2017 Updated Multi-Jurisdictional Hazard Mitigation Plan for Bremer County, Iowa

Adopted By:

Bremer County (1/30/2017)

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Prepared by:
Iowa Northland Regional Council of Governments (INRCOG)

INRCOG

ACKNOWLEDGEMENTS

HAZARD MITIGATION PLANNING COMMITTEE

Over the course of the planning process a number of individuals donated their time and efforts for the successful completion of this plan. This includes those who attended planning meetings as well as the city, county and educational staff and elected officials that spent time updating and reviewing the plan outside of meetings. The following is a list of people who participated in the hazard mitigation plan meetings:

Bremer County
Supervisor Dewey Hildebrandt
Supervisor Ken Kammeyer
Kip Ladage
Randy McKenzie
Susan Burton
Supervisor Tim Neil

City of Denver
Brock Farley
Joel Wikner
Larry Farley

City of Frederika
Cindy Asmus
Mayor Neil Whitney
Sylvan Mutschler

City of Janesville
Bryan Destival
Chris Robinson
Doug Bettis
Dustin Mooty
Randy Samec
Mayor Sandi Carroll
Sue Stapleton
Traci Beery

City of Plainfield
Andy Lunk
Blake Franzen
David Lehman
Mayor Tom Geise

City of Readlyn
Barry Fortsch
Dan Blaylock
James Bisbee
Louis Buhr
Sherry Sommerfeldt

City of Sumner
Allan Junkers
Billy Lehmkuhl
Cody Freese
Mayor Dave Waskow
David Lease
Maddi Frizdrich
Tim Duhrkopf

City of Tripoli
Mayor Brendt Bernard
DeAnn Lahmann
Jordan Ladage

City of Waverly
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Mike Cherry
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Brian Schoon
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SECTION 1 – INTRODUCTION

INTRODUCTION

Natural hazards have the potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. While an important aspect of emergency management deals with disaster recovery – those actions that a community must take to repair damages and make itself whole in the wake of a natural disaster – an equally important aspect of emergency management involves hazard mitigation. Hazard mitigation measures are efforts taken before a disaster happens to lessen the impact that future disasters of that type will have on people and property in the community. They are things you do today to be more protected in the future. Hazard mitigation actions taken in advance of a hazard event are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, hazard mitigation actions can be long-term, cost-effective means of reducing the risk of loss and help create a more disaster-resistant and sustainable community.

The 2017 Bremer County Multi-Jurisdictional Hazard Mitigation Plan (M-J HMP) was developed to assist in making the entire planning area (Bremer County unincorporated and incorporated areas) less susceptible to these hazards. The planning area includes the cities of Denver, Frederika, Janesville, Plainfield, Readlyn, Sumner, Tripoli, and Waverly as well as unincorporated Bremer County. Waverly-Shell Rock schools was engaged in the planning process but deferred their official district plan to the Butler County (home county of Shell Rock) 2015 MJ-HMP which the school district participated in and adopted.

What is a Hazard Mitigation Plan?

Generally the first question asked when communities begin the process of preparing a Hazard Mitigation Plan (HMP) is very simply "What is a Hazard Mitigation Plan and what is it intended purpose?" First, it is imperative to define what precisely the term mitigation entails. One definition of the term is stated most effectively by the Federal Emergency Management Agency (FEMA) and is as follows: *"Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. Mitigation, also known as prevention (when done before a disaster), encourages long-term reduction of hazard vulnerability. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability." (www.fema.gov).*

A hazard mitigation plan is developed by local government(s) before a disaster strikes. The plan identifies local community policies, actions, and tools for on-going, short-, mid-, and long-term implementation to reduce risk and potential future losses of property and lives.

Purposes of Hazard Mitigation Planning

The following list identifies reasons to conduct hazard mitigation planning:

- To facilitate the protection of the health, safety and economic security of residents, workers, visitors and property owners by mitigating the impacts of natural and manmade hazards.
- Influence decision making in both the public and private sectors.

Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning shall include: 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have authority to regulate development, as well as businesses, academia and other private non-profit interests to be involved in the planning process; and 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): [The plan shall document} the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

- Fulfill statutory requirements of the Disaster Mitigation Act of 2000 – as of November 1, 2004 a community must have a FEMA-approved hazard mitigation plan in order to be eligible for FEMA project grant monies under programs such as the Flood Mitigtion Assistance Grant program (FMA), Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Grant program (PDM), Severe Repetitive Loss Grant program (SRL), Repetitive Flood Claims Grant program (RFC), and certain categories of aid under the Public Assistance Grant program (PA).
- Fulfill contractual obligations under the Hazard Mitigation Grant Program (HMGP).
- Receive credit under the Community Rating System (CRS).

WHAT IS A MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN?

A multi-jurisdictional hazard mitigation plan is a plan jointly prepared by more than one local government or jurisdiction. Local jurisdictions have the option to participate in a multi-jurisdictional hazard mitigation plan under the Disaster Mitigation Action of 2000 (DMA 2000). A local government is defined by Title 44 Part 201 Mitigation Planning in the Code of Federal Regulations (CFR) as *"any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity."*

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process… Statewide plans will not be accepted as multi-jurisdictional plans.

Benefits of Multi-Jurisdictional Mitigation Planning

The following bulleted statements identify the many benefits for jurisdictions that participate in the multi-jurisdictional mitigation planning:

- Enables comprehensive approaches to mitigation of hazards that affect multiple jurisdictions
- Allows economies of scale by leveraging individual capabilities and sharing costs and resources
- Avoids duplication of efforts
- Imposes an external discipline on the process.

PLANNING PROCESS

With support of the Bremer County Board of Supervisors and participating City Councils, Bremer County applied for, and received, a FEMA HMGP Grant for the development of this updated Multi-Jurisdictional Hazard Mitigation Plan (M-J HMP).

The planning process for this HMP involved a variety of local decision makers and stakeholders within the planning area. The planning leaders were able to customize the process to meeting the needs of the municipalities. The process was developed around the requirements laid out in FEMA's *Local Mitigation Planning Handbook (*March 2013) and *Local Mitigation Plan Review* Guide (October 2011). Figure 1 illustrates the key steps in the hazard mitigation planning process and the specifics of each planning step are provided below.

Figure 1: Hazard Mitigation Planning Process

Step One: Organize Resources

The first step in developing the Multi-Jurisdictional HMP was to bring together a group of people with a variety of knowledge and backgrounds from all jurisdictions within the planning area, including the County itself, yet all having some connection to the goal of hazard mitigation.

Multi-Jurisdictional Planning Participation

Working in conjunction with the planning agency, Iowa Northland Regional Council of Governments (INRCOG), Bremer County and the other communities of developed a list of departments and positions they determined would best represent the knowledge base required to begin the planning process. The idea was

to first establish a base committee and then invite other organizations and/or individuals as necessary. Table 1.1 displays the name, jurisdiction, and position of the planning committee members.

TABLE 1.1: BREMER COUNTY MJ-HMP PLANNING COMMITTEE MEMBERS

Name	Jurisdiction	Position	Name	Jurisdiction	Position
Dewey Hildebrandt	Bremer County	Supervisor	Black Franzen	Plainfield	City Council
Ken Kammeyer	Bremer County	Supervisor	David Lehman	Plainfield	City Council
Kip Ladage	Bremer County	EMA Coordinator	Tom Geise	Plainfield	Mayor
Randy McKenzie	Bremer County	Building Official	Barry Fortsch	Readlyn	City Council
Susan Burton	Bremer County	EMA Intern	Dan Blaylock	Readlyn	
Tim Neil	Bremer County	Supervisor	James Bisbee	Readlyn	City Superintendent
Brock Farley	Denver	Student/citizen	Louis Buhr	Readlyn	City Clerk
Joel Wikner	Denver	City Council	Sherry Sommerfeldt	Readlyn	
Larry Farley	Denver	City Administrator	Allan Junkers	Sumner	Sumner Light & Power
Cindy Asmus	Frederika	City Clerk	Billy Lehmkuhl	Sumner	City Council
Neil Whitney	Frederika	Mayor	Cody Freese	Sumner	Police Department
Sylvan Mutschler	Frederika	Volunteer Fire Dept.	Dave Waskow	Sumner	Mayor
Bryan Destival	Janesville	Fire Chief	David Lease	Sumner	
Chris Robinson	Janesville		Maddi Frizdrich	Sumner	Police Department
Doug Bettis	Janesville		Tim Duhrkopf	Sumner	Fire Chief
Dustin Mooty	Janesville	Police	Brendt Bernard	Tripoli	Mayor
Randy Samec	Janesville	Police Chief	DeAnn Lahmann	Tripoli	City Clerk
Sandi Carroll	Janesville	Mayor	Jordan Ladage	Tripoli	City Council
Sue Stapleton	Janesville	City Council	Bill Werger	Waverly	Economic Development
Traci Beery	Janesville		Mike Cherry	Waverly	Director of Public Works
Andy Lunk	Plainfield		Tab Ray	Waverly	Director of Leisure Services

This initial group of people invited to the planning meetings encompassed individuals representing local government, law enforcement, fire and rescue, public utilities, local schools, local non-profits and service providers, and citizen volunteers. Others invited to the meetings were surrounding county emergency management administrators, state officials from Iowa Homeland Security and the Department of Transportation and an official from FEMA Region 7. Once established, this assembly was considered the Hazard Mitigation Planning Committee.

Additionally, Brian Schoon and Jacob Tjaden from INRCOG organized the meetings in conjunction with the County Emergency Management Coordinator and

County Auditor. All sequential meetings were determined at committee meetings. INRCOG was also responsible for compiling information and writing the final document.

Beyond this core group of individuals, public notices for all committee meetings were published in three newspapers, within the planning area, to inform neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties and residents of the planning process and to invite all interested parties to attend and contribute to the development of the plan. Prior to the adoption of the MJ HMP, each jurisdiction advertised and held public hearings. Public notices and public involvement materials can be found in Attachment 4.

Committee Meetings

Five public planning meetings were held at the Tripoli City Hall and Waverly City Hall on various dates, during the HMP planning process. Each meeting was open to all residents and stakeholders in the planning area, as well as neighboring communities. Attendance for each meeting was documented and can be found in Attachment 4. Table 1.2 provides a list of the public meetings. All meetings, except for the Frederika, Sumner, Board of Supervisors and City Council meetings, started at 7:00 pm.

TABLE 1.2: MEETINGS SUMMARY

Location	Group	Date	Topic
Tripoli City Hall	Participating jurisdictions from 2012 MJ-HMP	11/4/2015	Introductions, Purpose of HMP, Community Profile, Explain Hazard Analysis/Risk Assessment, Conduct Hazard Analysis/Risk Assessment
Waverly City Hall	Planning Committee	12/15/2015	Review Hazard Analysis/Risk Assessment, Establish Goals, Start Mitigation Action/Activity Development
Tripoli City Hall	Planning Committee	4/20/2016	Finish Mitigation Action/Activity Development
Tripoli City Hall	Planning Committee	5/9/2016	Review Mitigation Action/Activities, Prioritize Action / Activities
Tripoli City Hall	Planning Committee	11/22/2016	Finalize mitigation actions, Review HMP Draft Document
Bremer County Courthouse	Board of Supervisors	1/30/2017	Public Hearing for Adoption of M-J HMP
Various City Halls	City Councils	Various	Public Hearing and Adoption of MJ-HMP

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Multi-Jurisdictional Plan Adoption

Once the Committee's feedback was addressed, a final draft HMP was prepared and sent to the County Board of Supervisors along with a resolution for adoption. Upon County adoption, the final draft HMP was submitted to Iowa Homeland Security and FEMA for their review and feedback; at which time the draft was presented to local City Councils for their adoption as well. Resolutions can be found in Attachment 2.

Current & Previous Planning Documents Used

In addition to information obtained through the series of Committee Meetings, INRCOG also investigated other previously prepared documents in order to garner supplementary relevant information and contacted each jurisdiction for relevant information. Information and data about emergency services, mitigation activities and response procedures are described in various levels of detail within these documents. These documents and data include:

- Bremer County Comprehensive Countywide Emergency Management Plan
- Previous Hazard Mitigation Plans for Denver, Janesville, Plainfield, Readlyn, Sumner and Tripoli, and Waverly
- Comprehensive Plans for Bremer County, Denver, Janesville, Readlyn, Sumner and Tripoli, and Waverly
- Housing Needs Assessments for Denver, Frederika, Janesville, Plainfield, Readlyn, Sumner and Tripoli, Waverly
- 2013 Iowa Hazard Mitigation Plan and Comprehensive Emergency Plan
- Plans, studies, reports, maps and technical information that were not available five years ago, including updated Flood Insurance Rate Maps and data
- Documentation of communities current status in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)
- Repetitive Loss Properties and /or Severe Repetitive Loss Properties information
- Reports of disaster and other hazard events that occurred within the past 5 years
- Documentation of changes in the communities that impact vulnerability of structures and populations
- Documentation of mitigation projects and activities undertaken over the past 5 years

Step Two: Identify & Assess Hazards

Identify and Profile Hazards

Through the planning process the hazards that pose a risk to the entire planning area, as well as unique hazards for each jurisdiction, were reviewed and updated. The identified hazards in this plan update have changed slightly from the 2010 plan. The committee elected to use the same set of hazards as identified in the State of Iowa's 2013 Hazard Mitigation Plan. Second, an updated assessment of the hazards was conducted that took into account historic occurrence, the number of people that would be or were impacted, the area of the planning area that was or would be affected, potential costs that the planning area, individuals, and organization have or may incur, the likelihood of future occurrence, and the amount of warning time before and event occurs. An updated composite score for each hazard was developed based on these factors. This process used information from previous and current hazard mitigation plans within the planning area, as well as the State of Iowa's hazard mitigation plan.

Vulnerability Assessment

An updated vulnerability assessment was conducted to identify: repetitive loss structures, properties and population located in the identified hazard areas; inventory of existing and proposed buildings, infrastructure, and critical facilities located within identified hazard area boundaries; estimating potential losses; and analysis of development trends.

Step Three: Establish Mitigation Goals & Actions (Action Plan)

Once Step Two was completed, a capability assessment was conducted on the planning area's existing policies, practices, programs, regulations, and activities that either increase or decrease the planning area vulnerability to the identified hazards. Through this assessment, areas that can be improved upon were identified and developed into "action steps". Early in the planning process meeting attendees identify broad goals that briefly stated what the plan should attempt to accomplish. Every action step should, if implemented, work toward one or more of the goals of the plan. An action step may suggest continuing a current mitigation effort or propose a new project altogether.

Many of the identified action steps were projects that the local jurisdictions could independently accomplish. Other identified projects included efforts that either require the cooperation of two or more jurisdictions, or would not include the local jurisdiction at all. The intention is that each action step is considered at least on an annual basis. Early in the planning process meeting attendees reconfirmed the 2012 plan goals In order to increase the likelihood that the entire planning area implements the plan, each action step identifies the parties that would most likely be responsible for completing an annual review of that step.

Step Four: Implement the Plan and Monitor its Progress

Finally, once the hazards have been assessed, mitigation steps identified, and the action steps have been prioritized the plan makes some suggestions for implementation and makes estimates as to the costs of implementation. Some proposed projects are small in scope and thus relatively low cost. However, other projects are broad in nature and would require more funding than the one jurisdiction can reasonably provide. Therefore, the final piece of the plan suggests methods to implement the plan, how to keep the public involved, and what steps should be taken by the planning area to ensure that the concept of hazard mitigation is always a priority.

When implemented appropriately, mitigation projects can save lives, reduce property damage, is cost-effective, and environmentally sound. This, in turn, can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities, reduce exposure to liability, and minimize community disruption.

SECTION 2 – COMPOSITE COMMUNITY PROFILE

PHYSICAL ATTRIBUTES

Location of Bremer County

Bremer County is located in the Northeastern quadrant of the State of Iowa. The county includes a number of incorporated cities including, in alphabetical order: Denver, Frederika, Janesville, Plainfield, Readlyn, Sumner, Tripoli and Waverly. Since Waverly adopted their own Hazard Mitigation Plan in 2009, they are not included in this plan, but may be included in a future Multi-Jurisdictional Plan update. There is one significant unincorporated area in Bremer County, south of Waverly called Waverly Junction. Bremer County is divided into fourteen townships including, in alphabetical order: Dayton, Douglas, Franklin, Frederika, Fremont, Jackson, Jefferson, Lafayette, Le Roy, Maxfield, Polk, Sumner, Warren and Washington. The County itself encompasses a total area of approximately 440 square miles (438 sq mi land, 2 sq mi water). The population is the twenty-sixth largest in the state with 24,276 residents (2010 Census). Waverly is the county seat. It is near the southwest corner of the county, along US Highway 218 and bisected by State Highway 3. Please refer to *Attachment #1: Location Map of the County*, which includes the locations of the aforementioned communities.

History[1]

The first white man came to Bremer County in 1845 and settled about two miles southwest of Denver. At that time, this area was a Native American Reservation belonging to the Winnebago Tribe, numbering about 300 people. Later the reservation was purchased by the government, and the Native Americans were moved to the Crow River area of Minnesota, about 150 miles north of St. Paul.

Bremer County had been named in 1850 by Governor Stephen Hempstead, who was an admirer of the Swedish poet, Frederika Bremer. Bremer County is thought to be the only Iowa county named after a person eminent in literature.

Townships were named for famous people also: Washington, Jefferson, Jackson and Polk, four U.S. Presidents. Fremont and Douglas were named after candidates for U.S. President. Dayton was named for a Vice-Presidential candidate in 1856. Lafayette and Warren were named after two famous soldiers of the American Revolution. Frederika was named after Frederika Bremer, Maxfield after Judge Maxfield, and Sumner for Charles Sumner who was a U.S. Senator from Massachusetts from 1851 to 1874.

Waverly was first settled in 1850, and it soon grew to importance due to its waterpower that was used by the flour and saw mills. On January 24, 1853, Waverly was designated the county seat, and unlike numerous counties, the county seat has remained unchanged. Waverly was selected because of its growth, commercial position, and railroad facilities.

[1] *Bremer County Atlas, 1965 and Kathy Thoms, Bremer County Director of Finance & Management , 2002.*

Bremer County was permanently organized in August 1853, with the election of county officers. The first courthouse was erected one year later by Richard Miles at a cost of $147.50. The small frame building was used for only three years, and then it was replaced by a brick and stone two-story structure that cost $23,000 to complete. None of the materials used in its construction-brick, stone, and lumber were from outside of the county. This 43' x 63' building was dedicated on January 1, 1858 at a grand ball and reception that was held in the new building.

This second courthouse did not contain a vault for the safekeeping of county records, so in the summer of 1870, a small brick building was constructed adjacent to the courthouse. The $5,000 building was used to store all of the county records.

These two buildings were torn down in 1937 in order to make room for the third and present courthouse. The county used a Works Progress Administration (WPA) grant of more than $60,000 to construct a $139,000 courthouse. Several bands were on hand to celebrate the dedication and open house of the new courthouse on June 10, 1937.

On July 2, 1975 a joint law enforcement building was erected to be shared by the Waverly Police Department and The Bremer County Sheriff Department. At this time the Sheriff's housing quarters, office, and jail were removed from the courthouse building. In 2003, Bremer County celebrated its 150th year from the election of county officers.

Government Structure

Bremer County is governed by a 3-member Board of Supervisors. Figure 2 is a map of the Supervisor jurisdictions.

District 1 (purple) includes the City of Waverly and sections of Washington Township east of the city. District 1 is currently represented by Ken Kammeyer.

District 2 (blue) includes the townships of: Polk, Douglas, Fremont, Warrant, Lafayette, and Jackson. The district also includes a small section of the City of Waverly as well as the cities of Plainfield, Tripoli, and Janesville. District 2 is currently represented by Tim Neil.

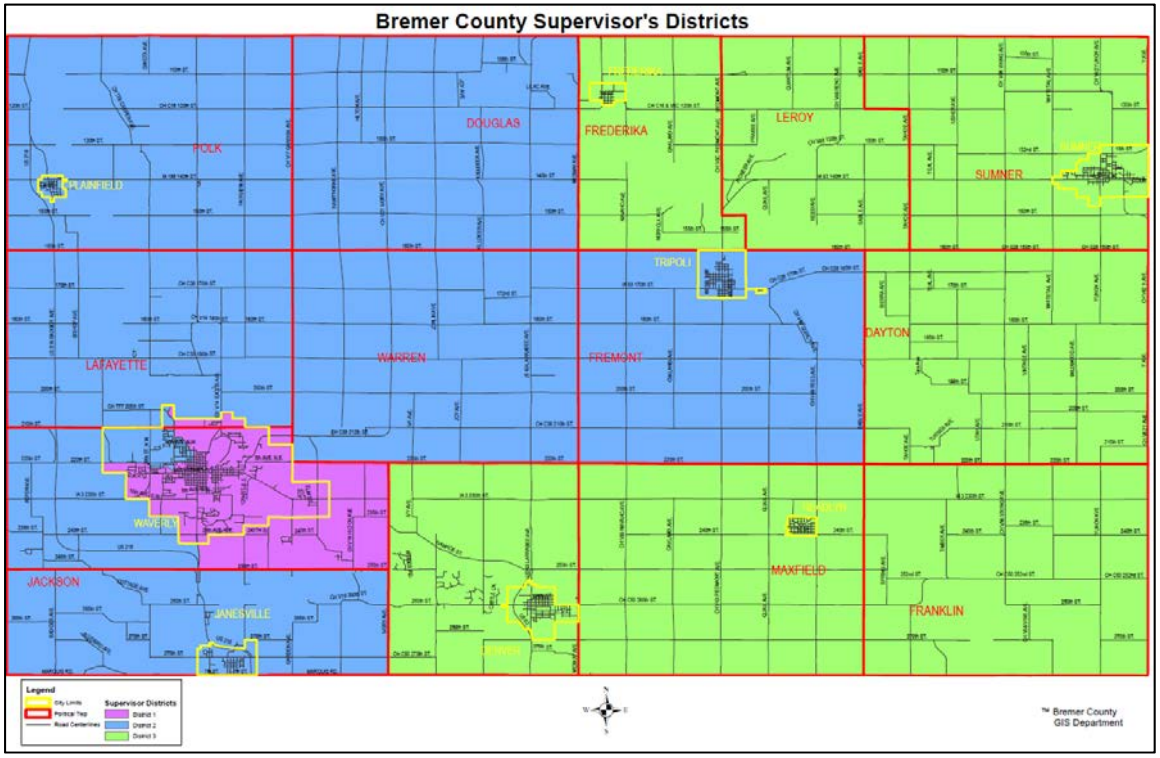

Figure 2.1: Bremer County Board of Supervisors District Map

District 3 (green) includes the townships of Frederika, LeRoy, Sumner, Dayton, Jefferson, Maxfield, and Franklin as well as the cities of Frederika, Sumner, Denver, and Readlyn. District 3 is currently represented by Duane Hildebrandt.

The eight incorporated cities in the county are represented by Mayor-City Council forms of government.

NATURAL ENVIRONMENT

The planning area's terrain is generally a flat to rolling slope topography that characterizes the agricultural areas of northeast Iowa. There are several areas of steeper than normal slope with these being dispersed throughout the county adjacent to watercourses. The highest elevation in the county, is 1,169 feet above mean sea level, is north of Sumner, located in the extreme northeast corner of the county. The lowest elevation is 865 feet above mean sea level, is found in the southwestern corner of the county, a few miles west of Janesville. The most visible geographic features within the county are the Cedar and Wapsipinicon Rivers. The Cedar River flows through Waverly and Janesville. The Wapsipinicon flows through Frederika and mainly unincorporated areas. See *Attachment 3: Topographic Map of the County*.

Soils

Ninety-two (92) percent of the planning area has soils with slopes of 5 percent or less. The planning area is abundantly supplied with a variety of soils other than productive agricultural soils. There are seven soil classifications for the planning area[2]:

- **Floyd-Clyde-Kenyon** – Level to moderately sloping, dark-colored loamy soils that are moderately well drained, poorly drained, and somewhat poorly drained.
- **Tripoli-Readlyn** – Nearly level, dark-colored loamy soils that are somewhat poorly drained and poorly drained.
- **Klinger-Maxfield** – Level to moderately sloping, dark-colored silty soils that are somewhat poorly drained, poorly drained, and well drained.
- **Spillville-Waukee-Coland** – Level to gently sloping, dark-colored loamy soils that are well drained to poorly drained.
- **Marshan-Sigglekov-Hayfield** – Nearly level to steep, well drained and poorly drained soils that formed in loess; on uplands.
- **Sparta-Rockton-Kenyon** – Nearly level to steep, dark-colored and light colored loamy soils that are well drained and are moderately deep to shallow over limestone.
- **Seaton-Port Byron** – Level to moderately sloping, dark-colored silty soils that are somewhat poorly drained, poorly drained, and well drained.

