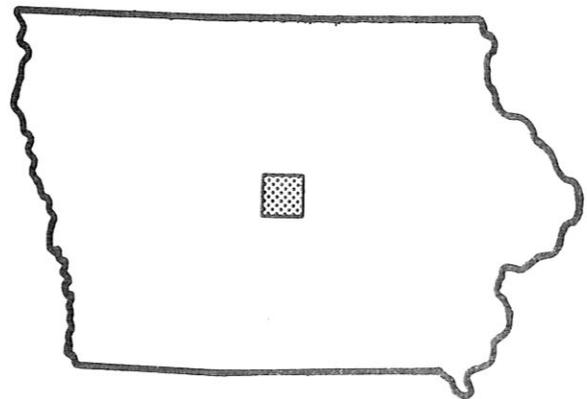


FLOOD INSURANCE STUDY



COUNTY OF STORY,
IOWA
UNINCORPORATED AREAS



DECEMBER 1, 1982



Federal Emergency Management Agency

COMMUNITY NUMBER - 190907

BILLING CODE: 6718-03

FEDERAL EMERGENCY MANAGEMENT AGENCY

(44 CFR PART 67)

NATIONAL FLOOD INSURANCE PROGRAM

Final Flood Elevation Determinations

AGENCY: FEMA.

ACTION: Final Rule.

SUMMARY:

Final base (100-year) flood elevations are listed below for selected locations in the nation.

These base (100-year) flood elevations are the basis for the flood plain management measures that the community is required either to adopt or show evidence of being already in effect in order to qualify or remain qualified for participation in the National Flood Insurance Program (NFIP).

EFFECTIVE DATE:

The date of issuance of the Flood Insurance Rate Map (FIRM), showing base (100-year) flood elevations, for the community. This date may be obtained by contacting the office where the maps are available for inspection indicated in the table below.

ADDRESSES:

See table below.

FOR FURTHER INFORMATION CONTACT:

Mr. Robert G. Chappell
National Flood Insurance Program
(202) 287-0230
Federal Emergency Management Agency
Washington, D. C. 20472.

SUPPLEMENTARY INFORMATION:

The Federal Emergency Management Agency gives notice of the final determination of flood elevation for each community listed.

This final rule is issued in accordance with section 110 of the Flood Disaster Protection Act of 1968 (Title XIII of the Housing and Urban Development Act of 1968 (Pub. L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 67). An opportunity for the community or individuals to appeal this determination to or through the community for a period of ninety (90) days has been provided. No appeals of the proposed base flood elevations were received from the community or from individuals within the community.

The Agency has developed criteria for flood plain management in flood-prone areas in accordance with 44 CFR Part 60.

Pursuant to the provisions of 5 USC 605(b), the Associate Director, to whom authority has been delegated by the Director, Federal Emergency Management Agency, hereby certifies that the (final) flood elevation determinations, if promulgated, will not have a significant economic impact on a substantial number of small entities. A flood elevation determination under section 1363 forms the basis for new local ordinances, which, if adopted by a local community, will govern future construction within the flood plain area. The elevation determinations, however, impose no restriction unless and until the local community voluntarily adopts flood plain ordinances in accord with these elevations. Even if ordinances are adopted in compliance with Federal standards, the elevations prescribe how high to build in the flood plain and do not proscribe development. Thus, this action only forms the basis for future local actions. It imposes no new requirement; of itself it has no economic impact.

List of Subjects in 44 CFR Part 67.

Flood Insurance, Floodplains.

The final base (100-year) flood elevations for selected locations are:

Final Base (100-Year) Flood Elevations

State	City/Town/County	Source of Flooding	Location	#Depth in feet above ground. *Elevation in feet (NGVD).
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Iowa	(Uninc.) Story County (Docket No. FEMA-6431)	Skunk River	About 2.05 miles downstream of U.S. Highway 30 Bypass	872*
			About 700 feet downstream of 13th Street	890*
			Just downstream of State Highway 221	958*
			At upstream county boundary	981*
		Fourmile Creek	Just upstream of Northwest 166th Avenue	1005*
			About 0.28 mile upstream of County Highway R38	1013*
		Indian Creek	Downstream county boundary	855*
			Just upstream of County Road (About 5.3 miles upstream of county boundary)	879*
		West Branch Indian Creek	Just downstream of County Road (About 5.05 miles downstream of City of Nevada corporate limit)	914*
			About 0.55 mile upstream of Chicago and Northwestern Railroad	967*
		Walnut Creek	About 550 feet downstream of County Highway R63	889*
			About 3830 feet upstream of U.S. Highway 69	928*
		Ballard Creek	About 500 feet downstream of Interstate 35	878*
			Just downstream of U.S. Highway 69	947*

Ballard Creek (cont'd)	About 200 feet downstream of County Road (About 1.43 miles upstream of U.S. Highway 69)	983*
	About 200 feet upstream of County Road (About 1.49 miles upstream of U.S. Highway 69)	988*
Worle Creek	About 0.65 mile downstream of U.S. Highway 30	905*
	About 250 feet downstream of County Road	935*
	About 450 feet upstream of County Road	942*
	Just downstream of County Highway R38	978*
	About 150 feet upstream of County Highway R38	983*
	At upstream county boundary	1018*
Onion Creek	Mouth at Squaw Creek	907*
	Just upstream of County Road (About 1.7 miles upstream of mouth)	935*
	About 650 feet downstream of county boundary	969*
Squaw Creek	Mouth at Skunk River	883*
	About 0.69 mile downstream of confluence of Onion Creek	906*
	About 0.61 mile upstream of County Road (About 3.5 miles upstream of confluence of Onion Creek)	919*

Bear Creek	About 600 feet downstream of Interstate 35	932*
	About 1.08 miles downstream of County Highway R77	1017*
	About 600 feet upstream of County Highway E15	1037*
Long Dick Creek	Mouth at Skunk River	960*
	About 0.20 mile upstream of County Road	994*
Rock Creek	At confluence with Indian Creek	862*
	About 1000 feet downstream of County Highway E63	879*
	Just downstream of County Road (About 1.7 miles upstream of County Highway E63)	906*
Rock Creek Tributary	About 900 feet upstream of mouth	876*
	About 0.94 mile upstream of mouth	902*
Keigley Branch	Mouth at Skunk River	926*
	About 600 feet upstream of County Road	942*
Lateral A	About 0.77 mile upstream of mouth	887*
	About 1.85 miles upstream of mouth	927*

Maps available for inspection at the Planning and Zoning Office, Story County Courthouse, Nevada, Iowa.

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Walnut Creek	Panels 16P-18P
Ballard Creek	Panels 19P-21P
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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

COUNTY OF STORY, IOWA UNINCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of the County of Story, Iowa, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Unincorporated Areas of the County of Story to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

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

The hydrologic and hydraulic analyses for this study were performed by Associated Engineers, Inc. for the Federal Emergency Management Agency, under Contract No. H-4737. Approximate flood boundaries were determined by Michael Baker, Jr., Inc., under contract to the Federal Emergency Management Agency. This study was completed in September 1980.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the Study Contractor, FEMA, and Story County on March 30, 1978. A community coordination meeting was held on February 13, 1979, attended by representatives of the Study Contractor and the Story County Planning and Zoning Officer.