[2] United States Department of Agriculture, Soil Conservation Service; Soil Survey of Bremer County Iowa.

Climate

The climate is identified as having cold, snowy winters with hot, humid summers. The climate is located in the polar front zone, the battleground of polar and tropical air masses. Being far removed from moderating influences of a large body of water, seasonal contrasts are quite distinctive and weather highly variable. Ample precipitation throughout the year is increased in the summer by invading maritime tropical air masses from the Gulf of Mexico. Cold winters are dominated by continental polar masses from the arctic regions.

The annual precipitation totals approximately 36 inches. Approximately 71 percent of a year's precipitation falls during the months of April to September. Precipitation can be expected to exceed one-half inch or more 20 days per year, or one-tenth inch or more 56 days a year. Precipitation can occur in amounts of multiple inches within one hour or less during intense rainstorms. These storms, usually associated with extreme humidity, are capable of causing extensive damage to infrastructure. Often times it is the intensity of these rainstorms that are as telling as the frequency or duration. An extremely intense rainfall can overload detention basins and small streams due to the extreme speed of onset of surface flow, thus causing flash flooding and potentially sewer backups into homes and businesses.

The annual temperature range is large, typical of a continental climate, with January, the coldest month, averaging 13.8 degrees Fahrenheit. July is the warmest month averaging 72.1 degrees Fahrenheit.

TABLE 2.1 : AVERAGE MONTHLY PRECIPITATION

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Inches	1.00	0.93	2.15	3.71	4.40	4.95	4.51	5.17	3.18	2.61	2.41	1.25	36.27

Source: www.idcide.com (Tripoli Weather Station)

TABLE 2.2 : AVERAGE MONTHLY TEMPERATURE RANGES

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max °F	23.1	29.5	42.4	57.4	70.1	79.7	82.9	80.9	73.2	60.9	42.4	28.2	55.9
Mean °F	13.8	20.4	33.0	46.5	58.7	68.6	72.1	69.9	61.3	49.4	33.5	19.8	45.6
Min °F	4.4	11.2	23.6	35.6	47.3	57.4	61.2	58.8	49.3	37.8	24.6	11.3	35.2

Source: www.idcide.com (Tripoli Weather Station)

Vegetation

The vast majority of rural Bremer County is planted or sowed for corn and soybeans. Grass and brush are present in uncultivated and undeveloped areas of the county. Trees and grasses are often incorporated with otherwise urbanized areas in the county for aesthetics, shade, or erosion control.
There are problems associated with cultivation methods used in the rural areas of the county. The high percentage of cultivated land and the relatively low percentage of conservation methods used in farming cause excessive runoff to occur during rain events. This can lead to problems that are discussed later in this plan, specifically erosion and silting in and around bridges and drainage ditches.

Surface Water Systems

There are three watersheds that fall within the planning area borders. These watersheds, as defined by the United States Geological Survey, include the following:

- **Shell Rock River** – The Shell Rock watershed is present in the extreme western portion of Bremer County. The watershed is approximately 102 miles long and encompasses two states, Iowa and Minnesota. The Shell Rock River eventually flows into the Cedar River.
- **Upper Cedar River** – The Upper Cedar watershed flows from north to south through Bremer County. The Cedar River flows through Waverly and eventually down through Cedar Falls/Waterloo in neighboring Black Hawk County.
- **Upper Wapsipinicon River** – The Wapsipinicon River flows north-south through Bremer County and this watershed covers approximately 50 percent of the county.

INFRASTRUCTURE

Transportation Systems

Bremer County has within its boundaries a variety of transportation systems. These systems include highways, gravel roads, blacktop roads, railway systems & transit. Access to bike and pedestrian trails for transportation is becoming more prevalent in the planning area. Additional, efforts are being made to plan and extend recreational trails throughout the area.

Two U.S. Highways run through Bremer County: 63 and 218. Construction on U.S. Highway 63 was recently completed making the route's entire length through Bremer County a four-lane divided highway. U.S. Highway 218 was widened and realigned in the 1990s to bypass Plainfield, Waverly and Janesville. State Highways present in Bremer County include: Iowa 3, 93, and 188. In addition to the State Highway systems, the County maintains a total of 130 miles of paved roads, 590 miles of granular surfaced roads, and 225 bridges greater than 20 feet long.

Air travel is an important form of transportation and one airport is available in the county, which is the Waverly Municipal Airport. The airport is publicly-owned but does not provide commercial service.

There are 27 miles of railway lines throughout the county, which includes routes owned by Canadian National and the Iowa Northern Railroad. The Canadian National route runs north-south through Plainfield, Waverly and Janesville while the Iowa Northern Railroad route runs northwest-southeast through unincorporated Waverly Junction.

The Iowa Northland Regional Transit Commission (RTC) offers limited transit service to residents of Bremer County. Currently, demand response service, which requires 24-hour notice, is offered in Waverly. The remainder of the County is served by RTC on a case-by-case basis depending on space and service timing considerations.

Potable Water Systems

Water service in the planning area is typically provided by private, individual or common wells. The wells tap rechargeable groundwater aquifers for water. In terms of need, the county does not foresee the need for a common or public water system. However, the county does want to protect the groundwater from depletion or contamination in order to maintain its supply of potable water.

Although not thoroughly developed, large rural water mains and storage facilities have the potential to supply water for purposes of fire fighting. It is estimated that the water line would need to be at least six inches in order to supply effective pressure for actual fire fighting. Smaller lines could serve as potential fill locations for tanker trucks. Further information for each community system can be in the Appendices.

Wastewater Treatment Facility and Collection System

All of the incorporated cities within county have wastewater treatment facilities. These include the cities of Denver, Frederika, Janesville, Plainfield, Readlyn, Sumner, Tripoli, and Waverly.

In the rural part of the County, the primary means of disposing of sewage in the county is by individual, on-site septic systems. These on-site systems include tanks and septic fields for disposal of household sewage. As with water service, the county does not envision the need for a common public sewage system. The County, however, does regulate on-site systems through ordinances, inspections and its Board of Health. Further information for each system can be in the Appendices.

See Attachment 1 for a location map of sanitary sewer treatment facilities within Bremer County.

Storm Water Systems

There are no established storm water systems in the planning area. Each city is in charge of its own program for managing storm water and pollution. Rural and unincorporated areas of the county often rely on open ditches to handle storm water.

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Other Utilities

The planning area is serviced by numerous utilities. Table 2.3 on the next page lists the utility providers for each jurisdiction. Figure 2.2 is an electrical service map of Bremer County.

TABLE 2.3: PRIMARY PROVIDERS FOR COMMUNITY UTILITIES WITHIN BREMER COUNTY

Community	Electric	Natural Gas	Telephone/ Internet	Cable TV	Water	Sewer	Sanitation
Bremer County (unincorporated)	MidAmerican Energy, Alliant Energy, REC	MidAmerican Energy; Black Hills Energy;	Butler-Bremer Communications	Butler-Bremer Communications	Iowa Rural Water Association; Private Wells	Private Systems	Private Systems
City of Denver	City of Denver	MidAmerican Energy	Qwest	Mediacom	City of Denver	City of Denver	City of Denver
City of Frederika	Alliant Energy		Butler-Bremer Communications	Butler-Bremer Communications	NA (Individual Wells)	City of Frederika	City of Frederika
City of Janesville	MidAmerican Energy		Windstream	Windstream	City of Janesville	City of Janesville	City of Janesville
City of Plainfield	MidAmerican Energy	MidAmerican Energy	Butler-Bremer Communications	Butler-Bremer Communications	City of Plainfield	City of Plainfield	Jendro Sanitation
City of Readlyn	City of Readlyn	Black Hills Energy	Readlyn Telephone Co.	Readlyn Telephone Co.	City of Readlyn	City of Readlyn	Tripoli-Readlyn Sanitation
City of Sumner	Sumner Municipal Light & Power	Black Hills Energy	Windstream/ Mediacom	Mediacom	City of Sumner	City of Sumner	City of Sumner
City of Tripoli	Alliant Energy	Black Hills Energy	Butler-Bremer Communications	Butler-Bremer Communications	City of Tripoli	City of Tripoli	Tripoli-Readlyn Sanitation
City of Waverly	Waverly Utilities	MidAmerican Energy	Waverly Utilities; Mediacom; Century Link	Waverly Utilities; Mediacom	City of Waverly	City of Waverly	City of Waverly

Source: Communities

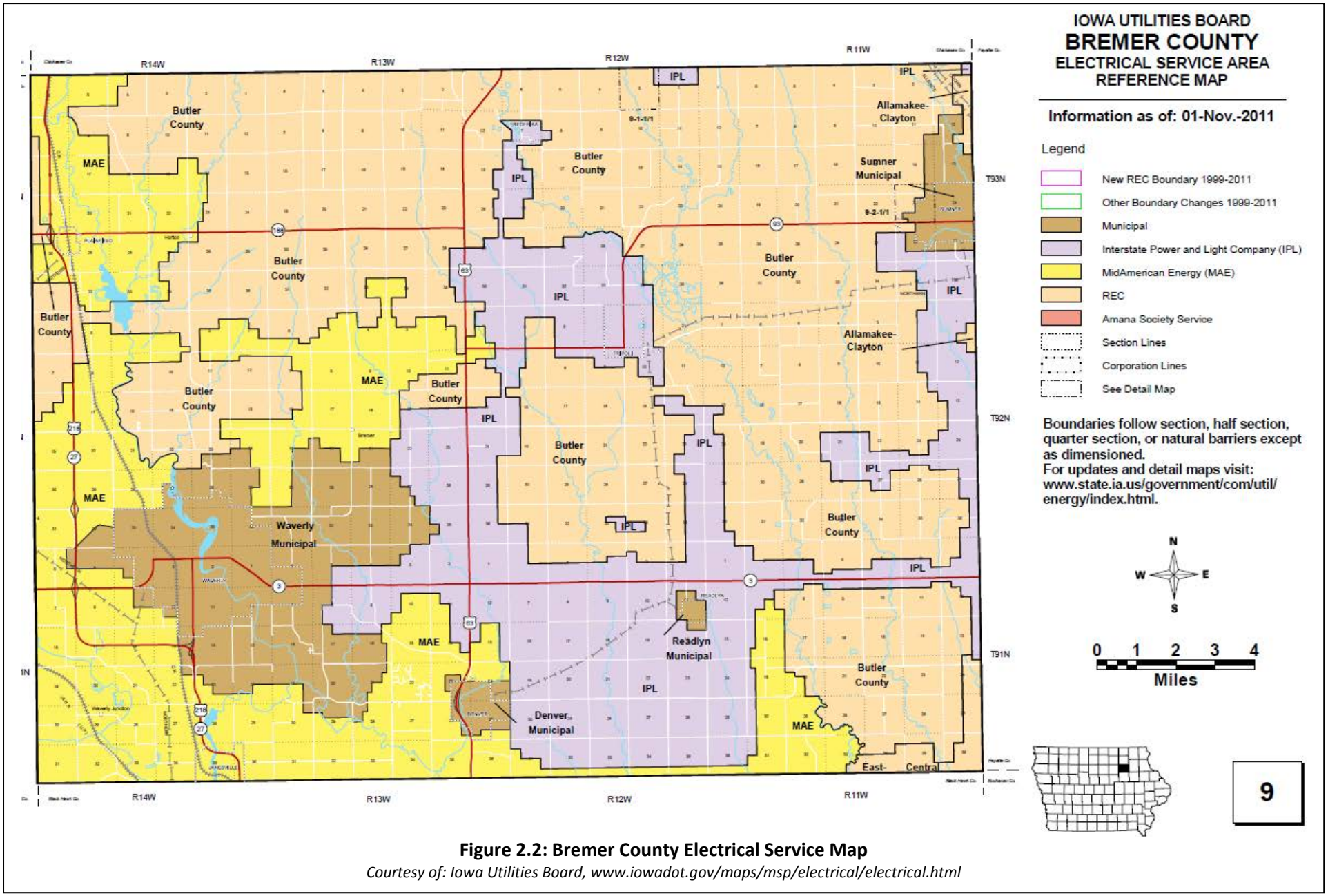


Figure 2.2: Bremer County Electrical Service Map

Courtesy of: Iowa Utilities Board, www.iowadot.gov/maps/msp/electrical/electrical.html

Communication

Websites

Bremer County, the participating school districts, and several of the cities have websites to provide the public with information. Many of the jurisdictions also have social media accounts.

- Bremer County: http://www.co.bremer.ia.us
- Denver: http://www.cityofdenveriowa.com
- Frederika: N/A
- Janesville: http://www.janesvilleia.com/
- Plainfield: http://sites.butler-bremer.com/web/plainfieldia/
- Readlyn: http://www.readlyn.com
- Sumner http://www.mysumneriowa.com
- Tripoli http://www.tripoliiowa.com
- Waverly: http://www.waverlyia.com

Newspapers

There are four newspapers published in Bremer County which residents follow for local news and announcements. These newspapers are:

- Denver Forum
- Sumner Gazette
- Tripoli Leader
- Waverly Democrat

Other regional newspapers, published outside of the planning area, include:

- Waterloo-Cedar Falls Courier
- The Charles City Press

DEMOGRAPHICS

Population

Table 2.4 illustrates the population trends for Bremer County, its incorporated communities, and the State of Iowa for the past 30 years. As is evident in the table, the planning area has seen an overall decrease in population since 1980, but the County and many communities have recovered some population since 1990 after the population losses suffered during the 1980s farm crisis.

TABLE 2.4: POPULATION TRENDS FOR SELECTED COMMUNITIES IN BREMER COUNTY, IOWA

Community	1980 Population	1990 Population	2000 Population	2010 Population	% Change 1980-2010
City of Denver, IA	1,647	1,600	1,627	1,780	8.1
City of Frederika, IA	223	188	199	183	-17.9
City of Janesville, IA	840	822	829	930	10.7
City of Plainfield, IA	469	455	438	436	-7.0
City of Readlyn, IA	858	773	786	808	-5.8
City of Sumner, IA	2,335	2,078	2,106	2,028	-13.1
City of Tripoli, IA	1,280	1,188	1,310	1,313	2.6
City of Waverly, IA	8,444	8,539	8,968	9,874	16.9
Bremer County (Unincorporated Area)	8,724	7,170	7,062	6,924	-20.6
Bremer County (total)	24,820	22,813	23,325	24,276	-2.2
State of Iowa	2,913,808	2,776,755	2,926,324	3,046,355	4.5

Source: U.S. Census Bureau and Iowa Data Center

Population Projections

Projections are only estimates of future population, and many factors have an effect on the future population, such as employment, housing, and educational opportunities. While some projections use some of this data in order to estimate future population, they cannot plan for unknown events, such as drastic changes in employment opportunities or the perilous effects of natural disasters.

The following projections are based on the linear and geometric methods, which assume that future population will continue to change based on past trends. The linear method adds or subtracts from the population the average number from each ten-year period since 1950, while the geometric method uses an average growth or decline rate. Table 2.5 shows the actual number change and the growth or decline rate for each decade and their averages.

Using the numbers derived in Table 2.5, population projections can be estimated using the two methods (Linear and Geometric). These projections are listed in Table 2.6 on the next page. It is important to note that these projections are just estimates based on past trends.

Many variables can affect a county's growth and/or decline in population. Nevertheless, projecting population can give some idea as to how to plan for the future.

TABLE 2.5: HISTORIC POPULATION CHANGES FOR BREMER COUNTY, IA

Year	Population	Number Change (Linear Method)	Growth/Decline Rate (Geometric Method)
1950	18,884	--	0.0
1960	21,108	2,224	11.8
1970	22,737	1,629	7.7
1980	24,820	2,083	9.2
1990	22,813	-2,007	-8.1
2000	23,325	512	2.2
2010	24,276	951	4.1
Average (1950-2010)		4,441 / 6.0 = 740.2	26.9/6.0 = 4.5%

Source: U.S. Census Bureau and Iowa Data Center

Housing and Development Trends

According to 2010 Census data, there are 9,915 total housing units in the County (Table 2.7). More recent data indicate a total of 9,939 housing units (Table 2.7). Of these housing units, 7,604 are owner-occupied, 1,706 are renter-occupied, and 629 are vacant. Mobile homes make up 2.9 percent of the county's housing units. This is slightly less than the State's figure of 4.1 percent. Besides the unincorporated area, the communities of Janesville, Sumner, Tripoli, and Waverly have a large number of mobile homes within their jurisdiction (Table 2.8). Bremer County's total household population is 22,558, with an additional 1,718 in group quarters. Average household size for Bremer County is 2.40 persons.

TABLE 2.6: POPULATION PROJECTIONS FOR BREMER COUNTY, IA

Year	Bremer County	State of Iowa
2020	24,633	3,172,237
2030	25,534	3,328,308
2040	26,462	3,487,942

Source: U.S. Census Bureau, Iowa Data Center, and Woods & Poole Economics

TABLE 2.8: TOTAL MOBILE HOMES IN SELECTED COMMUNITIES IN BREMER COUNTY, IA

Community	2010
City of Denver, IA	0
City of Frederika, IA	0
City of Janesville, IA	45
City of Plainfield, IA	3
City of Readlyn, IA	0
City of Sumner, IA	13
City of Tripoli, IA	17
City of Waverly, IA	139
Unincorporated Area	67
Bremer County (total)	284

TABLE 2.7: TOTAL HOUSING UNITS IN SELECTED COMMUNITIES IN BREMER COUNTY, IA

Community	1980	1990	2000	2010
City of Denver, IA	590	622	672	731
City of Frederika, IA	110	113	122	118
City of Janesville, IA	307	343	359	409
City of Plainfield, IA	203	193	202	197
City of Readlyn, IA	309	317	326	346
City of Sumner, IA	945	900	930	944
City of Tripoli, IA	536	546	561	568
City of Waverly, IA	2,985	3,160	3,383	3,732
Unincorporated Area	2,826	2,653	2,771	2,870
Bremer County (Total)	8,811	8,847	9,337	9,915
State of Iowa	1,121,314	1,143,669	1,232,511	1,336,417
Source: U.S. Census Bureau				

TABLE 2.9: AGE OF HOUSING UNITS IN BREMER COUNTY, IA

Year Built	Bremer County		Iowa Percent (%)
	Number	Percent (%)	
2010 or later	36	0.4	0.3
2000-2009	986	9.9	11.3
1990-1999	862	8.7	10.8
1980-1989	605	6.1	7.2
1970-1979	1,515	15.2	15.0
1960-1969	1,191	12.0	10.6
1950-1959	1,061	10.7	11.1
1940-1949	507	5.1	6.4
1939 or earlier	3,176	32.0	27.3
Total	9,939	100.0	100.0

Source: U.S. Census Bureau (2008-2012 5-Year Estimates)

Age of Housing

Approximately 32 percent of the housing units in Bremer County were built in 1939 or earlier. In the decades following 1940, the largest numbers of housing units were built in the 1970s. The 1980's and 1990's witnessed a dramatic decline in the number of houses being built. Table 2.9 shows the number of structures built in each decade since 1939 and the number built before that time. The numbers represented in the following table encompass all houses within the county, including incorporated areas.

Value of Housing

Housing value within Bremer County has dramatically increased since that of the previous decennial census. According to 2010 Census, the median value for an owner occupied unit in the county was $139,300.00. While this value is higher than the State average, most individual communities within the county still remain relatively low compared to State averages for owner occupied housing units.

The State of Iowa had a median housing value of $123,000 in 2010 according to Table 2.10.

Table 2.11 shows the number and percent of housing units in the county by type.

Table 2.12 provides a list of median gross rent for each community. Bremer County's median gross rent is $78 less than the State's. Of Bremer County's jurisdictions, Frederika has the lowest median gross rent, at $475.

TABLE 2.10: MEDIAN VALUE OF A SPECIFIED OWNER-OCCUPIED UNITS IN SELECTED COMMUNITIES

Community	1980	1990	2000	2010
City of Denver, IA	$ 56,600	$ 53,900	$ 92,900	$ 147,500
City of Frederika, IA	29,200	27,900	60,900	82,800
City of Janesville, IA	45,400	38,000	77,600	120,800
City of Plainfield, IA	34,300	28,600	66,100	90,700
City of Readlyn, IA	44,900	39,000	78,200	110,400
City of Sumner, IA	33,500	30,100	68,100	78,000
City of Tripoli, IA	35,000	29,200	64,800	90,000
City of Waverly, IA	50,800	53,100	95,800	142,800
Bremer County (total)	46,800	45,900	88,000	139,300
State of Iowa	40,600	45,500	82,500	123,000
Source: U.S. Census Bureau				

TABLE 2.11: HOUSING UNITS BY TYPE IN BREMER COUNTY

Units in Structure	Number of Units	Percent
1-unit, detached	8,322	83.7%
1-unit, attached	143	1.4%
2 units	276	2.8%
3 or 4 units	355	3.6%
5 to 9 units	290	2.9%
10 to 19 units	130	1.3%
20 or more units	222	2.2%
Mobile Home	205	2.1%
Total Housing Units	**9,943**	**100.0%**
Source: 2009-2013 5-year ACS		

TABLE 2.12: MEDIAN GROSS RENT FOR SELECTED COMMUNITIES

Community	1980	1990	2000	2010
City of Denver, IA	$202	$167	$451	571
City of Frederika, IA	140	203	288	475
City of Janesville, IA	178	262	358	518
City of Plainfield, IA	145	309	450	650
City of Readlyn, IA	159	256	360	525
City of Sumner, IA	128	257	351	505
City of Tripoli, IA	130	264	405	521
City of Waverly, IA	169	298	418	599
Bremer County(total)	161	288	400	577
State of Iowa	226	336	470	655
Source: U.S. Census Bureau				

TABLE 2.13: PER CAPITA & MEDIAN HOUSEHOLD INCOME FOR SELECTED COMMUNITIES

Community	Per Capita Income			Median Household Income		
	1990	2000	2010	1990	2000	2010
City of Denver, IA	$13,538	$20,791	26,978	$29,292	$44,375	61,042
City of Frederika, IA	9,817	20,224	34,968	17,500	36,250	54,000
City of Janesville, IA	11,077	18,878	26,549	26,538	40,060	53,102
City of Plainfield, IA	10,177	18,156	24,786	23,092	39,688	52,969
City of Readlyn, IA	11,508	17,721	27,907	30,043	41,625	57,083
City of Sumner, IA	10,969	18,029	25,419	20,885	33,417	47,768
City of Tripoli, IA	11,135	16,882	19,734	21,893	34,444	45,724
City of Waverly, IA	11,942	18,285	26,007	28,312	39,587	61,308
Bremer County(total)	11,626	19,199	28,276	27,326	40,826	60,193
State of Iowa	12,422	19,674	26,545	26,229	39,469	51,129

Source: U.S. Census Bureau

Economy

Income

The per capita and median household income for the county and its communities are listed in Table 2.13. The county, as a whole, has a per capita income in 2009 dollars of $28,276. The median household income for the entire county, in 2009 dollars, is $60,193. The City of Tripoli has both the smallest per capita income, $19,734, as well as the smallest median household income, $33,417.

Employment Sectors

As Table 2.14 reveals, Bremer County has a large percentage of its residents employed in the education, health and social services, similar to the State. Manufacturing is the second highest industry employing 17.5% of the county. The table also shows the rural environment of the county, with 4.4% employment in the agricultural, forestry, fishing and hunting, and mining industry. The retail trade sector is also a higher percentage due to the concentration of retail businesses in Waverly.

TABLE 2.14: NUMBER OF EMPLOYEES BY EMPLOYMENT SECTOR/INDUSTRY

Industry	Bremer County		State of Iowa	
	#	%	#	%
Agriculture, Forestry, Fishing & Hunting, and Mining	551	4.4%	62,188	4.0%
Construction	634	5.0	95,581	6.1
Manufacturing	2,205	17.5	229,557	14.7
Wholesale Trade	326	2.6	46,372	3.0
Retail Trade	1,443	11.4	181,666	11.7
Transportation & Warehousing, and Utilities	384	3.0	73,661	4.7
Information	137	1.1	30,862	2.0
Finance, Insurance, Real Estate, and Rental & Leasing	1,024	8.1	119,357	7.7
Professional, Scientific, Management, Administrative, and Waste Management Services	700	5.5	106,174	6.8
Education, Health and Social Services	3,544	28.1	372,756	23.9
Arts, Entertainment, Recreation, Accommodations and Food Services	798	6.3	118,557	7.6
Other Services (except public administration)	583	4.6	68,747	4.4
Public Administration	298	2.4	51,853	3.3

Source: U.S. Census Bureau (2008-2012 5-Year Estimates)

Agriculture, crops and livestock are major components of the Bremer County economy. According to a Study by Iowa State University Extension Service[3], Bremer County had 995 farms and over 243,000000 acres of farm land. Farm land occupies more than 86 percent of the surface land in the county. In 2007 Bremer County farmers harvested 134,932 acres of corn and 69,094 acres of soybeans. The corn and soybean harvest produced over 23 million bushels of corn and 3.5 million bushels of beans. All crop production in the county contributed $121.4 million in economic output. In 2007 farmers sold 298,884 hogs and 19,775 heads of cattle. The total crop and livestock economic output was estimated to be $192 million in Bremer County.

Major Employers

Wartburg College is the largest employer in Bremer County. The college is located in Waverly with 1,320 employees, 500 regular employees and 820 student employees. Local school districts, CUNA Mutual Life Insurance, Waverly Health Center, Nestle Beverage, and GMT Corporation are also major employers within the county.

Bremer County has six school districts providing K-12 education and employment. These districts include: Waverly-Shell Rock Community School, Denver Community School, Janesville Consolidated School, Sumner Community School, Tripoli Community School, Wapsie Valley Community School,

There are industrial parks located in Waverly (70 acres), Sumner (15 acres), and Denver has some acreage available as well.

[3] *http://www.extension.iastate.edu/bremer/crops*

SECTION 3 –RISK ASSESSMENT

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the …location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and the probability of future hazard events.

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

This updated risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The goal of the risk assessment is to estimate the potential loss in Bremer County, including loss of life, personal injury, property damage, and economic loss, from a hazard event. The risk assessment process allows the community to better understand their potential risk to various hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The risk assessment for Bremer County follows the methodology described in the FEMA publication 386-2, *Understanding Your Risks: Identifying Hazards and Estimating Losses* (2002), which includes a four-step process:

- Identify Hazards
- Profile Hazard Events
- Inventory Assets
- Estimate Losses

This section is divided into three parts: hazard identification, hazard profiles, and vulnerability assessment:

- **Hazard Identification** identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the probability of future occurrence.
- **Vulnerability Assessment** assesses the County's total exposure to natural hazards, considering critical facilities and other community assets at risk, and assessing growth and development trends. Hazards that vary geographically across the planning area are addressed in greater detail. This section includes steps 3 and 4 from above.

HAZARD IDENTIFICATION

In order to properly identify mitigation strategies and projects, the hazards that may affect the planning area must be identified and/or updated. The following section lists the potential hazards to the planning area that were identified by the Planning Committee. This section also discusses previous occurrences of the hazards, the areas of the planning area most at risk from each hazard, and the populations most at risk. By identifying the hazards and quantifying the risks, the planning area can better assess current mitigation strategies, develop future mitigation strategies and identify needed mitigation projects.

The hazard analysis identifies potential hazards that could affect the planning area for the purposes of mitigation planning. It is important to note that the focus of mitigation is on reducing long-term risks of damage or threats to public health and safety caused by hazards and their effects. Thus, in some cases the hazards identified for mitigation may not include all of or the same hazards identified for preparedness, response or recovery.

The Committee reviewed the recognized hazards in the 2012 Bremer County Multi-Jurisdictional Hazard Mitigation Plan, the 2013 Iowa Hazard Mitigation Plan, and the contractual agreement between the County and FEMA. After review, the committee elected to use the same list of hazards as those identified in the 2013 Iowa Hazard Mitigation Plan. The terminology of these hazards varied slightly from the County's 2012 plan, but the committee believed the list used by the state covered all the hazards the planning area could anticipate a need to address.

The Iowa 2013 Hazards List has three categories of hazards: Natural, Technological, and Human Caused. The planning committee used the hazards identified in the Iowa plan, as well as evaluating the planning area to see if there were any circumstances that called for additional hazards to be identified. No additional hazards were identified. Hazards identified for Bremer County and its communities are listed in Table 3.1.

The identified hazards are discussed at length on the following pages. The discussion will include known historical occurrence, probability of future occurrence, magnitude/severity, warning time, and duration. The overall average results of the Committee's scoring efforts will be provided following this discussion, under Vulnerability Assessment. The individual community scores can be found in each respective appendix.

TABLE 3.1: BREMER COUNTY HAZARD LIST

Natural	**Technological**
Animal/Plant/Crop Disease	HAZMAT Incident
Drought	Infrastructure Failure
Earthquake	Levee/Dam Failure
Expansive Soils	Radiological Incident
Extreme Heat	Transportation Incident
Flash Flood	
Grass/Wild Land Fire	**Human Caused**
Human Disease	Terrorism
Landslide	
River Flooding	
Severe Winter Storm	
Sinkholes	
Thunderstorm/Lighting/Hail	
Tornado/Windstorm	

A large portion of a communities risk and vulnerability to a specific hazard is affected by the geographic location of that community. In fact, some of the 20 hazards from the state's 2013 plan may not be applicable to certain communities. However, to be sure a comprehensive approach was undertaken, all communities conducted a hazard assessment for each of the 20 hazards.

Disaster Declaration History

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type… of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

One method used by the planning committee to identify hazards was to examine events that triggered federal and/or state disaster declarations. Federal and/or state declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

Table 3.2 lists state and federal disaster declarations received by Bremer County. Many of the disaster events were regional or statewide; therefore, reported costs are not accurate reflections of losses to Bremer County and its jurisdictions.

TABLE 3.2: PRESIDENTIAL DISASTER DECLARATION HISTORY FOR BREMER COUNTY

Declared Date	Type	Declaration #
July 1991	Severe Weather	DR-911-IA
April 1993	Flooding	DR-986-IA
June 1993	Flooding	DR-996-IA
July 1998	Severe Weather	DR-1230-IA
May 1999	Severe Storms, Flooding & Tornadoes	DR-1277-IA
July 1999	Flooding	DR-1282-IA
May 25, 2004	Severe Storms, Tornadoes & Flooding	DR-1518
September 2005	Hurricane Katrina	EM-3239
March 14, 2007	Severe Winter Storms	DR-1688
May 27, 2008	Severe Storms, Tornadoes, and Flooding	DR-1763

Source: FEMA, as of 8/31/2015

HAZARD PROFILES

Once hazards were identified and profiled, a vulnerability assessment was conducted. The vulnerability assessment identifies how people, properties, and structures will be damaged by the event. If the hazard can harm people or damage their homes and other structures, they are vulnerable. Finding the weak points in the system, for example, identifying building types that are vulnerable to damage and anticipating the loss in high risk areas, will help the planning area decide what mitigation measure should be undertaken and how to implement the activities they select.

Methodology

The risk assessment identifies how people, properties, and structures could be damaged by the event. If the hazard can harm people or damage their homes and other structures, they are vulnerable. Finding the weak points in the system, for example, identifying building types that are vulnerable to damage and anticipating the loss in high risk areas, will help the community decide what mitigation measure should be undertaken and how to implement the activities they select.

The Hazard Mitigation Planning Committee used the following updated factors in determining the hazard risk assessment (as used by the State of Iowa in their HMP Update). The Planning Committee considered the following for each identified hazard:

- Probability
- Magnitude / Severity
- Warning Time
- Duration

(Probability x.45) + (Magnitude/Severity x .30) + (Warning Time x .15) + (Duration x .10) = Final Hazard Assessment Score

Each hazard identified in this section is profiled individually. The level of information presented in the profiles varies by hazard based on the information available. With each update of this plan, new information will be incorporated to provide for better evaluation and prioritization of the hazards that affect the planning area.

The sources used to collect information for these profiles included previous and current hazard mitigation plan, available data from the National Climatic Data Center, the State of Iowa updated HMP and other available data from the County and incorporated communities. Detailed profiles for each of the identified hazards include information categorized as follows.

Probability

The probability score reflects the likelihood of the hazard occurring again in the future, considering both the hazard's historical occurrence and the projected likelihood of the hazard occurring in any given year. Many times the historical occurrence can be extrapolated into the future using best available data, but others, due to the nature

TABLE 3.3 : PROBABILITY

Score	Description	
1	Unlikely	Less than 10% probability in any given year (up to 1 in 10 chance of occurring), history of events is less than 10% likely or the event is unlikely but there is a possibility of its occurrence.
2	Occasional	Between 10% and 20% probability in any given year (up to 1 in 5 chance of occurring), history of events is greater than 10% but less than 20% or the event could possibly occur.
3	Likely	Between 20% and 33% probability in any given year (up to 1 in 3 chance of occurring), history of events if greater than 20% but less than 33% or the event is likely to occur.
4	Highly Likely	More than 33% probability in any given year (event has up to a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur.

of the hazard are more difficult to estimate the probability of future occurrence. If a hazard or its impacts have been mitigated against, the probability of future occurrences decreases. Conversely, hazards that have not occurred in the past may present themselves to the community in the future. Table 3.3 shows the probability scoring criteria.

Magnitude / Severity

The impact severity of a hazard event (past and perceived) is related to the vulnerability. Relevant factors include when the event occurs (year-round, seasonal), the location affected, community resilience, and the effectiveness of the emergency response and disaster recovery efforts. Quantifying impact severity is difficult to address at multiple levels simultaneously. Table 3.4 shows the Magnitude / Severity scoring criteria.

TABLE 3.4 : MAGNITUDE / SEVERITY

Rating	Description	
1	Negligible	Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid
2	Limited	10% to 25% of property severely damaged, shutdown of facilities and service for more than a week, and/or injuries/illnesses that do not result in permanent disability.
3	Critical	25% to 50% of property severely damaged, shutdown of facilities and services for at least two weeks, and/or injuries/illnesses that result in permanent disability.
4	Catastrophic	More than 50% of property severely damaged, shutdown of facilities and services for more than 30 days, and/or multiple deaths.

Warning Time

The speed of onset is the amount of warning time available before the hazard occurs. This should be taken as an average warning time. For many of the atmospheric natural hazards there is a considerable amount of warning time as opposed to the human caused accidental hazards that occur instantaneously or without any significant warning time. Table 3.5 shows the warning time criteria.

TABLE 3.5: WARNING TIME

Score	Description
1	More than 24 hours warning time.
2	12 to 24 hours warning time.
3	6 to 12 hours warning time
4	Minimal or no warning time (up to 6 hours warning)

Duration

This consists of the typical amount of time that the jurisdiction is impacted by the hazard. As an example, a snowstorm will likely last several hours, whereas a lightning strike would last less than a second. Table 3.6 shows the duration scoring criteria.

Table 3.7 lists the average scores for all jurisdictions in the planning area. Individual assessment scores for each jurisdiction can be found in their respective appendix.

The hazard assessment scores for unincorporated Buchanan County, whose appendix is served by this section of the plan's overview of the county, is shown in Table 3.8.

TABLE 3.6 : DURATION

Score	Description
1	Less than 6 hours
2	Less than 1 day
3	Less than 1 week
4	More than 1 week

Certain hazard rankings are different depending upon the jurisdiction affected, due to different topography, historical occurrences, vulnerability, severity of impact, and probability to that community. The identified hazards are discussed at length on the following pages, in alphabetical order.

TABLE 3.7: COMPOSITE HAZARD ASSESSMENT SCORES OF ALL JURISDICTIONS

Hazard Rank	Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Final Score
1	Thunderstorm/Lightning/Hail	3.22	2.00	2.78	1.67	**2.63**
2	Severe Winter Storm	3.33	2.00	1.44	2.89	**2.61**
3	Tornado/Windstorm	2.00	3.00	3.67	2.11	**2.56**
4	River Flooding	2.44	2.33	1.22	3.33	**2.32**
5	Flash Flood	2.33	1.67	2.78	2.22	**2.19**
6	Transportation Incident	2.11	1.89	2.89	2.11	**2.16**
7	Infrastructure Failure	1.44	2.33	3.22	2.89	**2.12**
8	Extreme Heat	1.89	1.56	1.11	3.22	**1.81**
8	Human Disease	1.56	1.44	1.78	3.67	**1.77**
10	Terrorism	1.22	1.56	3.22	2.67	**1.77**
11	Grass/Wild Fire	1.33	1.44	3.67	1.78	**1.76**
12	HAZMAT Incident	1.22	1.44	3.11	2.67	**1.72**
13	Drought	1.67	1.56	1.11	3.22	**1.71**
14	Animal/Plant/Crop Disease	1.89	1.00	0.89	2.89	**1.57**
15	Sinkholes	1.11	1.11	2.67	2.22	**1.46**
16	Radiological Incident	1.00	1.56	2.00	2.11	**1.43**
17	Landslide	1.11	1.00	2.67	2.22	**1.42**
18	Earthquake	1.00	1.11	2.67	1.33	**1.32**
19	Dam / Levee Failure	1.00	1.00	2.22	2.22	**1.31**
20	Expansive Soils	1.22	1.11	1.11	2.44	**1.29**

TABLE 3.8: HAZARD ASSESSMENT SCORES FOR UNINCORPORATED BREMER COUNTY						
Hazard Rank	**Hazard**	**Probability**	**Magnitude/ Severity**	**Warning Time**	**Duration**	**Final Score**
1	Flash Flood	4	2	3	3	**3.15**
2	Transportation Incident	3	3	4	1	**2.95**
2	Thunderstorm/Lightning/Hail	4	2	3	1	**2.95**
4	Severe Winter Storm	4	2	1	3	**2.85**
5	River Flooding	3	3	1	4	**2.80**
6	Sinkholes	2	2	4	4	**2.50**
6	Tornado/Windstorm	2	3	4	1	**2.50**
6	Infrastructure Failure	2	2	4	4	**2.50**
9	Expansive Soils	3	1	1	4	**2.20**
9	Terrorism	2	1	4	4	**2.20**
11	Extreme Heat	3	1	1	3	**2.10**
12	Drought	2	2	1	4	**2.05**
12	Human Disease	2	2	1	4	**2.05**
14	HAZMAT Incident	2	1	4	2	**2.00**
15	Grass/Wild Land Fire	2	1	4	1	**1.90**
16	Radiological Incident	1	2	4	2	**1.85**
17	Animal/Plant/Crop Disease	2	1	1	4	**1.75**
17	Dam / Levee Failure	1	1	4	4	**1.75**
19	Landslide	1	1	4	3	**1.65**
20	Earthquake	1	1	4	1	**1.45**

HAZARD PROFILES

Animal / Plant / Crop Disease

Definition and Description

Disease is any impairment of normal physiological function affecting all or part of an organism, esp. a specific pathological change caused by infection, stress, etc., producing characteristic symptoms; illness or sickness in general *(Collins).* Also it is any medical, health, or sanitation threat to plants, wildlife, domestic animals. For purposes of this discussion the topic will be contained to only communicable diseases and will largely deal with generalities.

Communicable diseases can have devastating effects on a health of the population of a community, the health of wild and domestic animals, and on the wide variety of plant life that is present in and around the community. Some of these diseases are considered to be a greater risk to the community than others.

Some diseases that affect livestock may include (but not limited to) West Nile Virus, Equine Infectious Anemia, Johne's Disease, Foot Rot, Coccidiosis, Pinkeye, Anaplasmosis, Anthrax, Bluetongue, Brucellosis, Trichomoniasis, Tuberculosis, Pseudorabies, Brucellosis, Porcine Reproductive Respiratory Syndrome, Brucella ovis, Ovine Progressive Pneumonia, Scrapie, Micoplasma, Newcastle, Vesicular Stomatitis, Chronic Wasting Disease (CWD), Exotic Newcastle Disease and Rabit calicivirus disease. In recent years, Avain Bird Flu has shown up throughout the state.

Some common plant diseases include cedar-apple and related rusts, anthracnose, oak wilt, Verticillium wilt, ash decline, Sphaeropsis blight of pine, Rhizosphaera of spruce, Cytospora of spruce, black knot of plum, and environmental or abiotic disease, and Dutch Elm disease among others.

Lastly, though not technically a disease, the threat from the Emerald Ash Borer poses an ever-increasing threat to ash trees in Bremer County and many of it's cities. According to the Iowa Department of Natural Resources, Bremer County has confirmed Emerald Ash Borer infestations. The damage caused by this invasive species is comparable to diseases such as Dutch elm disease.

Historical Occurrence

Instances of plant, crop, or animal disease are common across Iowa and Bremer County. However, according to available data and input, there have been no widespread recorded occurrences of plant, crop, or animal diseases having a long-term significant impact in the planning area.

Probability

Due to the lack of widespread diseases in the past, it is unlikely that a major animal, plant, or crop disease will develop in the future. That being the case, there is a much greater likelihood of complications, such as foodborne illness in humans, resulting from bacteria and viruses originating in livestock and crops.

In addition, the presence of pests, weeds, and fungi poses another threat because organisms have the potential to develop resistances against chemical sprays (e.g. pesticides, herbicides, fungicides) which, in turn, could result in widespread crop damage. The Iowa Hazard Mitigation Plan determined that though it

would have a high impact, the probability of this hazard occurring is low. The composite score (Table 3.7) determined the probability of this hazard event to be between unlikely and occasional (up to 1 in 5 chance occurring). Unincorporated Bremer County concluded the probability of this hazard to occasional – representing a 10-20 percent chance of occurring each year.

Magnitude / Severity

As discussed earlier in the profile, agriculture, primarily corn, soybeans, and livestock, is a major contributor to Bremer County's economy. An Iowa State University Extension study determined that in 2007, agriculture attributed over $259 million in economic output and provided 1,570 jobs throughout Bremer County, which makes up 11.9 percent of the county's workforce.[4]

The severity of a plant, crop, or animal disease depends largely on the disease itself. Effects from a widespread crop disease in Butler County or the state could result in unprecedented crop damage. The same is true for livestock. This damage to plants, crops, and livestock could have devastating effects on the local and state-wide economy.

Warning Time

It is unlikely that there would be any warning before a plant, crop, or animal disease develops. However, it is possible that a small, localized discovery of a new disease could prevent the spread of that disease if properly contained and managed.

Duration

The duration of a plant, crop, or animal disease is likely to last weeks, months, or even years. This is because of the time required to first discover the disease and then develop methods to treat the disease and prevent it from spreading.

[4] http://www.extension.iastate.edu/bremer/crops

Dam / Levee Failure

Definition and Description

A dam is defined as an artificial barrier with the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation. A dam failure is a break in, or imposed threat from, any water retention fixture which may endanger population downstream of the containment area.

According to the Federal Emergency Management Agency, dams can fail for one or a combination of the following reason: Overtopping caused by floods that exceed the dam capacity; Deliberate acts of sabotage; Structural failure of materials used in dam construction; Movement and/or failure of the foundation supporting the dam; Settlement and cracking of concrete or embankment dams; Piping and internal erosion of soil in embankment dams; and Inadequate maintenance and upkeep.

The Iowa Department of Natural Resources tracks all dams in the state of Iowa with a height of at least 25 feet or a total storage of at least 50 acre feet of water. The inventory excludes all dams less than six feet high regardless of storage capacity and dams less than 15 acre feet of storage regardless of height.

The Army Corps of Engineers classify dams into three categories based on the potential risk to people and property should a failure occur. Table 3.9 shows these classifications.

TABLE 3.9: DAM HAZARD POTENTIAL CLASSIFICATION

High Hazard Potential	Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.
Significant Hazard Potential	Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure
Low Hazard Potential	Dams where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Source: Army Corps of Engineers National Inventory of Dams

The classification may change over time because of development downstream from the dam since its construction. Older dams may not have been built to the standards of its new classification. Dam hazard potential classifications have nothing to do with the material condition of a dam, only the potential for death or destruction due to the size of the dam, the size of the impoundment, and the characteristics of the area downstream of the dam.

According to data from the National Inventory of Dams and the Iowa Department of Natural Resources, there are six dams in Bremer County, as shown in Table 3.10. See Attachment 1 for a map of the locations of these dams.

TABLE 3.10: DAMS IN BREMER COUNTY

Dam Name	River	Owner Name	Type & Purpose
Waverly Mill Dam	Cedar River	City of Waverly	Gravity – Hydroelectric and Recreation
Bremer County Road Grade Dam	Quarter Section Run Creek	Bremer County	Earth – Fire Protection, Stock or Small Fish Pond and Other
Denver Dam	Quarter Section Run Creek	City of Denver	Rock Dam – Recreation
Frederika Dam (Alcock Park)	Wapsipinicon River	Bremer County	Low-head – Recreation
Sweet Marsh Dam	Wapsipinicon River (East Fork)	Iowa DNR	Seasonal Wetland – Fish and Wildlife Pond
Janesville Rock Dam	Cedar River	N/A	Rock Dam – Recreation

Source: U.S. Army Corps of Engineers, National Inventory of Dams & Iowa DNR

A levee is a man-made low ridge or embankment built along the edge of a stream or river channel to prevent flooding of the adjacent land. Artificial levees are typically needed to control the flow of rivers meandering through broad, flat floodplains. Levees are usually embankments of dirt built wide enough so that they will not collapse or be eroded when saturated with moisture from rivers running at usually high levels. Grass or some other dense vegetation is planted on the top of the levee's bank so erosion is kept to a minimum.

A levee failure is the loss of structural integrity of a wall, dike, berm, or elevated soil by erosion, piping, saturation, or under seepage causing water to inundate normally dry areas.

Levees constructed of compacted clay with a high plasticity tend to crack during cycles of long dry spells. During heavy rainfalls that follow the dry spells, water fills the cracks and fissures. In addition to increasing the hydrostatics forces, the water is slowly absorbed by the clay. The effect of the absorbed water is an increase in the unit weight of the clay as well as a decrease in its shear strength. This results in a simultaneous increase of the slide (driving) forces and a decrease of the resisting (shear strength) forces. Furthermore, the cyclic shrink / swell behavior of the cracked clay zone results in a progressive reduction of the shear strength of the clay, perhaps approaching its residual strength. It also results in deepening of the cracked clay zone, which may eventually reach a depth of 9 ft. or more, especially for clays with a plasticity index greater than 40. The end result may be a sloughing failure following a heavy rainfall. It is believed that fast removal of the runoff water from the interconnected network of cracks could alleviate this surface instability problem.

According to information available from the Army Corps of Engineers National Levee Database, there are no levees, registered with the agency, within the planning area.

Historical Occurrence

There have been no documented dam or levee failures in the planning area.

According to information available from the Army Corps of Engineers National Levee Database, there are no levees, registered with the agency, within the planning area. However, the planning area likely has numerous rural, agricultural-related man-made levees, dikes, or berms to protection primary agricultural lands and communities.

Probability

For dams, with the increased attention to sound design, quality construction, and continued maintenance and inspection, dam failure probability is low across the planning area. The probability of a dam failure due to a breach in the structural integrity of the system is also minimal. The hazard risk for the dams in Bremer County was considered low. The probability of a catastrophic dam failure or other dam-related hazard was determined to be unlikely.

There are likely additional levees and berms in the planning area which are not listed in the Army Corps of Engineers database. The likelihood of these levees and berms failing may be higher since there is no official inspection, maintenance, or design on record. These levees and berms are likely built by landowners and farmers.