Results of the hydrologic analyses were coordinated with the Iowa Natural Resources Council, the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers (COE), the U.S. Department of Agriculture, Soil Conservation Service (SCS), the Bureau of Reclamation, and the U.S. Water Resources Council.

On June 7, 1982, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, the Iowa Natural Resources Council, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

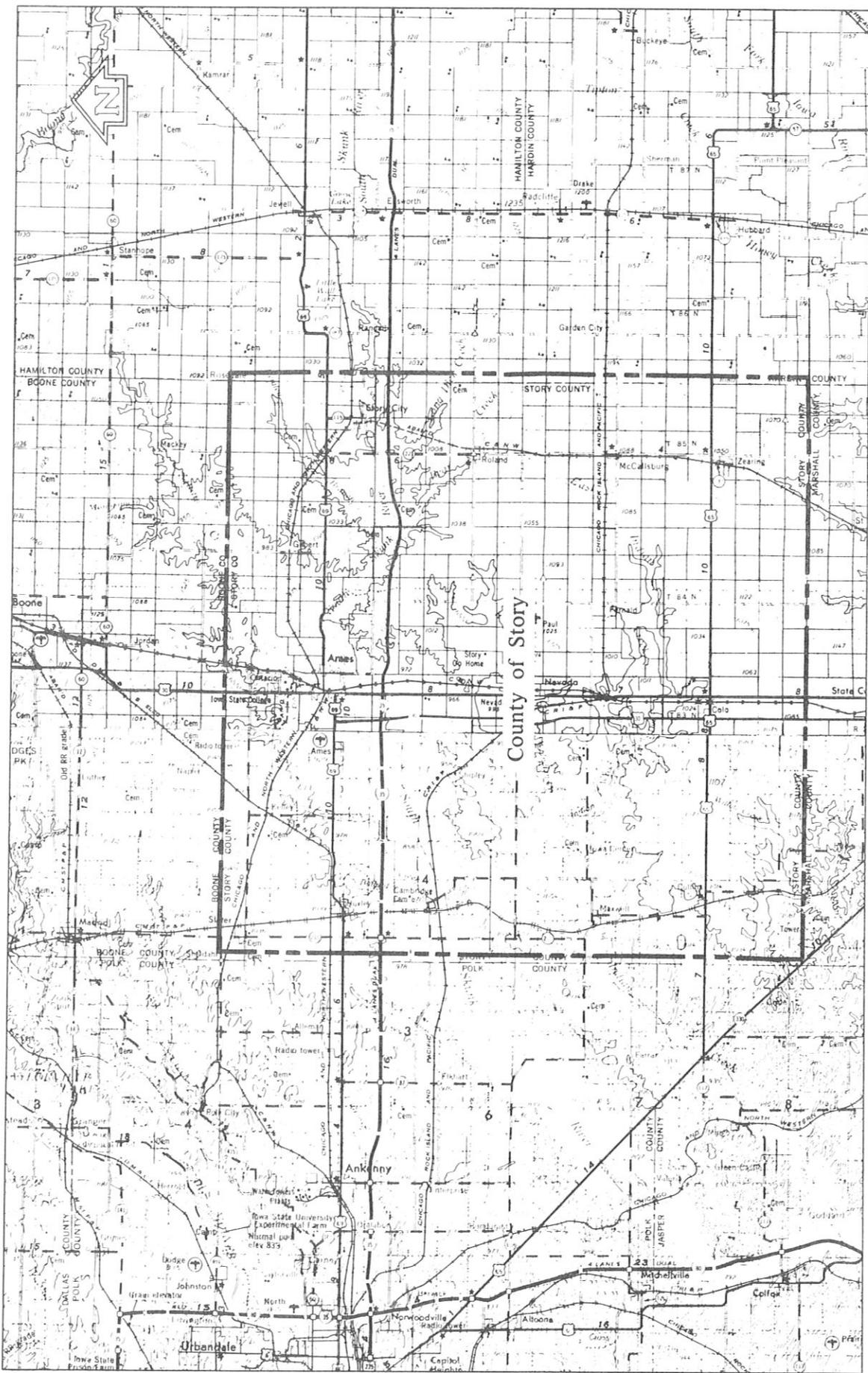
This Flood Insurance Study covers the unincorporated areas of the County of Story, Iowa. The incorporated community within Story County is not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through September 1985.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by FEMA and the County of Story.

The following streams were studied by detailed methods:

- a. Skunk River, from approximately 2.1 miles downstream of U.S. Highway 30 bypass, to the City of Ames corporate limit approximately 2,800 feet upstream of South 16th Street; from the City of Ames corporate limit, approximately 1,300 feet downstream of 13th Street to the confluence of Keigley Branch; from State Highway 221, to the City of Story City eastern corporate limit; from the City of Story City northern corporate limit, to the northern county boundary;
- b. Long Dick Creek, from the mouth at Skunk River, to approximately 3.6 miles upstream;
- c. Bear Creek, from approximately 600 feet downstream of Interstate Highway 35, to the City of Roland southern corporate limit; and from the City of Roland northern corporate limit to approximately 2.0 miles upstream of the City of Roland corporate limit;



APPROXIMATE SCALE



FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

VICINITY MAP

FIGURE 1

- d. Keigley Branch, from the mouth at Skunk River, to approximately 2.6 miles upstream;
- e. Lateral A, from approximately 4,000 feet upstream of the mouth, to approximately 1.9 miles;
- f. Squaw Creek, from the mouth to the eastern corporate limit of the City of Ames and from the City of Ames western corporate limit, to approximately 7,000 feet downstream of the county boundary;
- g. Onion Creek, from the mouth at Squaw Creek, to approximately 2,000 feet downstream of the county boundary;
- h. Worle Creek, from the City of Ames corporate limit, to the county boundary;
- i. Walnut Creek, from approximately 2.7 miles upstream of mouth to approximately 3,800 feet upstream of U.S. Highway 69;
- j. Ballard Creek, from approximately 500 feet downstream of Interstate Highway 35, to approximately 1.5 miles upstream of U.S. Highway 69;
- k. West Branch Indian Creek, from County Road (approximately 9.3 miles above mouth), to approximately 0.8 mile upstream of Avenue L;
- l. Indian Creek, from the county boundary, to approximately 5.3 miles upstream;
- m. Rock Creek, from the mouth at Indian Creek, to approximately 2.9 miles upstream;
- n. Tributary to Rock Creek, from the City of Maxwell corporate limit, to approximately 3,000 feet upstream; and
- o. Fourmile Creek, from the county boundary, to the City of Slater corporate limit.

2.2 Community Description

Story County is located near the center of Iowa. It is approximately 30 miles west of Marshalltown. Total land area is approximately 576 square miles. Story County is bordered by Hamilton and Hardin Counties on the north, Marshall County on the east, Polk and Jasper Counties on the south, and Boone County on the west. The 1980 population of Story County was 72,326 (Reference 1).

The climate of Story County typifies central Iowa with wide seasonal fluctuations in temperature and precipitation. The average annual temperature is 47 degrees Fahrenheit (F.) with an average high in July of 87 degrees F. and an average low in January of 11 degrees F. There is an

average of 155 frost-free days each year. The annual precipitation for the study area averages 32 inches. Of this, 71 per cent or 23 inches falls during the growing season from April to September. An average of 32 inches of snowfall occurs each winter.

The surface is characterized by nearly level to gently and strongly sloping terrain, the latter of which is most dominant along the south Skunk River and its tributaries. Due to the relatively level nature of the topography, up to one-half of the county has been drained by artificial systems through the use of tiles and open ditches.

All of Story County lies in the Clarion-Nicollet-Webster soil association area which contains some of the best agricultural soils in the State of Iowa. These soils were originally formed from glacial till of the last ice age under the influence of prairie vegetation. The Clarion loam soils are located on the upland highs and ridges on typical two to five per cent slopes. These soils range from slightly to severely susceptible to erosion, have good internal drainage and high water holding capacity.

Nicollet soils have a loamy texture and are found on upland intermediate high elevations on typical one to three per cent slopes. They are slightly susceptible to erosion, have a somewhat poor internal drainage and a high water holding capacity. The Webster soils are silty clay loams located on upland flats. They are not susceptible to erosion, have poor internal drainage and a high water holding capacity (Reference 2).

The general geology in Polk County consists basically of the unconsolidated deposits of glacial origin (Pleistocene Drift) above the consolidated rock formations of the Pennsylvanian and Mississippian Age. The unconsolidated deposits may be as thick as 200 feet containing silt, clay, sands and gravels.

The uppermost bedrock units in the northwest third of the county are dolomites and limestone of the Mississippian Age. In the remainder of the county, the bedrock unit is chiefly shale of the Pennsylvanian age with thin layers of sandstone.

Over 90 per cent of Story County lies in the upper reaches of the Skunk River basin whose drainage eventually outlets to the Mississippi River.

Development in the county is sparse residential. Development in the flood plain consists of single-family residential.

2.3 Principal Flood Problems

The history of flooding of the streams in Story 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 occurred on the South Skunk River below Squaw Creek near Ames, in May 1944, March 1960, and June 1975. The discharges associated with these events are 10,000 cubic feet per second (cfs), 9,260 cfs and 14,700 cfs. The estimated recurrence intervals for these floods are seven years, six years, and 37 years, respectively. Flooding on Squaw Creek occurred in June 1975 with a peak discharge of 11,300 cfs. The recurrence interval of this event is estimated to be 400 years.

Although there are no USGS gaging stations near the study area, West Branch Indian Creek and Indian Creek have been known to be subject to flooding. The flood with a 100-year recurrence interval on West Branch Indian Creek is estimated to have a peak discharge of 4,570 cfs, and the 100-year recurrence interval flood on Indian Creek at the City of Maxwell is estimated to have a discharge of 13,700 cfs. No high water marks are known to exist on West Branch Indian Creek or on Indian Creek within the study area.

2.4 Flood Protection Measures

There are few flood control structures on the study area streams in Story County. There are no major reservoirs and only very few levees constructed along Indian Creek. These levees are overtopped by the 100-year flood. There is a levee located along the north side of Fourmile Creek just south of Slatter. This levee does not meet minimum FEMA requirements for flood protection and consequently the levee is shown as failing during the 100-year flood. On the Skunk River, a Greenbelt Conservation District has been initiated. The statement of intent in Article XX111-A reads as follows:

INTENT: The Greenbelt/Conservation District is intended and designed to provide special regulations for the use of lands which are designated for conservation and/or recreation purposes in the officially adopted Park and Open Space Plan for Story County as acknowledged by the Story County Conservation Board and Board of Supervisors. These regulations will permit reasonable economic use of property and at the same time protect the natural resources and recreational assets of the area. This district is designed primarily to promote water quality and conservation, to protect aquifers, alluvial soils and slopes, and to protect areas which possess outstanding scenic, vegetation, wildlife habitat, travel corridors, geological, historic or recreational values. Structures that are inconsistent with the permitted uses shall not be allowed in the Greenbelt/Conservation District.

The area affected by the Greenbelt Conservation District includes the flood plain of the Skunk River between the Cities of Ames and Story City, Iowa (Reference 3).

State regulation of the flood plains of Iowa rivers and streams is provided primarily by the Iowa Natural Resources Council. The Resources Council has the duty and authority to establish and enforce an appropriate comprehensive state-wide program for the control, utilization, and protection of the surface and groundwater resources of the state. Prior

approval of the Resources Council is required for any structure, dam, obstruction, deposit, or excavation, to be erected, made, used or maintained in or on the floodway or flood plains of any river or stream. Similarly, works of any nature for flood control may not be constructed or installed until the proposed works are approved by the Resources Council. The Resources Council is authorized to establish and enforce regulations for the orderly development and wise use of the flood plains of any river or stream within the state. The Resources Council is directed to determine the characteristics of floods which reasonably may be expected to occur and to establish encroachments limits, protection methods, and minimum protection levels appropriate to flooding characteristics of the stream and to reasonable use of the flood plains.

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 which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 per cent chance, respectively, of being equalled 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 one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one per cent chance of annual occurrence) in any 50-year period is about 40 per cent (four in ten), and for any 90-year period, the risk increases to about 60 per cent (six in ten). The analyses reported here 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 in detail affecting the community.

Discharges for Long Dick Creek, Bear Creek, Keigley Branch, Lateral A, Walnut Creek, Ballard Creek, West Branch Indian Creek, Indian Creek, Rock Creek, Rock Creek Tributary and Fourmile Creek, were calculated using the T-year magnitude regionalized method for Iowa. The T-year magnitude method consists basically of two regional methods, one model for the north-central part of Iowa called the Des Moines lobe, which is flat and poorly drained; and another model for the remainder of the state where the topography is characteristically well drained. The parameters used in the models are recurrence interval, drainage area, and channel slope (Reference 4).

Discharges for two locations on the Skunk River, and for Onion Creek, are the same as those used in Flood Insurance Studies for the Cities of Ames and Story City, Iowa (References 5 and 6) in order for this study to be consistent with previously completed work.

The discharges for a third location on the Skunk River, for Squaw Creek below Onion Creek, and for Worle Creek, are taken from the Flood Insurance Studies for Ames and Story City, Iowa, with an adjustment made for a change in drainage area done by using a drainage area versus discharge rates formula.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

3.2 Hydraulic Analyses

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

Cross sections for the backwater computations were obtained from aerial survey flown on April 22, 1979. The below water portions of the cross sections were obtained by field measurement. All bridges, dams and culverts were field measured to obtain the necessary dimensions and elevations.

Hydraulics for portions of the Skunk River, Squaw Creek, Worle Creek were taken directly from the City of Ames Flood Insurance Study (Reference 5).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

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. Values vary from 0.030 to 0.040 for the channel roughness and from 0.060 to 0.150 for flow in the overbanks.