The Frederika Dam is located in the county owned Alcock Park. The par offers open space, recreational activities, shelters, picnic tables, boar ramp, camp ground, drinking wells, as well as a shower house and restroom. Alcock Park is also the location of a low-head dam that has been determined by the county to pose a potentially fatal risk. The parks webpage contains the following warning:

> *Alcock Park has a low-head dam within the park. Improper and unsafe activities can result in fatalities. The following information was written by Kip Ladage of Tripoli, Iowa. Low-head dams can look pleasant and relaxing with the water gently falling over them. However, the dams become dangerous with thousands of gallons of water pouring over the dams and creating a churning current, often called a "hydraulic." The water will take any object, large or small, wearing a Personal Flotation Device (PFD) or not, and slam it to the bottom of the dam, release it to the surface, and again slam it to the bottom. The cycle can continue indefinitely. You will not have the strength to fight the force of the water should you be caught in the backwash of the low-head dam. Do not attempt a rescue. Call in a trained rescue squad. Low-head dam accidents become multiple victim incidents when rescues are attempted by individuals lacking proper training. With these thoughts in mind, consider very carefully your activities around the dam so we can see you enjoying another day on the Wapsipinicon.*

Magnitude Severity

Dams are classified into three categories based on the potential risk to people and property should a failure occur; High, Significant, and Low, see Table 25. The planning area's vulnerability and severity of a dam failure is considered low.

All levees, dikes, berms, and floodwalls give a false sense of security. People feel that these devices will protect them and their property against any future

flooding. While this is usually true, the hazard is only temporarily contained. Therefore, people, property, and utilities located on the other side of the levee are most at risk. The residents of Aplington's nursing home would be vulnerable if that levee failed; however, this levee is not constructed around the entire facility so it wouldn't keep all floodwaters off the property to begin with.

Floodwaters breaching a levee are usually contained in the historic floodplain. Interestingly enough, levee failure in one area may prevent flooding in another area. A levee breach or overtopping occurring along one segment may drop the level of water along other segments of the stream. As mentioned previously under vulnerability, only a small portion of Aplington and Clarksville would be affected by a levee failure; whereas the entire community of New Hartford would be affected.

Water bursting through a narrow levee breach is moving much faster than the floodwaters in the main channel. The breaking out of this front of water and its fast flow can cause more destruction to structures behind the levee than floodwaters in the main channel would have caused. A failed levee continues to cause damage long after it breaks. The breach allows large volumes of water to enter formerly dry areas, forming temporary lakes. Such lakes do not go away immediately, because the lake is blocked from returning to the main channel by levee segments that were not destroyed. Consequently, the water level drops along the main river days before it drops behind breached levees. Often, pumps behind the levees are needed to remove floodwaters that breach the levees. This alleviates some of the impacts associated with levee failures. This alleviates some of the impacts associated with levee failures. Sudden failure in an urban setting could cause a catastrophe. In an urban setting the severity and duration may be important for health reasons, but in an agricultural area for economic reasons. Impacts would be similar to those experienced during a river or flash flood.

Warning Time

A dam failure can be immediate, leaving little or no time to warn those downstream of the imminent hazard. The conditions that may bring about a dam failure, i.e. heavy rains and river flooding, can be forecasted days in advance. However, there is no real way to predict at which point a dam will fail until just before the event occurs.

The amount of warning time depends on the type of levee failure. Local flood warning systems can help in determining the maximum water surface and the timing of a flood situation. Hours or days of warning may be available for high water that may overtop levees, but this does not provide complete security from a rupture in the levee itself. A sudden failure of a portion of the levee may send floodwaters gushing from this break within seconds. Normally, occupants of the floodplain can be warned about potential levee breaches or breaks when high water encroaches upon the levee.

Duration

The length of time that a dam or levee failure would impact the surrounding area depends largely on the amount of water the specific dam or levee held back. The duration of a failure's impact could feasibly range from hours to months.

Drought

Definition and Description

A drought is defined as a period of prolonged abnormally low precipitation producing severe dry conditions. There are four (4) types of drought conditions relevant to Iowa:

- Meteorological drought, which refers to precipitation deficiency;
- Hydrological drought, which refers to declining surface and groundwater supplies;
- Agricultural drought, which refers to soil moisture deficiencies; and
- Socioeconomic drought, which refers to when physical water shortages begin to affect people.

The highest occurrences of drought conditions with recorded events in Iowa are associated with agricultural and meteorological drought as a result of either low soil moisture or a decline in recorded precipitation.

Droughts can be spotty or widespread and last from a few weeks to a period of years. A prolonged drought can have a serious impact on a community's water supply and economy. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock. While droughts are generally associated with extreme heat, droughts can and do occur during cooler months.

Historical Occurrence

National Climatic Data Center has recorded drought since 1996. In that time, there have been three years with a recorded drought. These drought events were in August 2001, August 2003, as well as a registered drought July-October 2012. There was also a drought in 1995 affecting the whole state. A brief summary of these droughts are below.

August 1995 - This particular drought affected the entire state of Iowa. Precipitation was confined to widely scattered thunderstorm activity, which produced a wide variation of monthly rainfall amounts. The highest of these was 9.23 inches at Bondurant in central Iowa (details on that below) to .29 inches at Dubuque for the 4th driest August on record at Dubuque. Statewide rainfall distribution was highest over northwest and north central Iowa, and lowest over the south central counties. The dry weather conditions combined with well above normal temperatures translated to the warmest month recorded in Iowa since July 1988 and the 4th warmest August of record. The summer months of June through August of 1995 ranked 14th warmest in the 123 years data has been collected. The dry conditions resulted in deterioration of Iowa's corn and soybean crops. Yield losses were greatest over southern Iowa where plantings were delayed by excessive spring rainfall. Reports indicate losses in the corn of between five and 25 bushels per acre with the greatest over the south. Soybean losses were not that great and were generally 5% or less. In dollars this translates to about $420 million in corn and $116 million in soybeans.

August 2001 - Beginning on August 1, 2001 through August 23, 2001, a portion of Iowa (including Butler County and 50 additional counties) experienced a record drought. In what became a rather tough growing season, drought developed in Iowa during the month of July, and became serious in August. During the early part of the growing season, excessive rainfall caused significant planting delays across the state. Once the crop was planted, cool and cloudy weather settled into the state slowing crop maturation. Once the warm weather finally arrived, rainfall tailed off significantly. Very little rainfall was reported during the month of July; however, crops flourished with the moisture that was available. During the last half of July, temperatures began to soar into the 90s quite regularly. Temperatures were in the 90s to around 100 for most of the first 10 to 12 days of August with virtually no rainfall. Moisture reserves ran out during the critical time of pod filling for the soybeans and at the tasseling for the corn. Another factor that complicated the situation was the soil moisture profile over central and southwest Iowa. After two years of drought, rain began falling during the last fall of 2000 and continued into the spring of 2001. Though soil moisture was replenished in part, a layer of dry soil remained below the moistened layer, preventing root development below the moist layer. Reports indicate losses estimated between one third and one half in parts of central and southwest Iowa. A few locations had verifiable corn crop losses approaching 80%. Overall, losses for the season were closer to the 15% range. Damage to the corn crop was a little over $350 million, with about $225 million in losses to the soybean crop, and about a two million dollar loss to the oat crop.[5]

TABLE 3.11: BREMER COUNTY DROUGHT EVENTS, 2001-2014

Month/Year of Declaration	Deaths	Injuries	Property Damage	Crop Damage
August 2001	0	0	12.65M	107.350M
August 2003	0	0	0	11.35M
July 2012	0	0	0	90M
August 2012	0	0	0	6M
September 2012	0	0	0	0
October 2012	0	0	0	0

Source: National Climatic Data Center, retrieved 9/1/2015 Note: Damage amount includes areas outside Bremer County

August 2003 - Dry weather settled again over Iowa and Butler County during August 2003. The last widespread rain occurred on July 9th. An extended period of heat and humidity from the 15th to 25th saw highs into the 90s to over 100 degrees Fahrenheit (F) in some areas. By month's end drought indices had worsened to severe to extreme drought across south central Iowa (52 counties) and at least moderate drought over the remainder of the state. Waterloo had its driest August on record, Des Moines its 3rd driest and Ottumwa its 8th driest. A cold front brought only a brief respite from the intense heat, as temperatures rebounded into the 90s to near 100 degrees F. on the 24-26th. Des Moines Airport reached the century mark for the first time since July 29, 1999, reaching 100 F. on the 24th and 101 F. on the 25th. This was followed by a slow cool down as several pushes of cooler air traversed the state. Unfortunately there was only widely scattered convection across the state on the 27th and 28th, providing little significant drought relief. Light to moderate rainfall on the 31st fell across primarily the southern one half of the state, with the heaviest amounts in the southeast. The end of the month saw numerous records approached or established for an all-time record dry August. In Waterloo, the 0.08" broke the previous dry August record of 0.37" set in 1955, while Des Moines had its 3rd driest August ever with 0.31" (driest 0.14" in 1909). Many stations had from 10 to 25 percent of normal rainfall. The drought in south central Iowa as shown by the Palmer Drought Index reached the Extreme category (-4.09) for the first time in this event by August 30th. Statewide NWS Cooperative station data compiled by the Iowa State Climatologist's office showed August temperatures averaged 74.3 F. or 3.0 degrees above the 30-year (1971-2000) mean, ranking as the 18th warmest in 131 years. Precipitation statewide was 0.96" or 3.23" below than normal, ranking as the driest August on record. June through August was the 65th warmest (72.0 F. or 0.4 degrees above normal) and the 18th driest (9.55" or 1.93" below normal) months. The dry conditions caused deterioration in the states

[5]National Climatic Data Center, U.S. Department of Commerce, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~ShowEvent~422598, Retrieved December 4, 2009.

crops. Estimates place yield reductions of about 10% on the corn crop, or a loss of about $210 million. Losses on the soybean crop were around 30%, or a loss of about $435 million.

July-October 2012 – Very warm and dry weather that began in the spring continued into the summer. Temperatures warmed sharply the last few days of June. The heat persisted into July. Temperatures for the month of July were a month the warmest on record. Much of the state recorded less than 50% of normal rainfall for the month, with a few locations under 10% of normal. In addition, extended periods of temperatures above 95 F resulted in problems with pollination of the crops. The rapid deterioration of the corn and soybean crop that took place in July slowed as much of the damage had already occurred in July. By the end of the month, officials estimated that 15% of the soybean crop and 20% of the corn crop yield had been lost to the drought. At the current price, the loss total was in excess of $2.6 billion. For the month of September, temperature averaged fairly close to normal. Rainfall was in short supply across the state. Much of the state recorded less than 50% of normal rainfall for the month, with a few locations under 25% of normal. No significant damage occurred in September in spite of the dry conditions and early freeze of much of the state on the 23rd. Harvest activities were more than 2 weeks ahead of normal. Indications were that yields of the corn crop were around 140 bu/ac and 43/5 bu/ac for the bean crop. Temperatures cooled in October with the month averaging near to a little below normal. It was the first cooler than normal month in 13 months across the CWA. More widespread rainfall began by the middle of the month with fairly widespread even on the 13th. The rapid detrition of the corn and soybean crop that took place in July slowed as much of the damage had already occurred. No significant damage occurred in September in spite of the dry conditions and early freeze across much of the state on the 23rd. In the four months of recorded drought, there was a total estimated $96 million in crop damage.

Table 27 displays drought events in Butler County from 2001-2014 as recorded by the National Climatic Data Center.

Probability

From 2001-2014 there 3 years when a drought occurred spanning a total of six months. Based on the historical occurrence, the probability of a drought in a given year is occasional – with a 10 to 20 percent chance of occurring.

Magnitude / Severity

While the entire planning area would be affected by a drought, those dependent (persons, animals, and crops) on rain would be the most vulnerable. This means that agriculture, agribusiness, and consumers (if the drought lasted long enough or impacted a large area) would be impacted. A drought limits the ability to produce goods and provide services. Because the jurisdictions and rural residents draw their drinking water from groundwater sources, a prolonged severe drought may impact all county residents if there were to be a dramatic drop in the stream flow coupled with the drop in the water table. In addition, while a drought may not cause structural damage to properties, a drought could cause damage to the city utilities, especially the water and well system. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water.

A drought in Bremer County would likely also be affecting most of Iowa if not the Midwest as a whole. Because of the dependence on precipitation and water, the agricultural community would be impacted the most. The agricultural areas would be most adversely impacted, but the entire state would likely feel at least some impact.

Drought in the U.S. seldom results directly in the loss of life. Deaths associated with drought are usually related to a heat wave. Drought more directly affects agricultural crops, livestock, natural vegetation, wildlife, and stream flows (fish and aquatic vegetation). Impacts are costly economically, environmentally, and socially. Due to Bremer County's strong agriculture based economy, including row crops and livestock, the impact of a drought could be critical.

Warning Time

Drought warning is based on a complex interaction of many different variables, water uses, and consumer needs. Drought warning is directly related to the ability to predict the occurrence of atmospheric conditions that produce the physical aspects of drought, primarily precipitation and temperature. There are so many variables that can affect the outcome of climatic interactions, and it is difficult to predict a drought in advance. In fact, an area may already be in a drought before it is even recognized. While the warning of the drought may not come until the drought is already occurring, the secondary effects of a drought may be predicted and warned against weeks in advance. Warning time is not a concern with a drought as the onset of drought can take weeks, months, and sometimes even years to feel the effects.

Duration

The duration of a drought can affect the planning area for days and weeks, months, or longer.

Earthquake

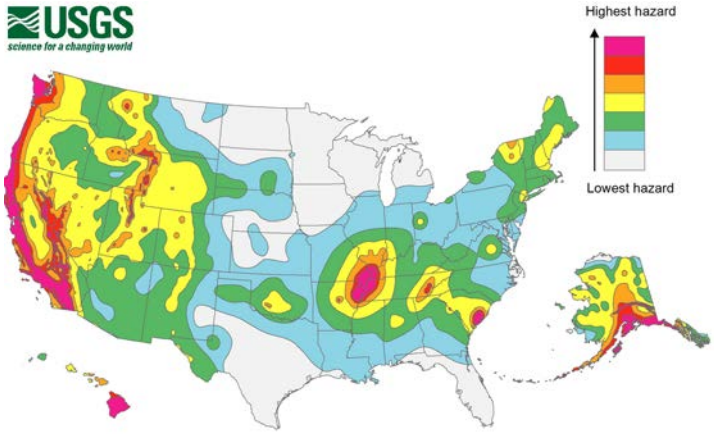
Definition and Description

An earthquake is any shaking or vibration of the earth caused by the sudden release of energy that may impose a direct threat on life and property. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger flash floods and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake.

Earthquakes are generally associated with plate tectonics or volcanic activity, but a third type includes artificial earthquakes. In other words, a large explosion can cause the earth to quake resulting in substantial damage.

According to the Iowa Geological Survey, Plum Creek River Fault Zone and Structural and Stratigraphic Framework of Eastern Iowa study volume Number 13, printed in 1985, there are several areas with faults in Iowa. The two that appear to be closest and could affect the community in this plan are the Plum River Fault Zone and the Fayette Structural Zone. The

FIGURE 3.1: SIMPLIFIED 2014 EARTHQUAKE HAZARD MAP



Source: earthquake.usgs.gov/hazards/

Fayette Structural Zone runs through the planning area starting north of the City of Waterloo, through the very southeast tip of Butler County and into Fayette County towards the City of Oelwein, at a diagonal from the southwest to the northeast. The Plum River Fault Zone can be found south of Cedar Rapids and running east towards Rockford, Illinois.

Historical Occurrence

Iowa as a whole has experienced the effects of only a few earthquakes in the past 175 years. The epicenters of 12 earthquakes have been located in the state. The first known occurrence was in 1867 near Sidney in southwest Iowa; the most recent occurrence was in 2004 near Shenandoah in southwest Iowa. The largest Iowa earthquake (Mercalli magnitude VI) occurred near Davenport in southeast Iowa in 1934. None of these events were instrumentally recorded.

On January 26, 1925 an earthquake occurred with a reported epicenter near Waterloo, Iowa (within an adjacent county). The event registered a magnitude of II (2) on the Mercalli Scale. Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I, at the low end, and XII at the high end. According to FEMA when a Mercalli magnitude II earthquake occurs only a few people might notice movement if they are at rest and/or on the upper floors of tall buildings.

While no other earthquakes with epicenters in Iowa have been recorded, earthquakes with far away epicenters can have minor affects on the region. For example, in 2002 an earthquake with an epicenter in Alaska caused temporary “black water” to occur in area wells.

Probability

Historic seismicity in the planning area in relation to the regional structural geology from 1800 to present has been slight. Assuming historic trends remain unchanged the likelihood of an earthquake causing any substantial damage to Bremer County and its jurisdictions is unlikely, less than 10%. Figure 3.1 illustrates the probability of an earthquake occurring in Iowa and the planning area. The committee determined the probability of an earthquake in Iowa to be unlikely.

Magnitude / Severity

Even though most of Iowa is in Seismic Zone 0, the lowest risk zone in the country, if an earthquake were to occur, the entire planning would be vulnerable to damage. The structures most at risk for damage would be those structures built on poor soil, such as a floodplain. It is expected that if an earthquake were to occur, the damage would be limited to the shifting of buildings off of their foundations, cracked plaster on walls and ceilings, and perhaps some bowed walls. Underground utilities would be at greater risk of damage during the winter season if the ground were frozen to depths of four feet or greater.

The damages associated with an earthquake would likely be relatively low. However, when considering the highly unlikely worst-case scenario, a larger earthquake would have catastrophic effects on the planning area should it occur.

Warning Time

Earthquake prediction is an inexact science. Even in areas that are well monitored with instruments, such as California's San Andreas Fault Zone, scientists only very rarely predict earthquakes. There would be little warning time if an earthquake were to take place.

Duration
The duration of an earthquake would be minutes; however, if the earthquake was large enough, the planning area would feel aftershocks for hours – even days later.

Expansive Soils

Definition and Description
As defined in the State of Iowa Hazard Mitigation Plan, expansive soils are soils and soft rock that tend to swell or shrink excessively due to changes in moisture content. The effects of expansive soils are most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. The hazard occurs in many parts of the Southern Central, and Western United States. Recent estimates put the annual damage from expansive soils as high as $7 billion. However, because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention, despite their costly effects.

Historical Occurrence
Historical records of damage due to expansive soils are not kept on a county-wide scale. Likewise, there are no historical records for the planning area for major expansive soil events.

Probability
Given the historical occurrences of severe winter storms and the annual spring thaw cycle in the planning area, the probability of minor expansive soil events that affect roads and sidewalks is high. The composite probability score of a large expansive soil event, affecting buildings and major infrastructure, was determined to be between Unlikely (up to 10 percent chance of occurring in a given year) and Occasional (10 to 20 percent chance of occurring in a given year. unlikely for the planning area. Expansive soils occur slowly over time.

Magnitude / Severity
The availability of data on expansive soils varies greatly. In our near metropolitan area and at dam sites, abundant information on the amount of clay generally is available. However, little information is reported other than field observations of the physical characteristics of clay.

Expansive soils have little if any direct human impacts. Impacts commonly involve swelling clays beneath areas covered by buildings and slabs of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. Expansive soils can also contribute to or cause damage to roadways, bridges, pipelines, and other infrastructure. Local jurisdictions are burden with the responsibility to repair the damage to roadways.

Houses and one-story commercial buildings are more apt to be damaged by the expansion of swelling than are multi-story buildings, which usually are heavy enough to counter swelling pressures. The most obvious manifestations of damage to buildings are sticking doors, uneven floors, and cracked foundations, floors, walls, ceilings, and windows.

Warning Time

The speed of onset is very slow, and is consistent with other geological hazards that occur over time. However, there are few warning signs of expansive soils until after structural damage becomes apparent, and that structural damage may occur slowly or extremely quickly.

Duration

The duration of an expansive soil event can be over within hours, days, or weeks depending up on the severity and location of the occurrence. Recovery is also depending upon the impact area.

Extreme Heat

Definition and Description

Extreme Heat happens when summertime weather is substantially hotter and/or more humid than average for a given location at that time of the year. This includes temperatures (including heat index) in excess of 100 degrees Fahrenheit or at least three successive days of 90+ degrees Fahrenheit.

A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees. When these extreme heat events occur, and even more so when they are prolonged, people, livestock, pets, wild animals and plant life are all affected to some degree.

In humans, extreme heat events make individuals much more susceptible to such heat related illnesses as heat cramps, heat exhaustion, heat rash, and heat stroke. Several factors affect the body's ability to cool itself during extremely hot weather. When the humidity is high, sweat will not evaporate as quickly, preventing the body from releasing heat quickly. Other conditions related to risk include age (the elderly and young children), obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and prescription drug use and alcohol use.

Many similar physical reactions occur in animals during extreme heat events, but can go unnoticed by an unobservant caretaker. The susceptibility to heat varies on the type of animal and whether or not they have access to water to avoid dehydration.

Plant life can also suffer substantially during prolonged heat waves, especially if they occur in conjunction with moderately dry conditions or even drought. This is of substantial concern to the community as the area is surrounded by primarily agricultural uses. Any negative effects on the surrounding farm economy would undoubtedly have some impact on the communities' well-being.

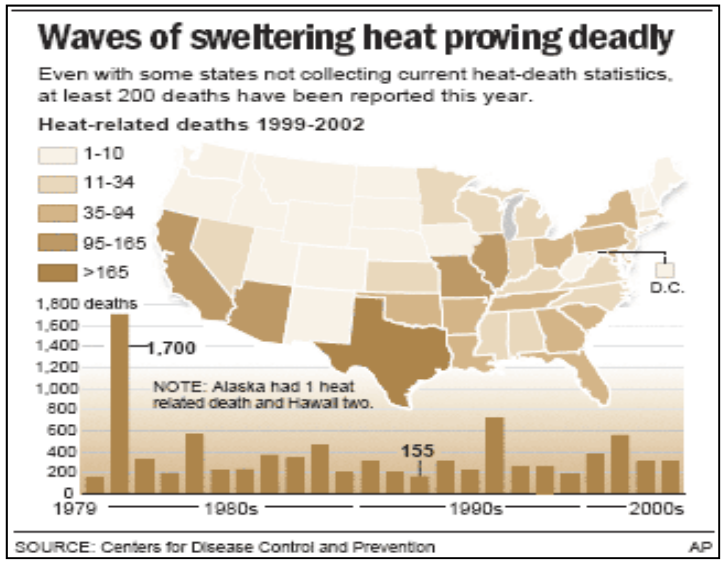


Figure 3.2: Heat Related Deaths, 1999-2002

Historical Occurrence

Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. Among the large continental family of natural hazards, only the cold of winter -- not lightning, hurricanes, tornadoes, floods, or earthquakes -- takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died (Source: NOAA).

The State of Iowa was impacted by a significant heat wave that occurred in the summer of 1995. In July of that year temperatures and dew point soared to new record levels across the State. The heat wave took a dramatic toll on the State as well as three human fatalities were attributed to the event. A significant loss occurred in livestock. Statewide figures indicate that there were property losses of approximately $3.8 million. Losses included 4,000 head of cattle, 370 hogs, 1,250,000 chickens, and 250,000 turkeys. On one farm alone 250,000 laying hens perished on the 2nd day of the heat. Another egg producer had 1.5 million laying hens on two farms. They reported a loss of at least 500,000 hens. Disposal became a serious problem as rendering plants were overwhelmed. In addition to problems caused to humans and livestock, there were numerous heat buckles reported on streets and highways around the state (Source: NCDC).

The National Climatic Data Center Storm Events Database indicates only one recorded Excessive Heat event in Bremer County since 1996; an extreme heat event was recorded beginning on July 15, 2011 and ending July 28, 2011. No injuries or deaths as a result, but there was an estimated $135,000 worth of property damage across several Iowa counties. In mid-July, a high pressure system developed that placed temperatures above 90 degrees Fahrenheit for several days. Most nightly lows did not fall below the mid-70s. These conditions caused considerable stress on livestock. Since 2009, there have been 15 days with an Excessive Heat event in Iowa.

Probability

Based on historical Excessive Heat events that were recorded, the probability of another heat wave affecting the planning area is relatively low. However, temperatures and heat index can still have an effect without reaching the threshold to be recognized as an event by NOAA. Because of this and that extreme heat can effect some members of communities more than others (such as elderly persons or households without air conditioning), some jurisdictions considered extreme heat to be more probable despite few historical occurrences. However, based on NOAA criteria, the probability is unlikely.

Magnitude / Severity

All persons in the planning area is susceptible to the impacts of a heat wave/extreme heat event. Those who have an elevated risk include the elderly, young children, chronic invalids, those on certain medications or drugs, persons who are over their recommended weight, alcoholics, and individuals who work outdoors or in confined spaces without air conditioning. Furthermore, class can figure into the vulnerability. Those individuals or families who cannot afford air conditioning or do not have access to air conditioning are also more susceptible to the effects of elevated temperatures. Unfortunately, it is unknown how many of Butler County's population would fall into this category.