Starting water-surface elevations for Worle Creek, Onion Creek, and Squaw Creek were taken from the City of Ames Flood Insurance Study at locations where detailed study for Story County started and detailed study for Ames terminated. Starting water-surface elevation for South Skunk River above Story City is from the Flood Insurance Study for Story City. Starting water-surface elevation for Skunk River above Ames is from the stage-discharge relationship at the USGS gage station (No. 05-4700.00). The starting water-surface elevation for the remainder of the detailed study areas in Story County were calculated using slope-area method. Starting water-surface elevations for Fourmile Creek were taken from the County of Polk Flood Insurance Study (Reference 7).

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA		PEAK DISCHARGES (CFS)			
	SQ MILES		10-YEAR	50-YEAR	100-YEAR	500-YEAR
SKUNK RIVER						
At gage station above City of Ames	315		5,930	8,150	8,990	10,700
Below confluence of Long Dick Creek	218		4,910	6,840	7,650	9,560
At Story City	185		4,410	6,145	6,880	8,590
LONG DICK CREEK						
Mouth at Skunk River	33.4		1,600	2,740	3,310	4,860
BEAR CREEK						
Mouth at Skunk River	31.8		1,990	3,470	4,200	6,200
Above Roland	20.0		1,400	2,550	3,100	4,000
KEIGLEY BRANCH						
Mouth at Skunk River	46.2		1,340	2,110	2,480	3,410
LATERAL A						
Mouth at Drainage Ditch 13	2.8		1,040	2,010	2,530	4,020
SQUAW CREEK						
Downstream of confluence of Union Creek	192		5,140	7,380	8,310	10,400
UNION CREEK						
Mouth at Squaw Creek	19.6		1,900	2,900	3,300	4,330
WORLE CREEK						
At City of Ames corporate limit	11.9		2,470	3,780	4,340	5,630

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA</u> <u>SQ MILES</u>	<u>PEAK DISCHARGES (CFS)</u>		
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>
WALNUT CREEK At downstream limit of detailed study	16.0	660	1,060	1,260
BALLARD CREEK At Interstate Highway 35	21.1	1,160	1,950	2,340
WEST BRANCH INDIAN CREEK At downstream limit of detailed study	43.0	2,120	3,750	4,570
INDIAN CREEK At county boundary	219	7,150	11,900	14,100
ROCK CREEK Mouth at Indian Creek	11.5	2,280	4,170	5,120
TRIBUTARY TO ROCK CREEK Mouth at Rock Creek	2.6	1,220	2,370	2,990
FOURMILE CREEK At county boundary	4.7	900	1,470	1,750
				2,480
				6,800
				3,380
				20,200
				7,800
				4,750

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 8).

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

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 overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using aerial photography at a scale of 1:4800 and a contour interval of 10 feet (Reference 9).

Approximate 100-year boundaries were taken directly from the Story County Flood Hazard Boundary Map (Reference 10). Flood boundaries for portions of the Skunk River and Squaw and Worle Creeks were taken from the City of Ames Flood Insurance Study (Reference 5).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. Portions of the Skunk River, Squaw , Worle, Indian and Rock Creeks floodways lie outside the unincorporated areas. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map, the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year 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 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
SKUNK RIVER									
A	1,165,510	1700	11,054	3.9	872.4	872.4	873.1	0.7	
B	1,167,030	1330	6585	4.1	873.2	873.2	874.0	0.8	
C	1,170,370	1450	7064	5.8	876.0	876.0	876.5	0.5	
D	1,174,838	1050	6768	5.3	880.4	880.4	880.9	0.5	
E	1,176,108	330	2917	7.6	881.4	881.4	881.9	0.5	
F	1,177,080	1150	8853	3.9	882.9	882.9	883.3	0.4	
G	1,178,202	1515	13,320	1.3	883.3	883.3	883.7	0.4	
H	1,179,710	1670	12,312	1.8	883.4	883.4	883.8	0.4	
I	1,187,740	320/120 ²	2210	4.2	889.7	889.7	889.8	0.1	
J	1,188,634	290/200 ²	2160	4.2	890.5	890.5	890.8	0.3	
K	1,189,350	330	2861	3.1	891.3	891.3	891.5	0.2	
L	1,189,992	485/210 ²	2484	3.6	891.8	891.8	892.0	0.2	
M	1,192,370	320 ³	2076	4.3	893.1	893.1	893.6	0.5	
N	1,193,405	306 ³	2654	3.4	894.1	894.1	894.5	0.4	
O	1,194,610	215 ³	2028	4.4	895.0	895.0	895.3	0.3	
P	1,195,592	198 ³	1648	5.5	896.2	896.2	896.5	0.3	
Q	1,196,700	254 ³	1628	5.5	898.2	898.2	898.3	0.1	
R	1,197,670	590/100 ²	2561	3.5	899.4	899.4	899.5	0.1	
S	1,198,715	735/200 ²	4206	2.1	900.2	900.2	900.4	0.2	
T	1,200,330	1050/360 ²	4835	1.9	900.7	900.7	900.9	0.2	
U	1,201,525	440/280 ²	3398	2.7	901.1	901.1	901.3	0.2	
V	1,202,640	232 ³	1715	5.2	902.0	902.0	902.1	0.1	
W	1,205,890	210	2053	4.4	904.5	904.5	905.5	1.0	
X	1,206,050	210	2070	4.3	904.6	904.6	905.6	1.0	
Y	1,206,770	195	1928	4.7	905.2	905.2	906.0	0.8	
Z	1,207,682	117	1704	5.3	906.0	906.0	906.9	0.9	

¹ FEET ABOVE MOUTH

² TOTAL WIDTH/WIDTH WITHIN UNINCORPORATED AREA

³ THIS WIDTH EXTENDS WITHIN CITY OF AMES

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

SKUNK RIVER

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
SKUNK RIVER									
AA	1,207,967	117	1694	5.5	906.2	906.2	907.1	0.9	
AB	1,210,207	303	2526	3.6	907.9	907.9	908.5	0.6	
AC	1,214,283	402	1930	4.7	911.9	911.9	912.2	0.3	
AD	1,216,703	289	2282	3.9	915.9	915.9	916.9	1.0	
AE	1,220,243	181	1525	5.9	918.3	918.3	919.1	0.8	
AF	1,220,963	467	3077	2.9	919.4	919.4	920.1	0.6	
AG	1,223,663	158	1432	6.3	921.5	921.5	921.9	0.4	
AH	1,223,953	193	1726	5.2	922.1	922.1	922.5	0.4	
AI	1,229,003	145	1376	6.5	925.4	925.4	925.5	0.1	
AJ	1,257,200	125	1600	4.8	958.3	958.3	959.2	0.9	
AK	1,257,270	125	1606	4.8	958.4	958.4	959.3	0.9	
AL	1,257,420	183	1754	4.4	958.6	958.6	959.5	0.9	
AM	1,258,130	252	2442	3.1	959.3	959.3	960.1	0.8	
AN	1,259,290	480	3425	2.0	959.8	959.8	960.6	0.8	
AO	1,269,520	266	1693	4.1	964.4	964.4	965.2	0.8	
AP	1,283,760	810	5676	1.2	975.2	975.2	976.1	0.9	
AQ	1,286,600	252	1787	3.9	976.4	976.4	977.3	0.9	
FOURMILE CREEK									
A	163,340	225	756	2.3	1005.4	1005.4	1006.2	0.8	
B	165,070	200	656	2.7	1007.9	1007.9	1008.1	0.2	
C	166,860	200	687	2.5	1008.8	1008.8	1009.5	0.7	
D	167,200	249	487	3.6	1009.7	1009.7	1010.2	0.5	

¹FEET ABOVE MOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

SKUNK RIVER - FOURMILE CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
INDIAN CREEK									
A	0	1143 ²	5710	2.5	855.0	855.0	856.0	1.0	
B	2000	1894	9471	1.5	856.8	856.8	857.8	1.0	
C	4400	1555	7132	2.0	858.2	858.2	859.1	0.9	
D	6960	2196	8827	1.6	860.0	860.0	860.9	0.9	
E	8160	1623	6944	2.0	861.0	861.0	861.9	0.9	
F	9160	1980	7840	1.8	861.9	861.9	862.8	0.9	
G	12,200	476	3156	4.3	865.1	865.1	866.0	0.9	
H	12,450	166	1670	8.2	865.4	865.4	866.4	1.0	
I	12,490	166	1713	8.0	865.8	865.8	866.6	0.8	
J	12,810	907	5944	2.3	867.3	867.3	867.8	0.5	
K	13,610	916	7968	1.7	868.6	868.6	869.1	0.5	
L	13,870	662/500 ³	5452	2.5	868.7	868.7	869.2	0.5	
M	14,010	301/70 ³	2634	5.2	868.7	868.7	869.2	0.5	
N	14,050	301/90 ³	2681	5.1	868.8	868.8	869.4	0.6	
O	14,450	548/310 ³	5222	2.6	869.8	869.8	870.4	0.6	
P	15,750	1739/770 ³	12,144	1.1	870.3	870.3	871.0	0.7	
Q	15,900	1741/810 ³	12,182	2.2	870.3	870.3	871.0	0.7	
R	15,950	1160/830 ²	6292	1.1	870.3	870.3	871.0	0.7	
S	16,075	1746/860 ³	12,415	1.1	870.4	870.4	871.1	0.7	
T	19,135	1409/390 ³	6163	2.2	871.1	871.1	871.8	0.7	
U	20,735	1307/790 ³	6623	2.1	872.8	872.8	873.2	0.4	
V	21,085	1326/770 ³	6928	2.0	873.0	873.0	873.4	0.4	
W	21,125	1326	8273	1.7	874.2	874.2	874.5	0.3	
X	21,365	1229	7770	1.8	874.3	874.3	874.6	0.3	
Y	25,105	1301	6651	2.1	876.0	876.0	876.8	0.8	
Z	27,605	652	5137	2.7	878.3	878.3	879.2	0.9	
AA	27,905	819	6434	2.1	878.6	878.6	879.6	1.0	
AB	27,945	819	6843	2.0	879.3	879.3	880.0	0.7	
AC	28,245	511	3329	4.1	879.4	879.4	880.1	0.7	

¹ FEET ABOVE COUNTY BOUNDARY

² THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY

³ TOTAL WIDTH/WIDTH WITHIN UNINCORPORATED AREA

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

INDIAN CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
WEST BRANCH INDIAN CREEK								
A	49,090	75	749	6.1	914.3	914.3	915.3	1.0
B	49,140	75	758	6.0	914.4	914.4	915.4	1.0
C	49,340	75	783	5.8	915.0	915.0	915.8	0.8
D	51,020	180	1331	3.4	916.8	916.8	917.7	0.9
E	53,060	232	1850	2.5	918.1	918.1	919.0	0.9
F	55,060	310	2289	2.0	918.7	918.7	919.6	0.9
G	56,740	82	874	5.2	919.2	919.2	920.1	0.9
H	65,520	304	1609	2.8	933.1	933.1	933.9	0.8
I	70,520	122	917	5.0	938.3	938.3	939.3	0.7
J	70,670	110	887	5.2	938.5	938.5	939.3	0.8
K	70,750	110	890	5.1	938.5	938.5	939.3	0.8
L	70,920	178	1240	3.7	939.1	939.1	939.7	0.6
M	74,640	178	1088	4.2	942.7	942.7	943.2	0.5
N	88,120	99/70 ²	435	10.5	956.8	956.8	957.6	0.8
O	88,960	462	3559	1.3	959.2	959.2	960.2	1.0
P	89,760	330	2509	1.8	959.3	959.3	960.3	1.0
Q	90,400	322	2391	1.9	959.5	959.5	960.5	1.0
R	91,600	120	1106	4.1	959.9	959.9	960.9	1.0
S	91,800	120	871	5.2	960.0	960.0	960.9	0.9
T	91,870	120	955	4.8	961.4	961.4	961.6	0.2
U	91,990	160	1317	3.5	961.5	961.5	962.1	0.6
V	93,040	76	704	6.5	962.2	962.2	962.8	0.6
W	93,150	36	451	10.1	962.2	962.2	962.8	0.6
X	93,350	36	447	10.2	963.1	963.1	963.8	0.7
Y	93,600	80	960	4.8	965.4	965.4	965.8	0.4
Z	94,800	210	2263	2.0	966.1	966.1	966.7	0.6

¹ FEET ABOVE MOUTH

² TOTAL WIDTH/WIDTH WITHIN UNINCORPORATED AREA

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

WEST BRANCH INDIAN CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
WEST BRANCH INDIAN CREEK									
AA	94,895	210	2269	2.0	966.1	966.1	966.8	0.7	
AB	94,945	221	2411	1.9	966.4	966.4	967.0	0.6	
AC	95,025	221	2415	1.9	966.4	966.4	967.0	0.6	
AD	96,225	196	2335	2.0	966.6	966.6	967.4	0.8	
WALNUT CREEK									
A	14,325	69	589	2.1	888.9	888.9	889.7	0.8	
B	14,805	22	246	5.1	889.0	889.0	889.9	0.9	
C	14,865	22	245	5.1	889.2	889.2	890.1	0.9	
D	15,265	284	1187	1.1	890.0	890.0	890.8	0.8	
E	16,065	42	329	3.8	890.3	890.3	891.0	0.7	
F	18,073	50	308	4.1	893.7	893.7	894.3	0.6	
G	21,393	47	273	4.6	901.5	901.5	902.1	0.6	
H	21,793	54	322	3.9	902.5	902.5	903.2	0.7	
I	21,853	54	323	3.9	902.7	902.7	903.3	0.6	
J	22,293	73	319	3.9	903.7	903.7	904.1	0.4	
K	24,893	97	376	3.4	910.5	910.5	911.3	0.8	
L	25,853	44	231	5.5	914.1	914.1	914.8	0.7	
M	26,563	30	238	5.3	916.8	916.8	917.3	0.5	
N	26,683	30	223	5.7	917.2	917.2	917.7	0.5	
O	26,803	30	243	5.2	917.6	917.6	918.1	0.5	
P	30,483	43	190	6.6	927.9	927.9	928.4	0.5	