The amount of vulnerability can be greatly reduced by taking certain precautionary measures. Such measure include, but are not limited to drinking plenty of

water to stay hydrated, staying in air conditioned areas, using sun block, reducing the amount of physical exertion normally expended, etc.

The impacts of extreme heat events have historically been known to cause death. This possibility remains today. The severity of a heat wave event would likely be multiplied if it occurred in conjunction with other events such as a drought or a power failure. If the air were extremely dry this would increase the rate of dehydration among plants and animals. If a power failure were to occur, air conditioners, fans, freezers, and refrigerators would cease to operate. As these are items used to alleviate the stresses of heat waves, their loss would contribute to the severity of the disaster.

Within the planning area, it is anticipated that the actual impacts of a heat or excessive heat event would be less severe than what could potentially happen. More likely, a heat wave would likely result in increased energy consumption as a result of more air conditioning units operating. Increased numbers of people at public places such as malls, movie theaters, and swimming pools is also anticipated. Companies and organizations that rely on outdoor labor would likely see a reduction in productivity. Plant life would suffer severe stress possibly stunting growth, hurting crop yields, and thereby affecting the local economy.

Costs to the planning area directly may occur if roads, sidewalks, and foundations expanded enough to cause structural damage.

Warning Time

Heat waves are generally well forecasted; therefore, the onset speed is at least 24 hours. When temperatures or heat indices rise to dangerous levels, the National Weather Service will initiate alert procedures.

Duration

Extreme heat conditions have been known to last days and even weeks with little to no relief.

Flash Flood

Definition and Description

A flash flood is an event that occurs with little or no warning where water levels rise at an extremely fast rate. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Even with information on soil saturation and predicted rainfalls flash floods can still catch people by surprise. Flash flooding is an extremely dangerous form of flooding which can reach full peak in only a few minutes and allows little or no time for protective measures to be taken by those in its path. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding often results in higher loss of life, both human and animal, than slower developing river and stream flooding.

Historical Occurrence

According to data from the National Climatic Data Center (NCDC) there have been 12 reported flash floods in Bremer County from 1996 through 2014. These floods caused an estimated $2.57 million in property damage and $270,000 in crop damage.

It should be noted that there can be several flood events that go unrecorded for several reasons. Either they do not cause substantial damage to houses or structures or they may occur around the same time of a larger, more publicized event. Nevertheless, these events do result in flood costs that the county taxpayers and individual property owners must finance.

TABLE 3.12: HISTORICAL OCCURRENCES OF FLASH FLOODING IN BREMER COUNTY, 1996-2014

Location	Date	Time	Deaths or Injuries	Property Damage	Crop Damage
Waverly	5/16/1999	18:30	0	$750,000	$0
Waverly	7/20/1999	19:00	0	$75,000	$25,000
Waverly	7/27/1999	22:00	0	$25,000	$20,000
Countywide	7/10/2000	00:30	0	$50,000	$75,000
Countywide	5/21/2004	19:35	0	$100,000	$50,000
Waverly	4/24/2008	21:30	0	$100,000	$0
Denver	4/25/2008	05:00	0	$100,000	$0
Waverly	6/07/2008	21:15	0	$10,000	$0
Waverly	6/08/2008	01:26	0	$10,000	$0
Denver	7/23/2010	02:25	0	$1,000,000	$100,000
Waverly	8/10/2010	20:23	0	$50,000	$0
Waverly	5/29/2013	16:00	0	$300,000	$0
		Total	**0**	**$2,570,000**	**$270,000**

Source: National Climatic Data Center; retrieved 4/19/2016

Probability

The probability of a flash flood varies between communities. Even within those communities, some areas have much higher likelihood of experiencing flash flooding than other areas.

Overall, the average jurisdictional flash flooding probability was between occasional and likely (10 to 33 percent chance of event happening each year.) See appendixes for details on the probability of flash flooding for each community.

.Flooding is an annual problem throughout the planning area. While the planning area can experience some degree of flooding throughout the year, the threat of flash flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, rivers, and tributaries. Bremer County has three primary rivers that flow through, including the Shell Rock River, Cedar River, and the Wapsipinicon River. However, flash flooding can also happen in developed areas that do not have proper drainage systems to carry the melted snow and rainfall away from homes and businesses. The committee determined the probability of a flash flooding event in the planning area to be likely.

Magnitude / Severity

Flash flooding in the incorporated areas can vary substantially. Homes, businesses, and infrastructure that remain near or in the floodway and 100-year floodplain will be flooded again. In addition to those low-lying areas in each jurisdiction can be vulnerable to flooding. All incorporated jurisdictions are vulnerable to flash flooding. See each communities respective appendix for specific information on previous and potential flash flooding impacts.

Warning Time
Flash flood warnings are disseminated from the National Weather Service, IAWAS, and local officials, who then, in turn, distribute warnings to the affected areas of the city and county. The new AlertIowa program can also provide notification of flash floods. Flash floods can result in a matter of tens of minutes. The warning time for a flash flood is considered to be minimal (less than 6 hours of warning).

Duration
The duration of flash flooding is dependent on the severity of the flooding event. The duration of a flash flooding event would likely be under one day. However, damage, and cleanup from an event may take several days to recover from.

Grass and Wildland Fire

Definition and Description
A grass or wild-land fire is an uncontrolled fire that threatens life and property in a rural or a wooded area. Grass and wild-land fires are more likely to occur when conditions are favorable, such as during periods of drought when natural vegetation is drier and more combustible.

Historical Occurrence
According to the communities, the National Climatic Data Center and 2013 Iowa Hazard Mitigation plan, there have been no events with significant impact that have been reported. According to data from the National Interagency Coordination Center Wildland Summary and Statistics Annual Report 2013, there were 433 wild land fires affecting 14,558 acres in Iowa in 2013.

Probability
Although much effort has been put into fire prevention in the community, based on historical occurrence, it is highly likely that numerous fires will occur in the community in the next year. There is no central database that records grass/wild land fires. However, grass and wildland fires do occur within the county and fire departments are called out on an annual basis.

Probability for grass or wild land fires increase during the dry seasons or when the area is experiencing a drought. Controlled burns, that have the potential of becoming out of control, pose a threat as well. Given the historical occurrence of grass or wildfires in Bremer County and the state, it is likely that the county will face threat of additional fires in the future, from both grass and wildland fires.

Magnitude / Severity
Grass and wildfires spread quickly; therefore, they require immediate attention from first responders. Those most vulnerable include residents in housing structures near these fields and grasses, typically lying just outside or on the out rim of the community.

Combustible building materials obviously are more vulnerable than structures constructed of steel or concrete. Structures without early detection devices are more likely to be completely destroyed before containment by response agencies. Structures in areas served by older, smaller, or otherwise inadequate water distribution infrastructure such as water mains and hydrants are also at significant risk. Problems vary from region to region, often as a result of climate, poverty, education, and demographics, but Iowa has about 13.4 fire related deaths per million annually.

The severity of impact would largely depend on how quickly the emergency agencies, fire, police, and ambulance, became aware that a fire had occurred. The worst-case scenario would occur if the responsive agencies had a delayed response or was not aware of the fire until it had spread to a larger area. A fire of this magnitude could cause drastic losses to crops and potentially rural homesteads. Bremer County has over 240,000 acres in farmland, over 85% of the area of the county, with majority which is dedicated to row crop production.

Warning Time

Wildland and grass provides little warning before their onset. In addition, fire spreads very rapidly especially in dry, hot, and windy conditions. However, all communities in Butler County have mutual aid agreements to assist if the need arises.

Duration

The area immediately impacted by a grass or wildland fire will be impacted during the duration of the fire. Based on previous experience of fires, likely hours, but depending on size could be days.

Hazardous Materials / HAZMAT Incident

Definition and Description

A HAZMAT (hazardous materials) incident is the accidental release of chemical substances or mixtures which presents a danger to the public health or safety during production or handling at a fixed facility. Fixed hazardous material incidents usually affect a localized area, and the use of planning and zoning can minimize the area of impact.

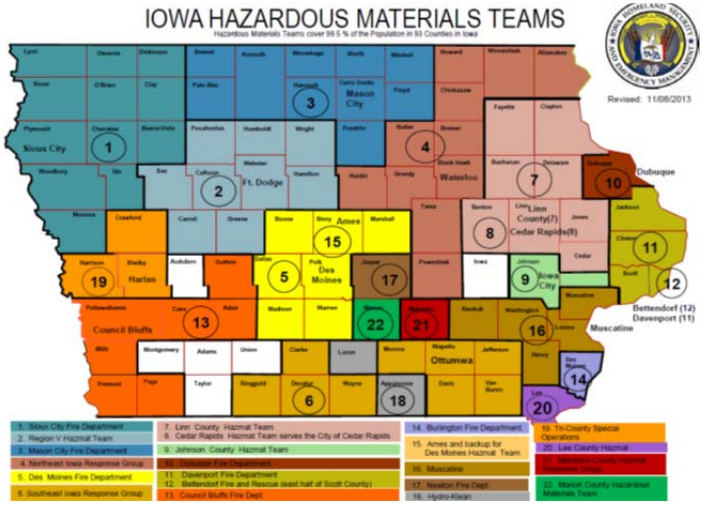


FIGURE 3.3: IOWA HAZARDOUS MATERIALS TEAMS
Courtesy of Iowa Homeland Security[6]

This hazard includes fixed hazardous materials, pipeline transportation, and transportation of hazardous materials. A HAZMAT or Radiological Transportation Incident is the accidental release of chemical substances or mixtures that presents danger to the public health or safety during transportation. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever increasing types and quantities. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced and transported across the county via semi-truck and train. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous materials incidents generally affect a localized area, and the use of planning and zoning can minimize the area of impact.

A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. A pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near to the pipelines.

Figure 3.3 shows the Iowa Hazardous Materials Teams of Iowa.

[6] *http://homelandsecurity.iowa.gov/documents/maps/MAP_HazMatTeams.pdf*

Historical Occurrence

According to data from the Iowa Department of Natural Resources Hazardous Material Release Database[7], there have been 30 hazardous material spills or incidents in Bremer County from January 1, 2011 through December 31, 2015. Table 3.13 shows hazardous spill by type. The most frequent types of spills were petroleum and fertilizer/pesticides. Table 3.14 displays how each spill occurred based on data from the Iowa DNR Hazardous Material Release Database. The two most popular modes of spilling were from Handling and Storage and Transportation.

Table 3.13: HAZARD SPILLS BY MODE
January 1, 2011 – December 31, 2015

Mode of Spill	Quantity
Handling and Storage	15
Transportation	9
Transformer	2
Manure	2
Pipeline	1
Vandalism	1
Total	**30**

Source: Iowa DNR Hazerdous Material Release Database

Probability

Bremer County averaged six hazardous spill incidents per year from 2011 through 2015.

Hazardous materials are transported are roadways and railways, both common sites for the release of hazardous materials. The Department of Transportation regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agriculture, and domestic uses and are being transported on neighboring roads.

Table 3.14 HAZARD SPILLS BY TYPE
January 1, 2011 – December 31, 2015

Type of Spill	Quantity
Petroleum	11
Fertilizer/Pesticide	10
Transformer oil/PCB	2
Inorganic Chemical	2
Manure	2
Acids/Bases	1
Organic Chemical	1
Propoane/LPG/Natural Gas	1
Total	**30**

Source: Iowa DNR Hazerdous Material Release Database

The Environmental Protection Agency manages a Toxics Release Inventory (TRI) dataset for communities to learn about toxic chemicals that industrial facilities are using and releasing into the environment. TRI database tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. According to the EPA's 2013 National Analysis dataset, there are 440 TRI facilities in Iowa and 21,930 TRI sites across the United States. However, Bremer County does not have any TRI facilities.[8]

Due to the historical data and the planning area's diverse array of industrial and agricultural activities, the probability of a HAZMAT incident occurring is highly likely. An average of all of the community's hazard assessment scores determined that the probability of this hazard taking place to between unlikely and occasional (0 – 20 percent chance of occurring in a given year. The committee's review compared to historical differences is due to the consideration that many of the recorded events are small, localized spills which are not probable to affect the public in a meaningful way.

Magnitude/Severity

Most of the hazardous materials incidents are localized and are quickly contained or stabilized by the highly trained fire departments and hazardous materials teams. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or

[7] *https://programs.iowadnr.gov/hazardousspills/Reports/SpillSummary.aspx*
[8] *http://iaspub.epa.gov/triexplorer/tri_factsheet.factsheet?pDataSet=TRIQ1&pyear=2013&pstate=IA&pcounty=Bremer%20County*

as large as five square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer.

A hazardous materials accident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation within approximately 3-4 blocks of facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly vulnerable.

Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water.

Facilities are required to have an off-site consequence plan that addresses the population of the surrounding area. Responding personnel are required to be trained to HAZMAT Operations Level to respond to the scene, and those personnel that come into direct contact with the substances released are required to have HAZMAT Technician level training.

The close proximity and continued mutual aid agreement with the Northeast Iowa Response Group, located in northern Waterloo, will improve the likelihood of a quick response. Figure 3.3 (two pages back) shows the 20 Iowa Hazardous Materials Teams.

Warning Time

When managed properly under current regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. HAZMAT incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time. The AlertIowa system the County has recently implemented would alert affected populations.

Duration

The duration of a HAZMAT incident is dependent upon the amount, type of hazardous material, and location of the release. A small release of gasoline or agricultural chemical on a roadway could close the road for a few hours to clean up. However, a large spill in a populated area or near a body of water would impact that area and possible the area downstream for days or weeks – depending on several factors of the type of release.

Human Disease

Definition and Description

Disease is any impairment of normal physiological function affecting all or part of an organism, esp. a specific pathological change caused by infection, stress, etc., producing characteristic symptoms; illness or sickness in general *(Collins).* Also it is any medical, health, or sanitation threat to humans, plants, wildlife, domestic animals. For purposes of this discussion the topic will be contained to only communicable diseases and will largely with generalities.

According to the Iowa Department of Public Health website there are eleven "Emergency Reportable Diseases or Conditions" that are to be reported by telephone immediately should they be detected. These diseases include Botulism, Cholera, Diphtheria, Haemophilus influenza type b invasive disease, Measles, Meningococcal invasive disease, Plague, Polio, Rabies (human), Vancomycin-resistant Staph aureus, and Yellow fever. Other events that should be immediately reported by telephone include outbreaks of any kind, unusual syndromes, uncommon diseases, or agents of terrorism such as anthrax, mustard gas, sarin gas, ricin, tularemia, and smallpox.

Other diseases of recent concern include SARS, Monkey pox, and West Nile Virus. Also, there are a variety of sexually transmitted diseases that are monitored and treated by the medical community. These diseases include chlamydia, syphilis, gonorrhea, and HIV/AIDS. In the past year, Ebola and the Zika Virus have both become concerning public health threats.

Historical Occurrences

The historical occurrence of the outbreak of communicable diseases in the planning area is difficult to determine. There were no known historical occurrences of the outbreak of communicable diseases in Bremer County that are what can be reasonably expected. However, there are the typical seasonal episodes of influenza, also known as the flu, within the county. Influenza is spread or transmitted, when a person who has the flu coughs, sneezes, or speaks and sends flu virus into the air, and other people inhale the virus. The virus enters the nose, throat, or lungs of a person and begins to multiply, causing symptoms of influenza. Influenza may, less often, be spread when a person touches a surface that has flu viruses on it – a door handle, for instance – and then touches his or her nose or mouth.

According to the Center for Disease Control (CDC), West Nile Virus has been found in the state for several years, including confirmed cases in neighboring counties, including: Black Hawk, Grundy, and Buchanan. First reported in the United States in 1999, the virus is most often transmitted to humans via mosquitoes. The CDC recommends taking preventative measures, including insect repellant ant and protective clothing. Less than 1 percent of infected individuals develop serious, potentially fatal, neurologic illness from the virus.[9]

[9] *http://www.cdc.gov/westnile/index.html*

Probability

It is highly likely human disease as defined will affect Bremer County residents on an annual basis. However, there is a far less likely probability of a human disease event making a severe impact on the county-wide level. Many safeguards from the Department of Public Health and other agencies are in place that mitigates the occurrence of a human disease epidemic. Numerous hospitals and clinics in Butler County are available to provide care as well. Balancing the array of type of disease and impact, the probability has determined to be occasional.

Magnitude / Severity

The severity of a human disease outbreak depends entirely on the disease itself. There are numerous safeguards that have been put into place to help deter an event before it begins, respond to an event once it does occur, and recover from an event as quickly as possible. Examples of such precautions include measures by service agencies (i.e. American Red Cross), government agencies (i.e. Butler County EMA, State Veterinarian, USDA, etc.), and private medical facilities (i.e. hospitals and clinics) to detect and respond to an event before it becomes an epidemic.

Warning Time

Warning time for a human disease event ranges from just a few days to no time at all. The onset of a regional or county-wide epidemic could provide minimal or no warning time due to the nature of human diseases in our globalized society. Because of air travel, a disease that spawns in another part of the world could easily reach Butler County in a matter of days.

Duration

The duration of a human disease incident in the planning area would be dependent on the type of disease, notification and containment of said disease, and treatment.

Infrastructure Failure

Definition and Description

This hazard includes communication failure, energy failure, structural failure, and structural fire.

Energy Failure or disruption is the loss of power as a result of a natural, man-made, or technological disaster or failure. Energy, for purposes of this plan, can also be described as a loss of power. For example, electricity is lost because a power line was accidentally cut; there was a malfunction at the power plant, etc. Another scenario would include the loss of natural gas, a fuel used by most in the community for purposes of heating and occasionally cooking.

Communication failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, and long-term interruption of electronic broadcast services, language barriers, and unfamiliarity with common emergency response terminology. AlertIowa, law enforcement, fire, emergency medical services, public works, and emergency warning systems are just a few of the vital

services which rely on communication systems to effectively protect citizens. Businesses and industry also rely heavily on various communication media. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failure can range from localized and temporary to widespread and long-term. If switching stations are affected, outage could be more widespread. Communications failure can also be realized when individuals who speak different languages try to communicate, or when people use unfamiliar terminology. These types of communications failure are exacerbated during times of disaster.

Structural Failure is the collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may cause a roof of a building to collapse under the weight of the snow. Heavy rains and flooding can undercut and washout a road or bridge. The age of the structure is sometimes independent of the cause of the failure.

Enforcement of building codes can better guarantee that structures are designed to hold up under normal conditions. Routine inspection of older structures may alert inspectors to "weak" points. The level of damage and severity of the failure is dependent on factors such as the size of the building or bridge, the number of occupants of the building, the time of day, day of week, amount of traffic on the road or bridge, and the type and amount of products stored in the structure.

For this profile, fire is an uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved firefighting equipment, training, and techniques, lessen the chance and impact of a major urban fire. Most structural fire occur in residential structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because the volume or type of the material involved.
According to the National Fire Protection Association (NFPA), eighty-five percent of fire deaths occur in the home (one-or two-family dwellings, apartments or manufactured housing). 72% of all fire deaths result from fires in one- and two-family dwellings, including manufactured homes.
Most fires occur as a result of natural causes (i.e. lightning), accidents (i.e. gas leaks), carelessness (i.e. smoking in close proximity to combustibles), or criminal (i.e. arson) reasons. According to statistics obtained from the NFPA Iowa ranked 13th out of the 50 states in the number of deaths per million in 1999.

Cooking is the leading cause of home fires in the U.S. It is also the leading cause of home fire injuries. Cooking fires often result from unattended cooking and human error, rather than mechanical failure of stoves or ovens. Careless smoking is the leading cause of fire deaths. Smoke alarms and smolder-resistant bedding and upholstered furniture are significant fire deterrents. Arson is both the second leading cause of residential fires and residential fire deaths. In commercial properties, arson is the major cause of deaths, injuries and dollar loss. Heating is the third leading cause of residential fires. Heating fires are a larger problem in single-family homes than in apartments. Unlike apartments, the heating systems in single-family homes are often not professionally maintained.

Historical Occurrences

On numerous occasions there has been localized loss of telephone service, generally due to some type of weather phenomenon (e.g. high winds, ice). There have also been short-term instances of power failure, most commonly occurring during thunderstorm and high wind events. In addition, winter ice events have caused power failures in communities in the past.

The county is not immune to structural and residential fires. Through not a central database to record previous events, jurisdictions can expect to face fire and energy outages each year.

Figure 3.4 shows the historic data of deaths caused by fires throughout the entire State of Iowa. The data is courtesy of the State Fire Marshall.

Probability

Although much effort has been put into fire prevention in the community, based on historical occurrence, it is highly likely that numerous fires will occur in the county and its jurisdictions in the next year. The average probability score of all nine jurisdictions determined the likelihood of infrastructure failure to be occasional.

Magnitude / Severity

The magnitude and severity of an infrastructure failure ranges from trivial to catastrophic. Regardi

Source: Iowa Department of Public Safety, State Fire Marshal Division

power outage caused by a thunderstorm, the effects would be relatively insignificant. However, if a major structural failure event occurred, such as a building or bridge collapse, the magnitude of such an event would be unprecedented considering the scope of the property damage, personal injury, and likely fatalities that would ensue.

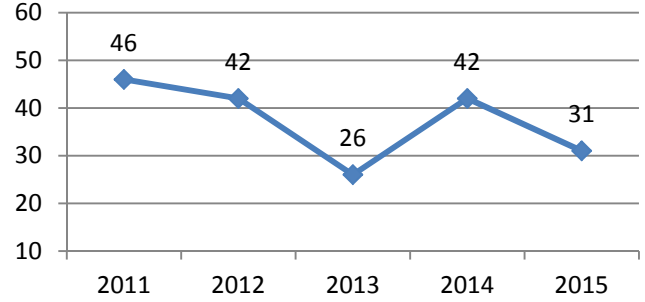
Warning Time

The warning time for the conditions that bring about infrastructure failures, such as a severe thunderstorm which could potentially cause a power outage, is relatively long and could be longer than a day. However, the warning time for the event itself, rather than the conditions that could cause an event, is very little to nonexistent. For example, structural engineers might know that a structure is in critical condition for months. However, it's impossible to predict at what time that structure would ultimately fail.

Duration

Just as the magnitude of an infrastructure failure can vary from trivial to catastrophic, the duration of such an event can also vary tremendously depending on the type of event.

Figure 3.4: Count of Iowa Fire Fatalities By Year



Landslides

Definition and Description

A landslide is a downward and outward movement of slope-forming materials reacting under the force of gravity. Landslides occur when masses of rock, earth, or debris move down a slope. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

- Erosion by rivers, glaciers, or ocean waves create oversteepened slopes
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- Earthquakes create stresses that make weak slopes fail
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures

Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path (USGS). Landslides commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods. (USGS)

Historical Occurrence

In a search of national databases,, there was no discovery of recorded landslides in Bremer County. It is possible that landslides have and were not reported; however there is no data available to determine this.

Probability

Based on the lack of reported landslides in the past, the probability of a landslides occurring in Bremer County is unlikely. Figure 3.5 shows the general risk landslides pose throughout Iowa. All of Bremer County is within the "low" risk category. Steep sloping areas, especially along waterways as well as areas that have been cleared of shrubbery or timber may have an increased probability. The topography map of the planning area is located in Attachment 1.

Magnitude / Severity

Maximum threat exists to those property owners located at the top or bottom of steep sloping areas without trees or shrubbery to absorb excessive amount of moisture. For

Figure 3.5: Landslide Potential

Red = Very High Potential; Yellow = High Potential; Green = Moderate Potential; Black = Low Potential

Courtesy of US Geological Survey, www.usgs.gov

structures located at the top or bottom of a landslide the severity of impact could be devastating. Earth giving way from underneath a structure could result in the structure giving way also. All ground that does give way will then topple onto the anything located below.

Landslides can damage structures and disrupted electricity, water service, communications, and transportation routes in some areas along river banks or in areas where impair development has occurred. Injuries and deaths are very unlikely except in the case of undetected slope failure warning signs in structures overlooking steep slopes.