¹ FEET ABOVE MOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

WEST BRANCH INDIAN CREEK - WALNUT CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
BALLARD CREEK								
A	13,020	55	390	6.0	878.1	878.1	879.1	1.0
B	13,440	51	267	8.7	879.8	879.8	880.5	0.7
C	13,590	51	281	8.3	880.2	880.2	880.7	0.5
D	14,550	48	247	9.5	882.5	882.5	882.5	0.0
E	16,350	82	375	5.3	892.2	892.2	892.7	0.5
F	16,750	61	281	7.0	893.4	893.4	894.0	0.6
G	16,820	62	283	7.0	893.4	893.4	894.0	0.6
H	17,170	44	201	9.8	896.1	896.1	896.2	0.1
I	19,620	68	397	5.0	906.2	906.2	907.0	0.8
J	19,920	66	299	6.6	906.8	906.8	907.8	1.0
K	19,970	67	303	6.5	906.9	906.9	907.8	0.9
L	20,295	57	280	7.0	909.0	909.0	909.3	0.3
M	22,935	128	530	3.7	920.2	920.2	920.8	0.6
N	25,335	52	292	6.7	929.2	929.2	929.7	0.5
O	25,485	78	282	5.3	929.9	929.9	930.4	0.5
P	25,535	101	414	4.8	932.0	932.0	932.0	0.0
Q	25,945	84	402	4.9	932.7	932.7	933.1	0.4
R	27,285	55	213	9.2	936.4	936.4	936.4	0.0
S	28,625	105	590	3.3	942.9	942.9	943.8	0.9
T	30,005	61	353	5.6	946.6	946.6	947.0	0.4
U	30,185	40	222	8.9	947.0	947.0	947.5	0.5
V	30,335	40	341	5.8	950.4	950.4	950.5	0.1
W	30,675	83	610	3.2	951.3	951.3	951.4	0.1
X	32,075	72	276	7.1	953.0	953.0	953.3	0.3
Y	33,475	42	245	8.0	963.8	963.8	963.8	0.0
Z	35,575	36	282	7.0	974.5	974.5	975.5	1.0
AA	37,675	71	406	4.9	983.1	983.1	983.8	0.7
AB	37,845	35	240	8.2	983.5	983.5	984.3	0.8
AC	37,920	35	247	8.0	983.7	983.7	984.5	0.8

¹ FEET ABOVE MOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

BALLARD CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
WORLE CREEK								
A	7710	65	399	7.4	908.9	908.9	908.9	0.0
B	11,670	80/75 ²	475	6.3	923.1	923.1	923.1	0.0
C	13,730	115	507	5.9	928.0	928.0	928.2	0.2
D	15,280	117	720	6.0	935.4	935.4	936.4	1.0
E	15,380	31	261	16.6	936.1	936.1	936.1	0.0
F	15,480	31	321	13.5	938.5	938.5	938.5	0.0
G	17,820	89	694	6.3	947.0	947.0	947.9	0.9
H	19,380	115	695	6.2	953.9	953.9	954.8	0.9
I	22,180	105	694	6.3	964.8	964.8	965.5	0.7
J	25,180	250	866	5.0	976.8	976.8	976.9	0.1
K	25,305	37	278	15.6	977.7	977.7	977.9	0.2
L	25,405	37	372	11.7	980.7	980.7	980.7	0.0
M	25,515	170	1648	2.6	983.4	983.4	983.4	0.0
N	26,115	145	1160	3.7	983.6	983.6	983.6	0.0
O	26,915	200	1116	3.9	984.3	984.3	984.4	0.1
P	27,955	123	662	6.6	985.8	985.8	986.3	0.5
Q	32,075	111	789	5.5	1002.6	1002.6	1003.4	0.8
R	34,715	145	855	5.1	1010.3	1010.3	1010.8	0.5
S	37,595	364	1605	2.7	1016.3	1016.3	1016.8	0.5
T	37,795	260	1181	3.7	1016.6	1016.6	1017.1	0.5

¹ FEET ABOVE MOUTH

² TOTAL WIDTH/WIDTH WITHIN UNINCORPORATED AREA

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

WORLE CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
ONION CREEK									
A	1480	359	978	3.4	908.5	908.5	908.9	0.4	
B	2380	210	832	4.0	910.6	910.6	910.8	0.2	
C	6560	230	906	3.7	927.3	927.3	927.6	0.3	
D	7500	204	833	4.0	929.0	929.0	929.7	0.7	
E	8260	220	878	3.8	930.4	930.4	931.4	1.0	
F	8800	120	671	5.0	932.0	932.0	932.4	0.4	
G	9030	85	827	4.0	935.5	935.5	935.5	0.0	
H	9980	119	785	4.2	935.9	935.9	936.5	0.6	
I	10,830	125	910	3.7	936.7	936.7	937.6	0.9	
J	11,920	95	482	6.9	939.0	939.0	939.3	0.3	
K	12,710	94	621	5.4	942.1	942.1	942.7	0.6	
L	13,580	120	679	4.9	944.6	944.6	944.9	0.3	
M	14,500	62	471	7.1	946.7	946.7	947.4	0.7	
N	15,410	105	724	4.6	949.4	949.4	950.1	0.7	
O	16,150	109	626	5.3	951.2	951.2	951.8	0.6	
P	17,850	90	483	6.9	956.1	956.1	956.7	0.6	
Q	19,100	98	549	6.1	961.2	961.2	961.6	0.4	
R	20,060	100	751	4.4	967.8	967.8	968.5	0.7	
S	21,360	97	939	3.5	969.3	969.3	970.2	0.9	

¹ FEET ABOVE MOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

ONION CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
SQUAW CREEK									
A	27,350	718 ²	6668	1.2	905.8	905.8	906.8	1.0	
B	30,000	815 ²	2912	2.9	906.5	906.5	907.5	1.0	
C	32,250	890	4620	1.8	908.4	908.4	909.1	0.7	
D	38,030	804	4840	1.7	911.9	911.9	912.8	0.9	
E	39,810	649	3656	2.3	913.1	913.1	914.0	0.9	
F	41,490	766	3469	2.4	914.5	914.5	915.2	0.7	
G	41,965	910	5076	1.6	914.8	914.8	915.5	0.7	
H	42,050	962	5589	1.5	915.5	915.5	915.9	0.4	
I	42,460	958	4879	1.7	915.6	915.6	916.0	0.4	
J	46,100	775	3462	2.4	917.0	917.0	917.3	0.3	
K	46,310	746	3503	2.4	917.1	917.1	917.4	0.3	
L	46,375	791	4225	2.0	918.0	918.0	918.2	0.2	
M	47,135	600	3226	2.6	918.2	918.2	918.4	0.2	
N	49,535	920	4542	1.8	918.9	918.9	919.3	0.4	

¹ FEET ABOVE MOUTH
² THIS WIDTH IS WITHIN CITY OF AMES

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
 (UNINCORPORATED AREAS)