According to a 2005 publication by the Us Geological Survey[10] landslides:

- Cause damage in all 50 states
- Cost $3.5 billion per year, in 2005, in damage repair
- Reduce real-estate values and tourist revenue
- Lead to lost human, industrial, agricultural, and forestry production
- Cause damage to the natural environment.

In general, the areas of the county most susceptible to a landslide include the Appalachian Mountains, Rocky Mountains, and the west coast. The Midwest, with a relative flat terrain, experiences very landslides compared to these other areas.

Warning Time

Great amounts of precipitation and moisture over time will greatly increase the warning time of a landslide event; however, there is no official warning system in place, thus the warning time would be short.

Duration

Landslides are typically over within hours of occurring.

[10] *https://pubs.usgs.gov/fs/2005/3156/*

Radiological Incident

Definition and Description

A radiological incident is an occurrence resulting in a release of radiological material at a fixed facility or in transit. An incident resulting in a release of radiological material at a fixed facility includes, but is not limited to, power plants, hospitals, and laboratories. Although the term "nuclear accident" has no strict technical definition, it generally refers to events involving the release of significant levels of radiation. Most commercial nuclear facilities in the United States were developed in the mid-1960s and are designed to withstand an aircraft attack. Therefore, they should withstand most hazards even though they may not have been designed for those particular forces.

"Radioactive materials are composed of atoms that are unstable. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is radiation. Each of us is exposed to radiation daily from natural sources, including the Sun and the Earth. Small traces of radiation are present in food and water. Radiation also is released from man-made sources such as X-ray machines, television sets and microwave ovens. Radiation has a cumulative effect. The longer a person is exposed to radiation, the greater the effect. A high exposure to radiation can cause serious illness or death"[11]

The United States Nuclear Regulatory Commission (NRC) identifies four types of emergency classifications for nuclear power plants. Table 3.15 provides a brief description of these types of emergencies.

3.15: UN NRC EMERGENCY CLASSIFICATIONS	
Unusual Event	Events are in progress or have occurred which indicate potential degradation of the level of safety of the plant or indicate security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety system occurs,
Alert	Events are in the progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of Hostile Action. Any releases are expected to be limited to small fraction of the EPA protection action guides (PAGs)
Site Area Emergency	Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or hostile action that resulted in intentional damage or malicious acts; 1) toward site personnel or equipment that could lead to the likely failure or; 2) that prevent effective access to, equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA PAG exposure levels beyond the site boundary.
General Emergency	Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity or hostile action that results in an actual loss of physical control of the facility. Releases can be reasonably epxted to exceed EPA PAG exposure levels offsite for more than the immediate site area.
Source: US Nuclear Regulatory Commission, "Emergency Classification"	

[11] *https://www.ready.gov/nuclear-power-plants*

Historical Occurrence

There is only one nuclear power plant in the state of Iowa, the Duane Arnold Energy Center, which is located 9 miles northwest of Cedar Rapids. The plant began construction in 1970 and became operational in 1974. From 1990 through 2014, the Duane Arnold Energy Center has had 7 Unusual Events, one Alert, no Site Area Emergencies and no General Emergencies.

Figure3.6 shows the location of the two nuclear power plants in eastern Iowa.

According to the state's 2013 Hazard Mitigation Plan, there are have be no occurrences of transportation radiological incidents in Iowa.

Transportation of radiological materials is licensed and regulated by the federal government. According to the state's 2013 Hazard Mitigation Plan, there have been no occurrences of transportation radiological incidents in Iowa.

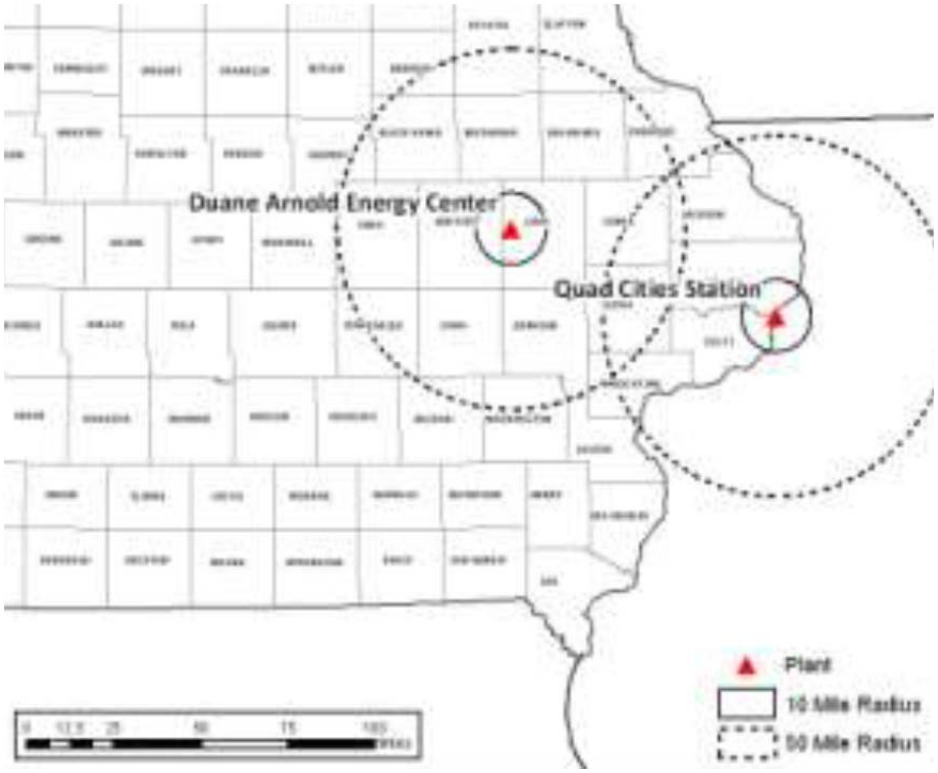


Figure 3.6: Location of Nuclear Power Plants in Eastern Iowa
Source: Iowa Hazard Mitigation Plan, 2013

Probability

Operators of facilities that use radioactive materials and transporters of radioactive waste are circumspect in the packaging, handling, and shipment of the radioactive waste; and are closely regulated by a variety of federal, state, and local organizations. Based on the minimal history of radiological incidents affecting the planning area, the probability of an incident is unlikely. A radiological incident may be trigged by one of other identified hazards, including: terrorism, earthquake, or structural failure.

Magnitude / Severity

Three nuclear facilities are located near the Iowa boarder. These are the Ft. Calhoun Nuclear Power Plant located north of Omaha, NE. The Cooper Nuclear Power Plant south of Nebraska City, NE, and across the Mississippi River at the Quad Cities Nuclear Power Plant.

Time, distance, and shielding minimize radiation exposure to the body. Nuclear radiation above normal levels could be a health and safety consideration because of its ability to damage human cells biologically as well as its long-lasting effect on the environment. Depending on the level of exposure, radiation can cause loss of life, long- and short-term health effects, and property damage from contamination, and disruption of business because of potential evacuations.

Therefore, multiple deaths could occur, thereby affecting the operation of essential facilities throughout the community, at least temporarily.

According to Ready.gov there are, "two 'emergency planning zones.' One zone covers an area within a 10-mile radius of the plant, where it is possible that people could be harmed by direct radiation exposures. The second zone covers a broader area, usually up to a 50-mail radius from the plant, where radioactive materials could contaminate water supplies, food crops, and livestock"[12]

The 50 mile radius of the nuclear plant covers the southeastern portions of Bremer County, including the rural area southeast of Janesville. The cities of, and their surrounding areas, Denver and Readlyn are also within the 50-mile radius of the plant.

Radiation exposure can happen two different ways, including: exposure from a release of radioactive material from the plant, such as a plume of radioactive gases and particles. However, the greatest risk to people in the area around a plume is the body's radiation exposure from the cloud and particles deposited on the ground, inhalation of radioactive material, and ingestion of radioactive materials.[13]

Although it is determined that the probability of an event was limited, it is recognized that if an event were to occur in, or in close proximity, to the community that the entire area would be vulnerable to the radiation.

Warning Time

Ionizing radiation cannot be seen, smelled, heard, or detected with human senses. Detection instruments are needed to indicate the existence of dangerous radiation. Distance from the incident would dictate the amount of time needed to avoid exposure from damaging radiation. Protective actions directed by state and county officials, will depend upon weather conditions and developments at the power plant. In an actual emergency, the public can turn to their local Emergency Alert System Station, NOAA Weather Radios, or through AlertIowa notifications.

Duration

Depending upon the severity of a radiological event, the planning area would be impacted from a few hours to possibility a day or two. In a worst case scenario event, the duration of the ensuring fallout could last decades.

[12] *https://www.ready.gov/nuclear-power-plants*
[13] *https://www.ready.gov/nuclear-power-plants*

River Flooding

Definition and Description

River flooding is a rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water when the volume of water in a stream exceeds the channel's capacity.

River floods are the most common and widespread of all natural disasters, except fire. Most communities in the U.S. can experience some kind of flooding after spring rains, heavy thunderstorms, winter storm thaws, waterway obstructions, or levee or dam failures. Often it is a combination of these elements that causes damaging floods. Floodwaters can be extremely dangerous. The force of six inches of swiftly moving water can knock people off their feet and two feet of water can float of car. Floods can be slow-, or fast-rising but generally develop over a period of days. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers or watershed areas.

Historical Occurrence

According to the National Climatic Data Center (NCDC), there have been 26 recorded flood events within Bremer County from 1996 through 2016. Table 3.16 displays the date, general location, and impact of these floods. Since 1996, floods have caused over $20 million in property and crop damage in the area. The following is not intended to be complete historical records of every flood event to have occurred within the planning area, but rather a brief summary of some of the more severe events that have taken place.

Floods of 1993 – Following a record winter snow accumulation and temperatures above normal, a major flooding event occurred in Iowa. Flood warnings were issued for a large part of the Iowa and Cedar River Basins. On March 30th and 31st, widespread 0.5 to 1 inch rains blanketed the state. To add insult to injury, thunderstorms dropped a large area of 1 to 2 inch rainfall over the area that needed it the least, upper portions of the Iowa and Cedar River Basins. By early May, eight counties had received the federal disaster declaration from the late March and early April flooding. These counties were Black Hawk, Butler, Linn, and Muscatine in the Cedar River basin; Tama and Benton in the Iowa River basin, Buchanan in the Wapsipinicon River basin, and Webster County in the Des Moines River basin. A record crest was observed on the Iowa River at Marshalltown, and initial indications were that Beaver Creek at New Hartford tied the record crest. Several state highways were closed by high water as well as countless county roads. Many of the rivers in the state crested as much as 4 to 8 feet over flood stage. Damage was quite extensive; however, it will be some time before assessments are completed. A few towns became isolated and were only accessible by boat. For example, water flooded the downtown areas of Algona, Chelsea, and New Hartford. Governor Branstad declared 11 Iowa counties disaster areas and several received federal disaster declaration. Property damages totaled over $50 million, with crop damage totaling over $10 million.

Flood of 1999 – A Mesoscale Convective Complex developed over north central and northeast Iowa during the overnight and early morning hours of the 18th and 19th of July. The first flash flood warnings were issued during the wee hours after midnight. The most intense rainfall, estimated by WSR-88D radar at 6 to 10 inches, fell over a relatively small area of Cerro Gordo and southern Worth Counties. The hardest hit area was around Manly, where unofficial rainfall totals of at least 13 inches were received from within the town. There was extensive flooding of homes, roads, and businesses from small streams and creeks. A tragedy was barely averted in the town of Rock Falls, when a sudden rise in flood waters on the Shell Rock River swept a number of camping vehicles downstream, requiring rescues from atop the campers. In the town of Nora Springs, downstream from Rock Falls, there was a small earthen dam break on the Shell Rock River, which may have increased flows downstream. The dam was already being significantly overtopped at the time of failure, so it was difficult to determine the exact impact on the flows downstream. A flash flood watch was issued early on the 19th for much of western, central, and north central Iowa. Significant storms did develop overnight, but the heaviest rains fell in the western parts of the Des Moines HSA and fortunately there was only scattered light activity over northeast Iowa. Urban and small stream advisories were issued for Emmet and northern Palo Alto Counties, where radar estimated 2 to 4 inches of rainfall. The heaviest 24-hour gage report however was in Carroll, in the Middle Raccoon basin, with 2.96 inches. Another flash flood watch was issued early on the 20th for roughly the north half of Iowa. Factors cited in discussions about the potential for heavy rainfall included the presence of a very slow moving cold front, combined with 30 to 45 MPH low level winds feeding abundant moisture into the boundary. The forecasts for extreme rainfall were verified by tremendous rains which began late on the afternoon of the 20th. A flash flood warning was already issued by the early evening hours for southern Worth County, with radar estimated rainfall at 2 inches per hour. Storms continued to develop and train over the same areas during the evening hours, causing additional flash flood warnings in both Bremer and Butler Counties. Rainfall was heaviest in the cedar and Shell Rock River basin, as the band of intense rainfall sank slowly southward with the frontal boundary. Unofficial reports of 7 to 8 inches of rain were reported near Clarksville, located along the Cedar River in Butler County. River flood warnings were issued before midnight, late on the 20th, for the Cedar River from the Bremer County line southward into the Waterloo area. As additional rainfall reports were received early on Wednesday the 21st, the extent and degree of possible river flooding became evident. Radar estimated rainfall indicated a large area of greater than 6 inches of rainfall centered over Floyd County, with a center of 8 to 11 inches stretching from just south of Charles City westward to Rockford. The highest 24-hour gage report within the Cedar basin was at Charles City, with 6.65 inches. According to the Rainfall Frequency Atlas of the Midwest (Midwestern Climate Center - 1992), the 100-year, 24-hour rainfall in this part of northeast Iowa is around 6 inches, meaning that 2 out of 3 nights the rain gage at Charles City had rains at or in excess of the 100-year frequency at 2 hours. Consider that this rain fell in much less time than 24 hours, and it was likely not at the most intense rainfall center! With all of this new rain falling within the same basins as the two nights previous, new flood warnings for yet higher crests were issued for the Winnebago, Shell Rock, and Cedar Rivers. Forecasts predicted several record flood levels along these rivers, with lead times to crest from 8 hours to several days. Near record flooding occurred along the Shell Rock River at Marble Rock with the 2nd highest crest on record, while record floods occurred further downstream at Shell Rock and on the Cedar River at Janesville. At Waterloo, rainfall over the West Fork Cedar River, Beaver Creek, and Black Hawk basin was much lower than in the Shell Rock and Cedar basins, reducing the inflows to the Cedar in Waterloo. Local officials in Cedar Falls, just upstream of Waterloo, stated that the crest exceeded the 1961 flood. The return frequency data for these river floods presents some interesting numbers. The most extreme flood in terms of return frequency was on the Cedar River at Janesville, where the discharge of 41,000 cubic feet per second (cfs) on July 22 made this about a 75-year flood (.015 exceedance probability). The stage at Janesville reached the highest stage on record. At Waterloo on the Cedar, the peak discharge of 65,700 cfs on July 23 was about a 20-year flood event (.05 exceedance probability). This stage was the 3rd highest on record. This highlights the importance of contributions from other tributaries to produce a major flood at Waterloo. On the Shell Rock River at Shell Rock, the peak discharge of 28.500 cfs on July 22 represented about a 25-year return frequency (.04 exceedance probability). Impacts from the flooding were extensive in terms of damaged infrastructure such as bridges and

roads, flooded homes, and disruptions to normal life. There were no injuries or deaths in the Des Moines HSA, although several rescues and many evacuations were performed. Extensive sandbagging efforts saved important facilities in some towns, but others lost the battle. Some of the worst flooding took place in Waverly on the Cedar River, where about 1500 people were evacuated. A total of at least 600 homes in the town of Waverly had to be evacuated due to the high water. Extensive flooding also occurred in Rockford and Greene on the Shell Rock River. Part of the downtown area and several neighborhoods in Cedar Falls were saved from flooding only by the emergency completion of a levee which was already in the process of being built by the U.S. Army Corps of Engineers. In addition, the Presidential Disaster Declaration for the July 2-3 Flooding was extended to include the July 18-22 flooding.

Floods of 2008 – Although the greatest impact from the flood of 2008 was in the City of Waverly, all areas of the county were impacted, resulting in FEMA registrations county-wide. FEMA housing (trailers) was used in Waverly and Plainfield. Outside of the City of Waverly, flooding damaged residences, primarily in basements. There were no FEMA buy-out projects in the areas of Bremer County outside of the City of Waverly.

Table 3.16 shows the recorded flooding events in Bremer County over a ten year span, from January 1, 1996 through December 31, 2015.

Probability

Considering the historical occurrence of flooding events and the number of streams and rivers located in planning area, the probability of future river flooding remains high. Flooding is an annual problem throughout the planning area.

As part of three watersheds (Shell Rock River, Upper Cedar River, and Upper Wapsipinicon), areas adjacent to the rivers and

TABLE 3.16: RIVER FLOODING EVENTS IN BREMER COUNTY, 1996-2015

Location	Date	Time	Death or Injuries	Property Damage ($)	Crop Damage ($)
WAVERLY	6/20/1998	16:15	0	50.00K	5.00K
WAVERLY	6/27/1998	22:30	0	50.00K	10.00K
WAVERLY	8/20/1998	16:15	0	25.00K	0.00K
BREMER (ZONE)	5/16/1999	21:00	0	500.00K	50.00K
BREMER (ZONE)	5/21/1999	15:00	0	50.00K	10.00K
BREMER (ZONE)	6/9/1999	6:00	0	50.00K	75.00K
BREMER (ZONE)	7/19/1999	6:00	0	100.00K	150.00K
BREMER (ZONE)	7/10/2000	6:00	0	50.00K	25.00K
BREMER (ZONE)	3/23/2001	18:00	0	7.50K	0.00K
BREMER (ZONE)	4/7/2001	21:00	0	150.00K	0.00K
BREMER (ZONE)	5/22/2004	18:00	0	100.00K	298.04K
BREMER (ZONE)	9/15/2004	5:00	0	50.00K	100.00K
BREMER (ZONE)	6/26/2005	0:00	0	74.07K	50.00K
COUNTYWIDE	4/1/2006	0:00	0	5.00K	0.00K
PLAINFIELD	4/25/2008	10:00	0	200.00K	0.00K
PLAINFIELD	4/25/2008	16:45	0	10.00K	0.00K
PLAINFIELD	6/8/2008	10:20	0	250.00K	500.00K
PLAINFIELD	3/13/2010	8:30	0	50.00K	0.00K
BABCOCK	3/14/2010	0:40	0	25.00K	0.00K
PLAINFIELD	6/12/2010	12:00	0	0.00K	20.000M
BABCOCK	3/25/2011	7:15	0	25.00K	0.00K
BABCOCK	5/21/2013	22:30	0	250.00K	0.00K
PLAINFIELD	9/22/2016	5:30	0	50.00K	0.00K
FREDERIKA	9/22/2016	13:24	0	100.00K	0.00K
WAVERLY	9/23/2016	3:45	0	100.00K	0.00K
READLYN	9/23/2016	12:17	0	20.00K	100.00K
		Total	**0**	**2.292M**	**21.373M**

Source: National Climatic Data Center, retrieved 4/14/2016

creeks, and its main tributaries are at significantly higher risk than those areas located away from these features. The jurisdictions of Denver, Frederika, Janesville, Plainfield, Sumner, Tripoli, Waverly, and unincorporated areas along the Shell Rock River, Cedar River, and the Wapsipinicon River can see a high probability of future river flooding.

While the planning area can experience some degree of flooding throughout the year, the threat of river flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, rivers, and tributaries. See each jurisdiction's individual appendixes for additional details on previous flood events and probability of future flooding events.

Magnitude / Severity

While there are substantial areas of floodplain (see floodplain maps of unincorporated area as well as each city in Attachment 1) in the planning area, as a percentage of the entire county, these areas are considered to be limited. As mentioned previously, areas along rivers, creeks, and other tributaries are vulnerable to flooding, as well as developed jurisdictions that do not have proper drainage systems. Fortunately, the unincorporated area is mainly agricultural land with sporadic residential land use.

Potential flooding impacts range from very low to catastrophic depending on the type and location of flooding. Flooding impacts include loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business. Risks of fire, health and transportation accidents, and contamination of water supplies are increased during flooding situations

Tables 3.17 & 3.18 displays the value of land, buildings, and dwellings in the 1.0% (100-year) , 0.2% (500-year) floodplains for the combined incorporated areas and the unincorporated areas of county. The parcel information is current as of 11/23/2015. The FEMA Digital FIRM data for Bremer County was completed on 03/04/2008. The incorporated boundaries are current as of 7/21/2016. Individual floodplain land, building, and dwelling values for each jurisdiction can be found in their respective appendices.

TABLE 3.17: FLOODPLAIN VALUES OF ALL INCORPORATED CITIES IN BREMER COUNTY

	# of Parcels	Land Value	Building Value	Dwelling Value	Total Value
1.0% Annual Chance Floodplain Values	1,227	$25,523,110	$27,161,390	$70,087,620	$122,772,120
0.2% Annual Chance Floodplain Values	359	$7,393,030	$4,417,075	$25,339,265	$37,149,370
Total Incorporated Floodplain Value	1,586	$32,916,140	$31,578,465	$95,426,885	$159,921,490
Total Incorporated Value	8,494	$194,206,750	$157,723,250	$716,538,040	$1,068,468,040

Figures calculated using data from Bremer County GIS Department; Parcel data current as of 11/23/2015

TABLE 3.18 FLOODPLAIN VALUES OF UNINCORPORATED BREMER COUNTY					
	# of Parcels	**Land Value**	**Building Value**	**Dwelling Value**	**Total Value**
1.0% Annual Chance Floodplain Values	3,791	$194,915,420	$10,054,090	$93,301,030	$298,270,540
0.2% Annual Chance Floodplain Values	11	$310,590	$0	$872,420	$1,183,010
Total Unincorporated Floodplain Value	370	$ 7,703,620.00	$ 4,417,075.00	$ 26,211,685.00	$38,332,380.00
Total Unincorporated Value	11,038	$672,490,090	$37,744,628	$434,439,382	$1,144,674,100
Figures calculated using data from Bremer County GIS Department; Parcel data current as of 11/23/2015					

Warning Time

People in the path of river floods may have time to take appropriate actions to limit harm to themselves and their property. River flooding can be forecasted to allow for several hours, perhaps even days notification.

Duration

The duration of a flooding event varies based on the severity and location of the flooding event. Duration can range from a few hours to several days or longer.

Severe Winter Storm

Definition and Description

Severe winter storms are weather conditions that affect day-to-day activities. A brief description of various types of severe winter storms is described in Table 3.19. Winter storms are common during the winter months of October through April. The various types of extreme winter weather cause considerable damage. Heavy snows cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife. Loose snow begins to drift when the wind speed reaches 9 to 10 mph under freezing conditions. The potential for some drifting is substantially higher in open country than in urban areas where buildings, trees, and other features obstruct the wind. Frigid temperatures and wind chills are dangerous to people, particularly the elderly and the very young. Dangers include frostbite or hypothermia. Water pipes, livestock, fish and wildlife, and pets are also at risk from extreme cold and severe winter weather.

TABLE 3.19: SEVERE WINTER STORM TERMS

Storm Event Type	Description
Blizzard	A winter storm last at least 3 hours which produces sustained winds or frequent guests 35 mph or greater and falling and/or blowing snow reducing visibility to less than ¼ mile
Cold/wind Chill	A period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typically value is -18®F or colder).
Heavy Snow	Snow accumulation meeting or exceeding the locally/regionally defined 12 and 24 hours warning criteria
Ice Storm	Ice accretion meeting or exceeding locally/regionally defined warning criteria (typical value is ¼ or ½ inch or more)
Winter Storm	A weather event which contains more than one significant hazard (i.e. heavy snow and blowing snow; snow and ice; snow and sleet) and meets or exceeds the locally/regionally defined 12 and/or 24 warning criteria

Source: "National Weather Service Instruction 10-1605" courtesy of the National Climatic Data Center

Historical Occurrence

The planning area has experienced winter storms of some type every winter on record. According to the National Climatic Data Center, from 1996 through 2015 there were 56 winter storm events, including: Blizzard (12), Cold/Wind Chill (4), Heavy Snow (14), Ice Storm (9), and Winter Storm (17). According to this data, there have been no fatalities or injuries resulting in from these hazard events. However, it is estimated that these 56 winter storm events have caused an nearly $1.5 million in property and crop damage.