FLOODWAY DATA

SQUAW CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
BEAR CREEK								
A	4000	250	1073	3.9	932.0	932.0	932.8	0.8
B	4500	190	774	5.4	933.0	933.0	933.8	0.8
C	4700	190	797	5.3	933.3	933.3	934.0	0.7
D	4950	222	939	4.5	934.8	934.8	934.9	0.1
E	6150	98	641	6.5	937.7	937.7	938.6	0.9
F	7350	96	653	6.4	943.2	943.2	943.9	0.7
G	8540	199	1230	3.4	946.0	946.0	946.9	0.9
H	10,110	84	546	7.7	949.3	949.3	950.1	0.8
I	12,730	194	1043	4.0	959.6	959.6	960.4	0.8
J	13,080	67	429	9.8	960.7	960.7	961.4	0.7
K	13,160	67	430	9.8	961.2	961.2	961.7	0.5
L	13,610	219	962	4.4	965.3	965.3	965.4	0.1
M	14,770	153	761	5.5	969.7	969.7	970.3	0.6
N	15,430	108	507	8.3	973.8	973.8	974.2	0.4
O	17,150	372	1824	2.3	978.1	978.1	978.6	0.5
P	18,950	126	671	6.3	980.5	980.5	981.0	0.5
Q	19,100	68	512	8.2	980.8	980.8	981.6	0.8
R	19,150	68	394	10.7	980.9	980.9	981.6	0.7
S	19,710	293	2337	1.8	983.9	983.9	984.3	0.4
T	21,430	149	948	4.4	984.4	984.4	985.0	0.6
U	22,430	100	597	7.0	986.7	986.7	987.6	0.9
V	24,830	169	1024	4.1	992.8	992.8	993.8	1.0
W	25,050	65	607	6.9	992.8	992.8	993.8	1.0
X	25,100	65	611	6.9	993.9	993.9	993.9	0.0
Y	25,280	169	1233	3.4	994.6	994.6	994.6	0.0
Z	28,680	266	1023	4.1	998.7	998.7	999.7	1.0

¹ FEET ABOVE MOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

BEAR CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
BEAR CREEK									
AA	30,760	143	814	5.2	1006.0	1006.0	1006.5	0.5	
AB	30,910	110	640	6.6	1006.6	1006.6	1007.0	0.4	
AC	31,510	84	643	6.5	1009.1	1009.1	1009.6	0.5	
AD	40,280	267	1054	2.9	1019.3	1019.3	1020.1	0.8	
AE	43,480	212	860	3.6	1026.5	1026.5	1027.4	0.9	
AF	43,720	47	341	9.1	1027.1	1027.1	1028.0	0.9	
AG	43,750	47	377	8.2	1027.9	1027.9	1028.8	0.9	
AH	43,990	245	1724	1.8	1029.8	1029.8	1030.3	0.5	
AI	46,150	212	864	3.6	1031.0	1031.0	1031.7	0.7	
AJ	47,650	253	1109	2.8	1034.0	1034.0	1034.8	0.8	
AK	47,890	367	966	3.2	1034.2	1034.2	1035.1	0.9	
AL	47,920	367	1326	2.3	1035.7	1035.7	1036.2	0.5	
AM	48,520	211	1030	3.0	1036.6	1036.6	1036.9	0.3	
LONG DICK CREEK									
A	200	167	753	4.4	960.0	955.6 ²	956.5	0.9	
B	3320	257	945	3.5	963.4	963.4	963.4	0.0	
C	3560	119	615	5.4	963.8	963.8	963.8	0.0	
D	3750	75	525	6.3	965.0	965.0	965.0	0.0	
E	3920	357	1975	1.7	967.0	967.0	967.0	0.0	
F	7110	111	528	6.3	968.6	968.6	969.2	0.6	
G	10,310	210	952	3.5	977.0	977.0	977.4	0.4	
H	16,320	277	1106	3.0	987.1	987.1	987.9	0.8	
I	18,020	116	675	4.9	991.2	991.2	992.0	0.8	
J	18,220	141	781	4.2	991.6	991.6	992.5	0.9	

¹ FEET ABOVE MOUTH

² ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM SKUNK RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

BEAR CREEK - LONG DICK CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
ROCK CREEK								
A	2500	369/340 ²	1488	3.4	867.5	867.5	868.0	0.5
B	2590	375/340 ²	1601	3.2	867.7	867.7	868.2	0.5
C	6160	300	1440	3.6	879.5	879.5	880.2	0.7
D	6350	346	1955	2.6	880.3	880.3	880.9	0.6
E	6490	289	2129	2.4	885.0	885.0	885.0	0.0
F	6610	310	2317	2.2	885.0	885.0	885.2	0.2
G	7770	379	1993	2.6	886.0	886.0	886.2	0.2
H	9010	178	1022	5.0	887.9	887.9	888.4	0.5
I	9160	195	1229	4.2	888.5	888.5	889.1	0.6
J	9240	195	664	7.7	888.7	888.7	889.2	0.5
K	9320	220	1603	3.2	889.9	889.9	890.5	0.6
L	11,920	160	761	6.7	894.6	894.6	895.1	0.5
M	13,020	126	939	5.5	898.9	898.9	899.2	0.3
N	15,100	109	695	7.4	904.6	904.6	905.3	0.7
O	15,330	109	795	6.4	905.5	905.5	906.2	0.7

¹ FEET ABOVE CONFLUENCE WITH INDIAN CREEK

² TOTAL WIDTH/WIDTH WITHIN UNINCORPORATED AREAS

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

ROCK CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
ROCK CREEK TRIBUTARY								
A	950	165	967	3.1	876.4	876.4	876.4	0.0
B	2610	80	422	7.1	879.1	879.1	879.7	0.6
C	4230	78	339	8.8	889.0	889.0	889.0	0.0
D	4830	15	201	14.8	897.0	897.0	897.7	0.7
KEIGLEY BRANCH								
A	155	338	1089	2.3	925.9	921.8 ²	922.2	0.4
B	1755	476	999	2.5	925.9	923.4 ²	923.6	0.2
C	2515	68	356	7.0	925.9	924.1 ²	924.4	0.3
D	2580	68	361	6.9	925.9	924.2 ²	924.5	0.3
E	2780	450	1158	2.1	925.9	925.5 ²	925.7	0.2
F	6780	422	1050	2.4	928.5	928.5	929.4	0.9
G	7440	242	717	3.5	929.3	929.3	930.3	1.0
H	11,840	165	588	4.2	937.7	937.7	938.0	0.3
I	12,800	137	461	5.4	939.4	939.4	940.1	0.7
J	13,050	296	936	2.6	940.3	940.3	941.0	0.7
K	13,100	266	874	2.8	940.6	940.6	941.2	0.6
L	13,300	153	614	4.0	940.9	940.9	941.3	0.4
LATERAL A								
A	4060	40	270	9.4	887.3	887.3	888.3	1.0
B	5010	56	441	5.7	901.1	901.1	901.1	0.0
C	5600	46	311	8.1	902.8	902.8	903.3	0.5
D	6440	107	567	4.5	910.3	910.3	910.8	0.5
E	7340	113	737	3.4	914.5	914.5	915.5	1.0
F	8540	43	301	8.4	919.8	919.8	920.7	0.9
G	9740	173	632	4.0	927.0	927.0	927.9	0.9

¹ FEET ABOVE MOUTH

² ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM SKUNK RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOODWAY DATA