Table 3.20 displays the reported storm events in Bremer County, according to the National Climatic Data Center for reported Blizzards, Cold/Wind Chill, Heavy Snow, Ice Storms, and Winter Weather. The timeframe covered by the data is from January 1, 2016 through December 31, 2015.

TABLE 3.20 WINTER STORM EVENTS IN BREMER COUNTY, 1996-2015							
Date	**Type**	**Property Damage ($)**	**Crop Damage ($)**	**Date**	**Type**	**Property Damage ($)**	**Crop Damage ($)**
1/18/1996	Cold/wind Chill	0.00K	0.00K	1/4/2005	Heavy Snow	10.00K	0.00K
1/18/1996	Blizzard	0.00K	0.00K	1/22/2005	Blizzard	5.00K	0.00K
1/18/1996	Heavy Snow	0.00K	0.00K	1/20/2007	Heavy Snow	0.00K	0.00K
1/26/1996	Heavy Snow	0.00K	0.00K	2/24/2007	Winter Storm	250.00K	0.00K
1/26/1996	Blizzard	0.00K	0.00K	12/1/2007	Winter Storm	10.00K	0.00K
1/28/1996	Blizzard	0.00K	0.00K	2/10/2008	Cold/wind Chill	0.00K	0.00K
2/1/1996	Cold/wind Chill	0.00K	0.00K	12/8/2008	Winter Storm	10.00K	0.00K
3/24/1996	Blizzard	0.00K	0.00K	12/18/2008	Winter Storm	5.00K	0.00K
5/1/1996	Cold/wind Chill	0.00K	0.00K	12/20/2008	Blizzard	0.00K	0.00K
11/14/1996	Ice Storm	0.00K	0.00K	12/27/2008	Ice Storm	5.00K	0.00K
1/9/1997	Cold/wind Chill	0.00K	0.00K	1/13/2009	Heavy Snow	0.00K	0.00K
1/15/1997	Cold/wind Chill	0.00K	0.00K	4/5/2009	Winter Storm	0.00K	0.00K
2/3/1997	Heavy Snow	0.00K	0.00K	12/8/2009	Heavy Snow	10.00K	0.00K
11/14/1997	Heavy Snow	4.55K	0.00K	12/9/2009	Blizzard	50.00K	0.00K
12/21/1997	Ice Storm	2.05K	0.00K	1/6/2010	Winter Storm	25.00K	0.00K
1/4/1998	Ice Storm	20.40K	0.00K	1/25/2010	Blizzard	75.00K	0.00K
3/7/1998	Heavy Snow	50.00K	0.00K	12/11/2010	Blizzard	75.00K	0.00K
3/17/1998	Ice Storm	5.88K	0.00K	12/23/2010	Heavy Snow	0.00K	0.00K
1/1/1999	Winter Storm	10.00K	0.00K	2/1/2011	Blizzard	25.00K	0.00K
2/11/1999	Ice Storm	5.00K	0.00K	1/20/2012	Heavy Snow	0.00K	0.00K
9/21/1999	Cold/wind Chill	0.00K	294.12K	12/19/2012	Winter Storm	25.00K	0.00K
1/19/2000	Winter Storm	1.00K	0.00K	12/20/2012	Blizzard	100.00K	0.00K
2/17/2000	Winter Storm	10.00K	0.00K	1/27/2013	Ice Storm	50.00K	0.00K
12/10/2000	Winter Storm	24.90K	0.00K	1/30/2013	Winter Storm	25.00K	0.00K
12/18/2000	Blizzard	25.00K	0.00K	2/21/2013	Heavy Snow	0.00K	0.00K
12/21/2000	Blizzard	20.00K	0.00K	1/26/2014	Blizzard	10.00K	0.00K
12/28/2000	Heavy Snow	5.00K	0.00K	2/20/2014	Blizzard	25.00K	0.00K
2/8/2001	Ice Storm	75.00K	0.00K	1/8/2015	Blizzard	0.00K	0.00K
2/8/2001	Winter Storm	50.00K	0.00K	2/1/2015	Winter Storm	50.00K	0.00K
3/1/2002	Heavy Snow	5.00K	0.00K	2/25/2015	Heavy Snow	0.00K	0.00K
3/4/2003	Heavy Snow	1.00K	0.00K	11/20/2015	Winter Storm	0.00K	0.00K
4/4/2003	Ice Storm	5.00K	0.00K	12/28/2015	Winter Storm	0.00K	0.00K
4/6/2003	Winter Storm	5.00K	0.00K		**Total**	**1.170M**	**294.12K**
1/1/2005	Ice Storm	5.00K	0.00K	*Source: National Climatic Data Center; Damage estimates include areas outside of Bremer County*			

Probability

From 1996 through 2015 there have been 66 recorded storm events in Bremer County. This includes 40 days with an event resulting in property damage and one day with an event resulting in crop damage. The frequency and impact of severe winter storm events varies from year to year. Bremer County did not record any events in 2004 and 2006 and only one event in 2011. However, based on historical occurrences it is highly likely a severe winter storm will affect Bremer County on an annual basis, likely multiple times in a year. As can be seen in Table 3.21, in the past 20 years Bremer County has averaged almost three winter storm events per year.

TABLE 3.21: Annual Average of Winter Storm Events in Bremer County, 1996-2015

Storm Event	Total Events	Events Per Year
Blizzard	16	1.6
Cold/wind Chill	7	0.7
Heavy Snow	16	1.6
Ice Storm	10	1.0
Winter Storm	17	1.7
Total	**66**	**6.6**

Source: National Climatic Data Center, retrieved on 9/22/2016

Magnitude/Severity

Those most vulnerable to the effects of a winter storm are those who cannot fend for themselves in times of severe weather. The planning area's elderly, youth, and disabled populations who rely on outside entities for delivery of food or medicine are highly vulnerable to winter storms. People, such as farmers, who work outdoors, are also at greater risk of being affected by wind chill, extreme low temperature, and wet winter conditions. Unfortunately, based on the large area that these storms can cover and the cascading effects that can accompany them, the entire population and planning area are vulnerable to some type of impact from a winter storm. The committee recognized this as fact and scored it accordingly.

Although the developments in technology have been very beneficial in reducing the long-term negative effects of winter storms, certain dangers still exist. The maximum threat of winter conditions would be realized if it was accompanied by power outages and elimination of travel due to hampered road conditions. This could result in the inability for some of the population to maintain temperatures necessary for the body. In addition, long winter events that eliminate communication could result in the reduction of adequate medical response time.

Warning Time

The National Weather Service has developed effective weather advisories, which are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public up to days in advance. Again, weather prediction capabilities have made significant improvements in the past few years. There are several notifications made by the National Weather Service. These include winter storm watch, winter storm warning, blizzard warning, winter weather advisory, and a frost/freeze advisory. Despite the advancements in technology, there have been several instances where the actual winter storm event was much more severe than what was actually forecasted to occur.

Duration

Depending on the type, duration, and the size of the event the entire population could feel the effect of a winter storm. Generally, due to existing snow removal services and other community services the effects of winter storms on incorporated communities in Bremer County are short term; however, the more rural, unincorporated areas tend to be impacted longer due to rural nature of the county. Although more of an inconvenience, and somewhat more dangerous, travel and communication are usually an option in less than 24 hours of any given event.

Sinkholes

Definition and Description

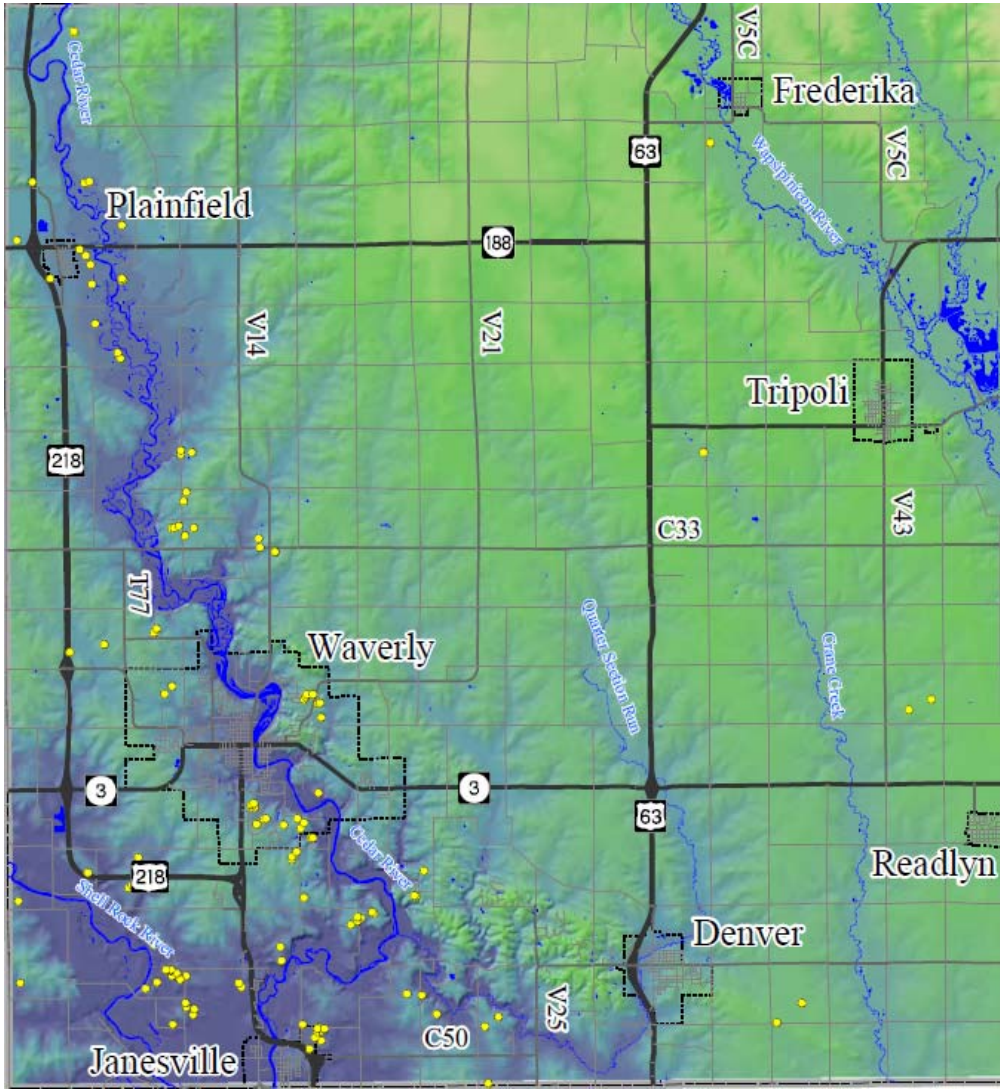
A sinkhole is the loss of surface elevation due to the removal of subsurface support. Sinkholes range from broad, regional lowering of the land surface to abrupt localized collapse. The primary causes of most subsidence are human activities such as underground mining of coal, groundwater/petroleum withdraw, or drainage of organic soils. Sinkholes can aggravate flooding potential, collapse of an abandoned mine may destroy buildings, roads and utilities.

Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by ground water circulating through them. As the rock dissolves, spaces and caverns develop underground. Sinkholes are dramatic because the land usually stays intact for a while until the underground spaces just get too big. If there is not enough support for the land above the spaces then a sudden collapse of the land surface can occur. New sinkholes have been correlated to land-use practices, especially from ground-water pumping and from construction and development practices. Sinkholes can also form when natural water-drainage patterns are changed and new water-diversion systems are developed. Some sinkholes form when the land surface is changed, such as when industrial and runoff-storage ponds are created. The substantial weight of the new material can trigger an underground collapse of supporting material, thus causing a sinkhole.

Historical Occurrence

Most of Iowa's sinkholes occur in rural areas where their main impact is rendering some land unsuitable for row-crop agriculture. Sinkholes have also resulted in the failure of farm and other types of ponds, roads, and one sewage-treatment lagoon. As sinkholes sometimes allow surface runoff to directly enter bedrock aquifers, their presence has

Figure 3.7: Locations of Sinkhole Depressions in Bremer County



Source:Iowa Department of Natural Resource's Natural Resources Geographic Information Systems Library & INRCOG

implications for groundwater quality.[14]

According to the Iowa Department of Natural Resource's Natural Resources Geographic Information Systems Library, there have been 122 recorded sinkholes in Bremer County. Their locations are displayed in Figure 3.7. See Map 2b, included in Attachment 1, for a historical map of Bremer County sinkholes.

According to the Iowa Department of Natural Resource's Coal Mine Map[15] there are no abandoned coal mines in Bremer County.

Probability

Bremer County consists of several different soil types, a high prevalence of precipitation and current agricultural practices which focus on re-directing natural water flow. As is shown in Figure 3.7, Bremer County has experienced a number of sinkholes historically. The vast majority of the sinkholes are in the western half of the county. The cities of Waverly and Janesville and areas along the Shell Rock and Cedar Rivers are the most likely to experience a sinkhole event.

Sinkhole probability varies by jurisdiction. Cumulatively, the committee determined the probability of a major sinkhole event to be between Unlikely and Occasional (0 to 20 percent chance of occurring in a given year)

Magnitude / Severity

The planning area's vulnerability to property damage, injury and loss of life as a result of a sink hole is small. Sinkhole damage is usually contained to a structure. The onset of sink holes is typically slow and can resemble the normal settling of a structure. However, failure to identify a sink hole could increase the homeowner's vulnerability. Building near and or around soils that have the potential to cause sinkholes is highly discouraged to limit future vulnerability.

Maximum threat exists to those property owners located at the top of bottom of steep sloping areas without trees or shrubbery to absorb excessive amounts of moisture. For structures located at the top or bottom of a landslide the severity of impact could be devastating. Earth giving way from underneath a structure could result in the structure giving away also. All ground that does give way will then topple onto anything located below.

Unknown sink holes on property located near and around a structure could have a significant impact on the structures in the area if the sink hole were to collapse. Personal property located near the sink hole would also be consumed in the event of a collapse.

Warning time

Sink holes growing in mass is a slow yet gradual process. Land use practices in the area, soil type in addition to a number of other factors will impact the speed of onset. By identifying these areas city agencies and property owners will be able to implement the necessary precautions to slow and potentially eliminate the development of a sink hole. Catastrophic sinkholes can provide little visible warning, setting in in as little as a few minutes.

[14] *Iowa Department of Natural Resources, Geological Survey, http://www.igsb.uiowa.edu/service/hazards.htm*
[15] *Iowa Department of Natural Resources , http://programs.iowadnr.gov/maps/coalmines/,*

Duration
A sinkhole can affect the location in which it occurred for weeks.

Terrorism

Definition and Description
Terrorism is the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives *(Federal Bureau of Investigation).* The Federal Bureau of Investigation (FBI) categorizes terrorism in the United States as one of two types--domestic terrorism or international terrorism. Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction.

International terrorism involves groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries. A terrorist attack can take several forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the attack, and the points of weakness of the terrorist's target. Bombings have been the most frequently used terrorist method in the United States. Other possibilities include an attack at transportation facilities, an attack against utilities or other public services or an incident involving chemical or biological agents.

Historical Occurrences
To date, there have been no known or reported instances of any terrorist attacks having been perpetrated in the planning area, as defined by the State of Iowa. However, in 2002 an animal rights group, known as the Animal Liberation Front, claimed responsibility of the releasing of more than 1,200 domesticated minks from a fur farm in Bremer County. The Bremer County Sheriff's Department, Federal Bureau of Investigation, Iowa State Patrol, and the Iowa Department of Natural Resources were involved in the investigation. A similar animal release took place in neighboring Chickasaw County in 2000.

Outside of the event mentioned above, there have been no known or reported instances of any terrorist attacks having been perpetrated in the planning area.

Probability
No other events, which could be considered terrorism, are known of. Overall, the probability of terrorist event occurring in the planning area is unlikely (less than 10 percent probability in a given year). The type of terrorist attacks that have the highest probability are those involving small-arms fire at community events of public facilities, such as schools, city halls, and other-like organizations.

Magnitude / Severity
Potential vulnerabilities for terrorist attacks may include: danger to the water supply, bio-terrorism, and an attack on a nearby

nuclear facility. The severity of impact would largely depend on how quickly the planning area became aware that an event had occurred. The worst-case scenario would occur if the public had no knowledge until all or most of the population had been contaminated or poisoned before a proper response could be made. This could result in widespread sickness and potentially death.

Warning Time

Depending on the type of event to occur the speed of onset could vary from immediate (no time) to days, weeks, even years (poisoned water, poisoned food, financial impacts). In the event of the mink release, it took dozens of volunteers to retrieve the remaining living minks over the following days.

Duration

The duration of an incident on the planning area would be dependent upon the type and size of the event. A small, remote/isolated incident would have a smaller duration than a large, urban-centered incident which could last for days or even weeks.

Thunderstorm / Lightning / Hail

Definition and Description

Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. Thunderstorms can result in heavy rains, high winds (reaching or exceeding 58 mph), tornados, or hail. Thunderstorms are created from a combination of moisture, rapidly raising warm air, and the lifting mechanism such as that caused when warm and cold air masses collide. The SHMT chose to combine previously separated hazards of Thunderstorm/Lightning and Hail. The combined hazard was then scored with lower of the two values for magnitude as well as warning time. The magnitude reduction was due to the fact that a majority of thunderstorms don't cause state level response, and tracking and prediction of thunderstorms is quite sophisticated.

Associated hazards related to thunderstorms are discussed further as individual hazards (tornado/windstorm and various kinds of flooding). Most thunderstorms produce thunder, lightning, and rain. Severe storms can also produce tornadoes, straight-line winds with microburst above 58 mph, hailstorms, and flooding. The National Weather Service (NWS) considers a thunderstorm severe if it produces hail at least 1-inch in diameter, wind 58 mph or higher, or tornadoes. Straight-line winds that exceed 60 mph are often mistaken for tornadoes.

TABLE 3.21: HAILSTONE SIZE CODES

Size code	Maximum Diameter mm	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg, squash ball
5	41-50	Golf ball, pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball, cricket ball
8	76-90	Large orange, soft ball
9	91-100	Grapefruit
10	>100	Melon

Source: The Tornado and Storm Research Organization

Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt" or flash of light that occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches temperatures approaching 50,000 degrees Fahrenheit in a split second. This rapid heating, expansion, and cooling of air near the lightning bolt creates thunder.

Hailstorms are a product of a severe thunderstorm in which pellets or lumps of ice (of most concern when greater than 1 inch in diameter) fall with rain. Hail is produced in many strong thunderstorms by strong rising currents of air carrying water droplets to a height where freezing occurs, the ice particles grow in size until they are too heavy to be supported by the updraft and fall back to earth. Hail can be smaller than a pea or as large as a softball and can be very destructive to plants and crops. Pets and livestock are particularly vulnerable to hail. Table 3.21 outlines the different sizes of hail and Table 3.22 describes the categories used to classify hailstorms.

TABLE 3.22: TORRO HAILSTORM INTENSITY SCALE

	Intensity Category	Typical Hail Diameter (mm)*	Typical Damage Impacts
H0	Hard Hail	5	No damage
H1	Potentially Damaging	5-15	Slight general damage to plants, crops
H2	Significant	10-20	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60	Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75	Severe roof damage, risk of serious injuries
H8	Destructive	60-90	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: The Tornado and Storm Research Organization

Historical Occurrence

Thunderstorms are common events in Bremer County. Each spring and summer bring many thunderstorms, often accompanied by rain, lightning, high winds, hail, funnel clouds, and tornadoes. This document discusses hazards of Tornadoes / Windstorms, River Flooding, and Flash Flooding in their respective sections.

Table 3.23 depicts the historical occurrences of Thunderstorm Wind events, as recorded by the National Climatic Data Center, for the past ten years, from 1/1/2006 – 12/31/2015. While this is far from a comprehensive list of all thunderstorms in the planning area, and does cross over with Tornado / Windstorm hazard, the data provides an indication of the frequency and impact that can be associated with thunderstorms. A Thunderstorm Wind event is defined as: "Winds, arising from convection (occurring within 30 minutes of lighting being observed or detected), with speeds of at least 50 knots (58 mph) or winds of any

speed producing a fatality, injury, or damage…"[16] NOAA reports, from 2006-2015, Bremer County experienced 41 Thunderstorm Wind events over 20 days. Based on this average, Bremer County should expect Thunderstorm Wind Events an average of twice per year.

TABLE 3.23: HISTORIC THUNDERSTORM WIND EVENTS IN BREMER COUNTY. 2006-2015

Location	Date	Wind Speed (knots)	Property Damage	Crop Damage	Location	Date	Wind Speed (knots)	Property Damage	Crop Damage
SUMNER	7/20/2006	57 kts. EG	10.00K	0.00K	WAVERLY	7/10/2009	65 kts. EG	50.00K	200.00K
HORTON	3/31/2007	52 kts. EG	3.00K	0.00K	SUMNER	7/10/2009	52 kts. EG	5.00K	25.00K
SUMNER	7/17/2007	52 kts. EG	5.00K	0.00K	SUMNER	7/10/2009	52 kts. EG	10.00K	0.00K
READLYN	7/17/2007	52 kts. EG	5.00K	0.00K	TRIPOLI	6/23/2010	83 kts. EG	50.00K	0.00K
PLAINFIELD	8/15/2007	70 kts. EG	75.00K	25.00K	BREMER	6/23/2010	83 kts. EG	350.00K	0.00K
PLAINFIELD	8/15/2007	65 kts. EG	75.00K	50.00K	TRIPOLI	6/23/2010	87 kts. EG	50.00K	0.00K
BREMER	8/15/2007	52 kts. EG	5.00K	0.00K	SUMNER	6/23/2010	74 kts. EG	50.00K	0.00K
WAVERLY	8/15/2007	52 kts. EG	10.00K	0.00K	SUMNER	6/23/2010	65 kts. EG	20.00K	0.00K
TRIPOLI	8/15/2007	61 kts. EG	10.00K	0.00K	PLAINFIELD	8/8/2010	56 kts. MG	0.00K	0.00K
WAVERLY	9/21/2007	52 kts. EG	5.00K	0.00K	TRIPOLI	8/8/2010	52 kts. EG	2.00K	0.00K
JANESVILLE	9/21/2007	70 kts. EG	5.00K	5.00K	SUMNER	5/24/2012	57 kts. EG	15.00K	0.00K
WAVERLY	5/6/2008	57 kts. EG	50.00K	0.00K	WAVERLY AIRPORT	6/20/2012	52 kts. EG	5.00K	0.00K
TRIPOLI	6/6/2008	51 kts. MG	0.00K	0.00K	PLAINFIELD	5/19/2013	52 kts. EG	2.00K	0.00K
JANESVILLE	6/7/2008	65 kts. EG	50.00K	0.00K	WAVERLY	5/19/2013	52 kts. EG	2.00K	0.00K
PLAINFIELD	7/7/2008	52 kts. EG	3.00K	0.00K	PLAINFIELD	8/22/2013	51 kts. MG	0.00K	0.00K
WAVERLY	7/7/2008	52 kts. EG	5.00K	0.00K	PLAINFIELD	8/22/2013	61 kts. EG	25.00K	0.00K
WAVERLY	7/7/2008	52 kts. EG	5.00K	5.00K	HORTON	8/22/2013	56 kts. EG	25.00K	5.00K
JANESVILLE	6/23/2009	56 kts. EG	25.00K	0.00K	BUCK CREEK	6/16/2014	83 kts. EG	200.00K	0.00K
JANESVILLE	6/23/2009	57 kts. EG	25.00K	0.00K	PLAINFIELD	8/29/2014	56 kts. MG	10.00K	0.00K
TRIPOLI	6/23/2009	61 kts. EG	40.00K	10.00K	Janesville	6/22/2016	65 kts. MG	50.00K	0.00K
TRIPOLI	6/23/2009	57 kts. EG	25.00K	0.00K			**Total**	**1.347M**	**325.00K**

Source: National Climatic Data Center, retrieved 4/14/2016

Since January 1993, the National Climatic Data Center reports that there has been one recorded lighting strike in the County. There have been four lighting strikes recorded in Bremer County from 1993-2015. In 1997, lighting struck and blew up the chimney of a home in Waverly. Other lighting strikes have included antennas, trees, and homes.