ROCK CREEK TRIBUTARY - KEIGLEY BRANCH - LATERAL A

TABLE 2

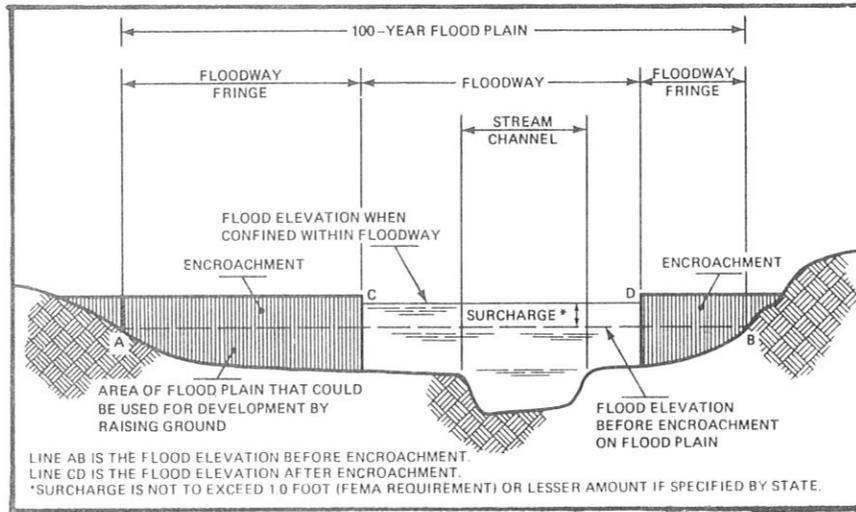


FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the County of Story.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 per cent of the reach.

<u>Average Difference Between 10- and 100-year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the County of Story are shown on the Flood Profiles and are summarized in Table 3, "Flood Insurance Zone Data."

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF's are used to set actuarial insurance premium rate tables based on FHF's from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHF's, the entire unincorporated areas of the County of Story were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHF's determined.
Zones A2-A6, A9:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHF's, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

FLOODING SOURCE	PANEL ¹	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION ³ (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
SKUNK RIVER							
REACH 1	0065,0070	-1.7	-0.4	1.0	015	A3	VARIABLES-SEE MAP
REACH 2	0055,0065	-1.7	-0.4	1.0	015	A3	VARIABLES-SEE MAP
REACH 3	0055,0060	-2.1	-0.5	0.9	020	A4	VARIABLES-SEE MAP
REACH 4	0005,0010,0015	-1.8	-0.5	1.0	020	A4	VARIABLES-SEE MAP
REACH 5	0020 0010	-1.5	-0.4	0.1	015	A3	VARIABLES-SEE MAP
FOURMILE CREEK							
REACH 1	0115	-0.8	-0.2	0.5	010	A2	VARIABLES-SEE MAP
INDIAN CREEK							
REACH 1	0130,0140	-2.1	-0.6	1.5	020	A4	VARIABLES-SEE MAP
WEST BRANCH INDIAN CREEK							
REACH 1	0090,0130	-3.1	-0.9	2.1	030	A6	VARIABLES-SEE MAP
REACH 2	0070,0090	-3.1	-0.9	2.1	030	A6	VARIABLES-SEE MAP
WALNUT CREEK							
REACH 1	0102,0106	-1.9	-0.5	1.0	020	A4	VARIABLES-SEE MAP

¹FLOOD INSURANCE RATE MAP PANEL

²WEIGHTED AVERAGE

³ROUNDED TO NEAREST FOOT

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

SKUNK RIVER - FOURMILE CREEK -

INDIAN CREEK - WEST BRANCH INDIAN CREEK - WALNUT CREEK

TABLE 3

FLOODING SOURCE	PANEL ¹	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION ³ (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
BALLARD CREEK REACH 1	0105,0110	-1.9	-0.5	1.3	020	A4	VARIABLES—SEE MAP
WORLE CREEK REACH 1 REACH 2 REACH 3	0065 0065 0065	-2.0 -2.0 -1.1	-0.6 -0.6 -0.3	1.0 1.0 0.6	020 020 010	A4 A4 A2	VARIABLES—SEE MAP VARIABLES—SEE MAP VARIABLES—SEE MAP
ONION CREEK REACH 1	0055	-1.7	-0.5	1.1	015	A3	VARIABLES—SEE MAP
SQUAW CREEK REACH 1 REACH 2	0055 0055	-2.0 -1.5	-0.6 -0.4	1.0 0.8	020 015	A4 A3	VARIABLES—SEE MAP VARIABLES—SEE MAP
BEAR CREEK REACH 1 REACH 2 REACH 3	0020 0010 0010	-2.1 -1.2 -2.1	-0.6 -0.3 -0.6	1.9 0.4 1.0	020 010 020	A4 A2 A4	VARIABLES—SEE MAP VARIABLES—SEE MAP VARIABLES—SEE MAP

¹FLOOD INSURANCE RATE MAP PANEL

²WEIGHTED AVERAGE

³ROUNDED TO NEAREST FOOT

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

BALLARD CREEK - WORLE CREEK -
ONION CREEK - SQUAW CREEK - BEAR CREEK

FLOODING SOURCE	PANEL ¹	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION ³ (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
LONG DICK CREEK							
REACH 1	0010,0020	-2.1	-0.5	1.4	020	A4	VARIES--SEE MAP
REACH 2	0010,0020	-1.6	-0.4	0.9	015	A3	VARIES--SEE MAP
ROCK CREEK							
REACH 1	0140	-2.2	-0.8	1.4	020	A4	VARIES--SEE MAP
REACH 2	0130,0140	-2.6	-0.8	1.5	025	A5	VARIES--SEE MAP
ROCK CREEK TRIBUTARY							
REACH 1	0140	-4.6	-1.4	1.5	045	A9	VARIES--SEE MAP
REACH 2	0140	-2.7	-0.7	2.0	025	A5	VARIES--SEE MAP
KEIGLEY BRANCH							
REACH 1	0020	-1.2	-0.3	0.6	010	A2	VARIES--SEE MAP
LATERAL A							
REACH 1	0070	-2.6	-0.8	1.4	025	A5	VARIES--SEE MAP

¹FLOOD INSURANCE RATE MAP PANEL

²WEIGHTED AVERAGE

³ROUNDED TO NEAREST FOOT

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF STORY, IA
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

ROCK CREEK TRIBUTARY - KEIGLEY BRANCH - LATERAL A
LONG DICK CREEK - ROCK CREEK -

TABLE 3

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the County of Story is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

Flood Insurance Studies have been completed for the City of Ames (Reference 5) and for the City of Story City (Reference 6). The Flood Insurance Studies for the County of Polk, and the City of Nevada are currently in progress (References 7 and 11). The flood discharges and water-surface elevations used in this study agree exactly with the City of Story City, City of Nevada and Polk County Flood Insurance Studies. Portions of the flood boundaries for the City of Ames Flood Insurance Study are not in agreement due to the more detailed topographic mapping used in this study.

Discrepancies exist in the computed flood discharges and flood profiles between this Flood Insurance Study and the Flood Plain Information Study for the Skunk River and Squaw Creek (Reference 12) on the Flood Hazard Boundary Map for Story County, due to the more detailed nature of this Flood Insurance Study.

A Flood Hazard Boundary Map has been published for the community (Reference 10). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

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

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 911 Walnut Street, Kansas City, Missouri 64106.

8.0 REFERENCES AND BIBLIOGRAPHY

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