Data from NOAA, compiled using National Lighting Detection Network, found that the state of Iowa averaged 645,685 cloud-to-ground lighting flashes between

[16] *National Weather Service Instruction 10-1605* http://www.ncdc.noaa.gov/stormevents/pd01016005curr.pdf

1997 and 2011; equating to an average of 11.4 flashes per square mile[17]. Therefore Bremer County, which is approximately 440 square miles, should anticipate 5,016 lighting flashes annually.

Table 3.24 shows the recorded hailstorm events in Bremer County from 2006-2015. In the previous 10 years, 54 hail events have been recorded over the course of seven days. From 1981-2015 there were 36 days which in hailed in Bremer County. Of these days, 23 resulted in property damage and 17 caused crop damage. The largest hail size recorded in the previous 35 years was hail stones reported to be 2.75 inches in magnitude. This has occurred on two occasions in 1987 and 1999.

[17] http://www.lightningsafety.noaa.gov/stats/Table-Flashes_by_State_1997-2011.pdf

TABLE 3.24: HISTORIC HAILSTORMS IN BREMER COUNTY, 2006-2015									
City/Township	Date	Magnitude (inches)	Property Damage	Crop Damage	City/Township	Date	Magnitude (inches)	Property Damage	Crop Damage
JANESVILLE	5/25/2008	1.75 in.	312.00K	306.00K	TRIPOLI	6/12/2013	1.00 in.	0.00K	5.00K
DENVER	5/25/2008	1.75 in.	10.00K	0.00K	TRIPOLI	6/12/2013	1.25 in.	3.00K	10.00K
WAVERLY	5/25/2008	0.88 in.	10.00K	0.00K	KNITTEL	6/12/2013	1.75 in.	10.00K	10.00K
DENVER	4/6/2010	0.88 in.	1.00K	0.00K	READLYN	6/12/2013	1.00 in.	3.00K	10.00K
READLYN	4/6/2010	1.00 in.	0.00K	0.00K	KNITTEL	6/12/2013	2.00 in.	15.00K	10.00K
TRIPOLI	5/22/2011	1.00 in.	1.00K	0.00K	READLYN	6/12/2013	1.75 in.	10.00K	10.00K
TRIPOLI	5/22/2011	1.00 in.	3.00K	5.00K	BUCK CREEK	6/12/2013	1.75 in.	10.00K	15.00K
SUMNER	5/22/2011	2.00 in.	3.00K	3.00K	TRIPOLI	6/12/2013	0.88 in.	0.00K	5.00K
SUMNER	5/22/2011	1.00 in.	10.00K	3.00K	BUCK CREEK	6/12/2013	1.75 in.	10.00K	10.00K
DENVER	4/9/2013	1.00 in.	3.00K	5.00K	BUCK CREEK	6/12/2013	1.75 in.	10.00K	15.00K
PLAINFIELD	5/19/2013	1.00 in.	1.00K	0.00K	READLYN	6/12/2013	2.75 in.	25.00K	15.00K
JANESVILLE	6/12/2013	1.00 in.	1.00K	0.00K	READLYN	6/12/2013	2.00 in.	15.00K	10.00K
PLAINFIELD	6/12/2013	1.75 in.	1.00K	5.00K	BUCK CREEK	6/12/2013	1.75 in.	10.00K	10.00K
PLAINFIELD	6/12/2013	1.50 in.	5.00K	10.00K	READLYN	6/12/2013	1.50 in.	5.00K	15.00K
BREMER	6/12/2013	1.50 in.	5.00K	0.00K	TRIPOLI	6/12/2013	0.88 in.	0.00K	5.00K
BREMER	6/12/2013	1.00 in.	5.00K	10.00K	BUCK CREEK	6/12/2013	1.00 in.	2.00K	10.00K
BREMER	6/12/2013	1.00 in.	0.00K	5.00K	SUMNER	4/12/2014	1.25 in.	3.00K	0.00K
TRIPOLI	6/12/2013	1.00 in.	0.00K	5.00K	PLAINFIELD	4/12/2014	1.00 in.	0.00K	0.00K
FREDERIKA	6/12/2013	0.75 in.	0.00K	5.00K	WAVERLY	4/12/2014	0.88 in.	0.00K	0.00K
ARTESIAN	6/12/2013	1.75 in.	0.00K	5.00K	WAVERLY	4/12/2014	1.00 in.	2.00K	0.00K
ARTESIAN	6/12/2013	1.75 in.	5.00K	10.00K	WAVERLY	4/12/2014	0.88 in.	0.00K	0.00K
KNITTEL	6/12/2013	1.75 in.	5.00K	10.00K	DENVER	4/12/2014	1.25 in.	3.00K	0.00K
ARTESIAN	6/12/2013	1.75 in.	10.00K	10.00K	DENVER	4/12/2014	2.00 in.	30.00K	0.00K
KNITTEL	6/12/2013	1.75 in.	5.00K	10.00K	READLYN	4/12/2014	1.75 in.	15.00K	0.00K
BREMER	6/12/2013	0.75 in.	5.00K	10.00K	READLYN	4/12/2014	1.75 in.	10.00K	0.00K
TRIPOLI	6/12/2013	1.75 in.	0.00K	5.00K	WAVERLY	4/12/2014	1.25 in.	2.00K	0.00K
READLYN	6/12/2013	1.75 in.	5.00K	10.00K	WAVERLY	4/12/2014	1.75 in.	15.00K	0.00K
					Total			**312.00K**	**306.00K**
Source: National Climatic Data Center, retrieved 4/14/2016									

Probability

The probability of a Thunderstorm/Lightning/Hail event occurring in the planning area and having an impact on some property in the next five years is high. Based off of data from the last 10 years, it is estimated that the planning area will experience approximately two thunderstorms per year that result in wind damage. Thunderstorms without measureable impacts are likely to occur as well. This conclusion is based on the historical occurrences of thunderstorms in the area and the fact that the climate in the area is very conducive to the development of thunderstorms. The climate in the area is of humid continental variety and therefore there is generally enough moisture to form clouds and rain, relatively warm and unstable air that can rise quickly, and fluctuating weather fronts that work to cause uplift in air masses.

As previously mentioned, based on Iowa's 1997-2011 average of cloud-to-ground lighting flashes of 645,685 flashes per year. Based on it's size (439 square miles) Bremer County should anticipate approximately 5,000 lighting flashes annually. However, reported lighting strikes have a low probability.

There is a high probability of hailstorms affecting part or all of the planning area. Based on the historical occurrence of hail events from 2006-2015, the entire planning area can expect to average approximately five to six hail events per year. However, many of these hail events occurred on the same day as a result of the same storm. The 54 hail events in the past 10 years have occurred over the course of seven days. From 1981-2015, 35 years, there were 36 days of hail falling in the county. Therefore, based on historic data, Bremer County should anticipate multiple hail events (4-5) occurring one day a year.

Magnitude / Impact

It is anticipated that a severe thunderstorm could impact 100% of the population (currently 24,276 persons) in the planning area. Those individuals most at risk would include:

1. People in automobiles (unable to determine),
2. People in mobile homes: (222 persons)
3. People in group quarters (1,718 persons),
4. Persons who speak English less than "very well" (244)
5. Elderly persons 65 years or older (4,192) and young persons, less than 18 years old (5,513)

Other persons at risk include those people outdoors, either working or camping. Pets and livestock are particularly vulnerable to hail. The incorporated jurisdictions are also impacted by a hailstorm since they are burdened with hail damage to trees and branches that have fallen. Critical infrastructure, power lines, is also vulnerable to hail damage.

Because of the elements involved with a thunderstorm (tornados, hail, high wind, lightning, heavy rain) those vulnerable are very similar to what was identified in the tornado event analysis (see Tornado/Windstorm Hazard Profile).

Thunderstorms affect relatively small areas when compared to winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 20 to 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, only about 10% are classified as severe. Despite their relatively

small size, thunderstorms are large enough to impact the entire community. The severity of the storm would likely determine the extent of any associated damage.

Thunderstorms may occur singly, in clusters, or in lines. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. Lightning is a major threat during a thunderstorm. It is the lightning that produces thunder in a thunderstorm. Lightning is very unpredictable, which increases the risk to individuals and property.

In the United States, 75 to 100 people are killed each year by lightning, although most lightning victims do survive. Persons struck by lightning often report a variety of long-term, debilitating symptoms, including memory loss, attention deficits, sleep disorders, numbness, dizziness, stiffness in joints, irritability, fatigue, weakness, muscle spasms, depression, and an inability to sit for long periods. It is a myth that lightning never strikes the same place twice. In fact, lightning will strike several times in the same place in the course of one discharge.

The most severe impacts with a thunderstorm would be realized when cascading events occurred as a result of the storm. For example, multiple lightning strikes may result in death, fire, destruction of infrastructure, loss of power, communications failure, etc.

The severity of a hailstorm depends on the size and amount of hail. Hail several inches in diameter can cause severe damage to an urbanized area (broken windows, down trees and power lines, and automobile damage). Hail as small as 0.5 inch diameter can cause damage to crops and other plants.

Warning Time

The National Weather Service has developed effective weather advisories, which are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public in advance of the storm. Again, weather prediction capabilities have made significant improvements in the past few years. There are several notifications made by the National Weather Service. These include severe thunderstorm watch, severe thunderstorm warning, tornado watch, tornado warning, flash flood watch, and flash flood warning.

Despite these advancements in technology, the potential for a storm to form quickly and without warning still exists. Therefore the committee staggered the score for the speed of onset. This allowed for the possibility if minimal or no warning time, but also acknowledged that there is generally some warning time before an event occurs.

The National Weather Service has developed effective weather advisories, which are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public in advance of the storm. The count's use of the state-wide Alert Iowa program also provides an additional way to notify the public of warnings.

Duration

This hazard typically stays in a given area a relatively short time, depending on wind speeds. The duration of an event in one location is likely less than 6 hours.

Tornado / Windstorm

Definition and Description

A tornado is a violent whirling wind characteristically accompanied by a funnel shaped cloud extending down from a cumulonimbus cloud that progress in a narrow, erratic path. Rotating wind speeds can exceed 300 mph and travel across the ground at average speeds of 25-30 mph. A tornado can be a few yards to around a mile wide where it touches the ground. An average tornado is a few hundred yards wide. A tornado can move over land for distances ranging from short hops to many miles, causing damage and destruction wherever it descends. The funnel is made visible by the dust sucked up and condensation of water droplets in the center of the funnel.

TABLE 3.25: ENHANCED FUJITA SCALES FOR TORNADOS

Fujita Scale		Enhanced Fujita Scale		Type of Tornado	Description of Damage
Scale	**3-Second Gust Speed (mph)**	**Scale**	**3-Second Gust Speed (mph)**		
F0	45-78	EF0	65-85	Gale	Some damage to chimneys, broken tree branches, push over shallow rooted trees, damage to sign boards
F1	79-117	EF1	86-109	Moderate	The lower limit is the beginning of hurricane wind speed, peel surface off roofs, mobile homes pushed off foundations or overturned, moving automobiles pushed off roads
F2	118-161	EF2	110-137	Significant	Considerable damage: roofs torn off frame homes, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light object missiles generated
F3	162-209	EF3	138-167	Severe	Severe damage: roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, heavy cars lifted off ground and thrown
F4	210-261	EF4	168-199	Devastating	Devastating damage: well-constructed houses leveled, structure with weak foundation blown off some distance, cars thrown and large missiles generated
F5	262-317	EF5	200-234	Incredible	Incredible damage: strong frame houses lifted off foundations and carried considerable distance to disintegrate, automobile sized missiles fly through the air in excess of 100 yards, trees debarked, incredible phenomena will occur.

The tornado funnel is made visible by the dust sucked up and by condensation of water droplets in the center of the funnel. The rating scale used to rate tornado intensity is the Fujita Scale. The Fajita Scale categorizes tornado severity based on observed damage. The six-step scales ranges from F0 (light damage) to F5 (incredible damage). As of February 2007, the National Weather Service uses the Enhanced Fujita Scale (EF Scale). This new scale ranges from EF0-EF5 and is shown in Table 39

Windstorms are extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very steep pressure gradients. Windstorms, other than tornados, are experienced in all regions of the United States. It is difficult to separate the various wind components that cause damage from other wind-related natural events that often occur with or generate windstorms. Although Iowa does not experience direct impacts from hurricanes, the state is no stranger to strong, damaging winds. Unlike tornadoes, windstorms may have a destructive path that is miles wide and duration of the event could range from hours to days. These events can produce straight line winds in excess of 64 knots (73 mph) causing power outages, property damage, impaired visibility, and crop damage. It is often difficult to separate windstorms and tornado damage when winds get above 64 knots.

Historical Occurrence

Since 1960 there have been 23 recorded occurrences of tornado events in the planning area. The estimated total of property damage from these tornadoes is $6.524 million while crop damage totals to $4,000. The recorded tornado events for the entire planning area can be referenced for detail in Table 3.24. The first column in Table indicates the location where the tornado touched down, it does not include the communities impacted or where it ended. Data used in this table was collected from the National Climatic Data Center and the private website TornadoProject.com. The data gathered indicates reported tornados only, and does not account for unreported or misreported information. Accordingly, this information is intended for reference only, and not as a true and accurate historical account. A graphic representation of historic tornado events and the rough path they traveled can be found in Attachment 1.

Windstorms occur in the planning area on an annual basis. High winds are often associated with thunderstorms, but can be produced during severe snow storms or tornados.

According to the National Climatic Data Center, the County the county experienced 70 Thunderstorm wind events between 1/1/2002 and 12/31/2016. Winds resulted in estimated $3.19 million in property damage and $390,000 in crop damage.

Table 3.23 in the Thunderstorm / Lighting / Hail hazard section includes a table of historical Thunderstorm Wind events from 2006 through 2015.

TABLE 3.24: HISTORICAL OCCURRENCES OF TORNADOES IN BREMER COUNTY, 1960-2015

Touch Down Location	Date	Deaths/ Injuries	Property Damage ($)	Crop Damage ($)	Fujita Scale
BREMER CO.	5/14/1961	0	25.00K	18.50K	F1
BREMER CO.	9/1/1961	0	2.500M	0.00K	F4
BREMER CO.	5/29/1962	0	25.00K	0.00K	F0
BREMER CO.	8/20/1964	0	25.00K	0.00K	F0
BREMER CO.	4/19/1966	0	25.00K	0.00K	F2
BREMER CO.	9/9/1970	0	25.00K	0.00K	F2
BREMER CO.	7/12/1971	0	250.00K	0.00K	F2
BREMER CO.	6/4/1973	0	2.50K	0.00K	F1
BREMER CO.	11/9/1975	0	250.00K	0.00K	F1
BREMER CO.	6/7/1977	0	0.00K	0.00K	F0
BREMER CO.	7/16/1977	0	250.00K	0.00K	F2
BREMER CO.	4/10/1981	0	2.500M	0.00K	F2
BREMER CO.	7/5/1985	0	0.00K	0.00K	F0
BREMER CO.	5/8/1988	0	250.00K	0.00K	F1
BREMER CO.	11/15/1988	0	250.00K	0.00K	F1
BREMER CO.	6/14/1991	0	2.50K	0.00K	F0
WAVERLY	6/16/1996	0	1.00K	0.00K	F0
WAVERLY	6/27/1998	0	3.00K	1.00K	F2
JANESVILLE	6/1/2001	0	30.00K	0.50K	F1
WAVERLY	9/6/2001	0	100.00K	3.00K	F2
TRIPOLI	6/23/2010	0	10.00K	10.00K	EF1
TRIPOLI	5/22/2011	0	0.00K	0.00K	EF0
TRIPOLI	6/16/2014	0	0.00K	0.00K	EF0
Totals	**-**	**0**	**6.524M**	**4.00K**	**-**

Source: Tornado Project and National Climatic Data Center, retrieved 4/14/2016

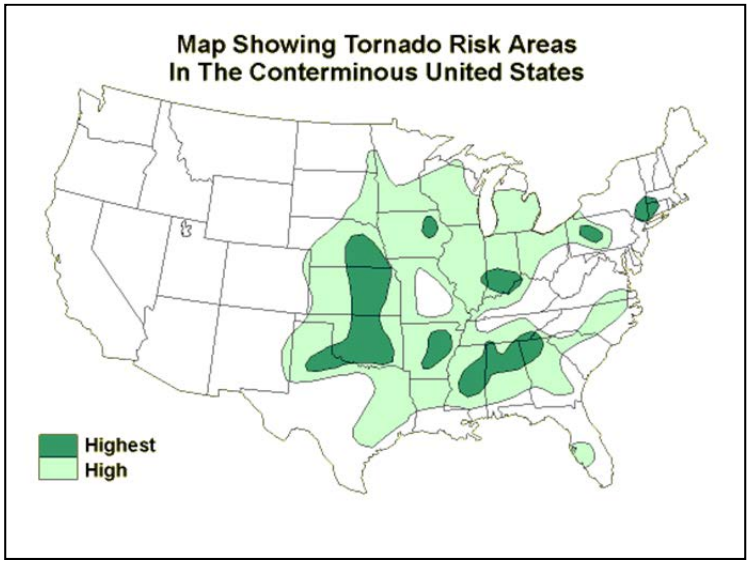
Probability

There have been 23 recorded tornados in the planning area since 1960. That averages, roughly, to a tornado every 2-3 years. Because tornadoes are sporadic, there cannot be a reliable long-term prediction made as to when or if they may occur. In the past 15 years, 2001-2015, Bremer County has experienced five tornadoes. The committee determined the probability of a Tornado/Windstorm event to be occasional (10 to 20 percent probability in a given year).

If the historical average holds, it is highly likely the planning area will likely experience multiple tornados within the next five years. Also, given the historical

paths of tornadoes (Attachment 1) in the planning area, it is likely that future events could impact the same areas.

FIGURE 3.8: TORNADO RISK



The probability of a windstorm occurring in the planning area and having an impact on said area in the next year is likely. This conclusion is based on the historical occurrences of winds associated with thunderstorms in the area and the fact that the climate in the county is very conducive to the development of thunderstorms and high winds. The climate in the area is of humid continental variety and therefore there is generally enough moisture to form clouds and rain, relatively warm and unstable air that can rise quickly, and fluctuating weather fronts that work to cause uplift in air masses.

Magnitude / Severity

Tornadoes consist of strong, often destructive, winds. The winds in the strongest tornadoes are the fastest winds experienced anywhere on Earth, with rotation velocities up to 300 mph. Generally, the damage associated with a tornado is greatest within several hundred feet of the column. The maximum threat of a tornado occurs when a tornado stays on the ground for an extended period of time. The risk becomes even greater when the tornado event is accompanied by hail, heavy rain, and lightning.

The maximum threat of a windstorm is usually several hundred or thousand feet wide, as they are often associated with large thunderstorm cells. Much of the damage incurred during a windstorm event is often due to the accompanying hail, lightning, and wind shear.

The severity of a tornado event would likely be determined by five primary components: 1) the size of the tornado (see Table 18), with an EF5 posing the most severe risk to the community; 2) the time the tornado stayed in or around the community; 3) the time of day would be a major factor; 4) the density of the population at the point of impact; and 5) the area of the community that was directly impacted (i.e. a mobile home park or an undeveloped portion of the community). The worst case scenario would be an EF5 through one or more incorporated jurisdictions in the planning area.

In the event of a tornado, the entire planning area has an extensive network of outdoor warning sirens that, given enough time, allow people to search for suitable shelter. All jurisdictions in the planning area have been active in upgrading these sirens, as many of them are old and unreliable. Bremer County Emergency Management Agency routinely tests warning sirens.

For windstorms, Impacts can vary from broken tree limbs, broken corn stocks, to the total destruction of buildings and other structures depending upon the built environment and the speed of the winds.

As Figure 3.8 shows, northeast Iowa is considered one of the highest risk locations for tornadoes. According the meteorologists with KGAN CBS2 in Cedar Rapids, Iowa northeast Iowa is, "…one of the most fertile breeding grounds in the nation for violent tornadoes. Since 1965 Iowa has experienced five of the country's 42 EF-5 tornadoes. In addition, since 1965, 33 of Iowa's 75 related deaths were within a 55 mile radius of Parkersburg, Iowa. Located in Butler County, which boarders the western edge of Bremer County, the entire county falls within this 55 mile radius around the City of Parkersburg.[18]

Using available data, a tornado scenario was developed for each city. These scenarios estimates the potential damage on an EF0 through EF tornado impacting each city. See each city's respective appendix for the estimated impact of tornadoes. Maps of the tornado scenarios are included for each jurisdiction in Attachment 1.

Warning Time

Although the advancement in radar and forecasting has improved and continues to improve it cannot predict when and where a tornado may strike. They can however inform a community of when the conditions are right for an event to occur. In fact, it is estimated that approximately 95 percent of all tornadoes occur in areas where a tornado watch has been issued. Nevertheless, the five percent of the time that they do not accurately predict, or someone is simply uninformed can result in an almost immediate onset, with little or no warning time.

Tornado and thunderstorm watches can warn of likely conditions hours in advance of an upcoming storm. Although significant advances in meteorological technology has allowed for more effective forecasting, it is impossible to predict, in advance, when and where a windstorm will strike. A windstorm's rapid change in direction makes it difficult to say with certainty, the path the windstorm will continue on after it has been identified. Therefore, warning time is often very short or occasionally non-existent.

Duration

Duration of the actual event of a tornado or windstorm can range from a few minutes to several hours. However considering the the resulting damage, and the threat this damage poses, some jurisdictions deemed the duration could last up to a week or longer in the case of major infrastructure damage

[18] http://www.cbs2iowa.com/news/features/top-stories/stories/NE-Iowa-Prone-to-Violent-Tornadoes-126215.shtml

Transportation Incident

Definition and Description

This hazard includes all modes of transportation - air, highway, railway, and waterway. Thus, transportation includes any incident involving a military, commercial, or private aircraft; single-multi-vehicle incident which requires responses exceeding normal day-to-day capabilities; derailment or a train accident which directly threatens life or property, or which adversely impacts a community's capabilities to provide emergency services; and an event involving any vessel that threatens life or which adversely impacts a community's capability to provide emergency services.

Air

An air transportation incident may involve a military, commercial, or private aircraft. Airplanes, helicopters, and other modes of air transportation are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident including mechanical failure, pilot error, weather conditions, or an on-board fire could all lead to an incident at or near the airport. Air transportation incidents can occur in remote unpopulated areas, residential areas, or downtown business districts, incidents involving military, commercial, or private locations. An aircraft incident can also occur while the aircraft is on the ground.

The sole airport in the county is the Waverly Municipal Airport (C25), located two miles northwest of Waverly's central business district. The facility is classified as a local service airport offering a 2,800 foot long and 50 food wide paved asphalt runway. In 2010 there were 23 aircraft based at the airport generating approximately 5,750 annual operations. These figures are projected to increase to 29 aircraft and 7,250 annual operations by 2030. The closest major airport is the Waterloo Regional Airport (ALO), less than 10 miles from the southern border of Bremer County. This public airport is owned and operated by the City of Waterloo and overseen by an Airport Commission appointed by the Mayor. The primary runway is 8,400 foot long, 150 foot wide, and has a grooved asphalt surface. The airport is classified as a non-hub primary commercial service airport, offering general aviation and commercial service.

TABLE 3.25: AUTOMOBILE CRASHES IN BREMER COUNTY, 2007-2011

Year	Number of Crashes	Total Fatalities	Total Injuries
2007	279	3	93
2008	271	1	79
2009	258	1	91
2010	255	2	102
2011	213	1	73
5-year Total	**1,276**	**8**	**438**
Annual Average	**255.2**	**1.6**	**87.6**

Source: Iowa Department of Transportation, retrieved 9/3/2015

Roads and Bridges

A highway transportation incident can be single or multi-vehicle requiring responses exceeding normal day-to-day capabilities. An extensive surface transportation network exists in Iowa; local residents, travelers, business, and industry rely on this network on a daily basis. Thousands of trips a day are made on the streets, roads, highways, and interstates of the county. If the designed capacity of the roadway is exceeded, the potential for a major highway incident increases. Weather conditions play a major factor in the ability of traffic to flow safely in and through the state as does the time of day and week. Incidents involving buses and other high-occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of response agencies.

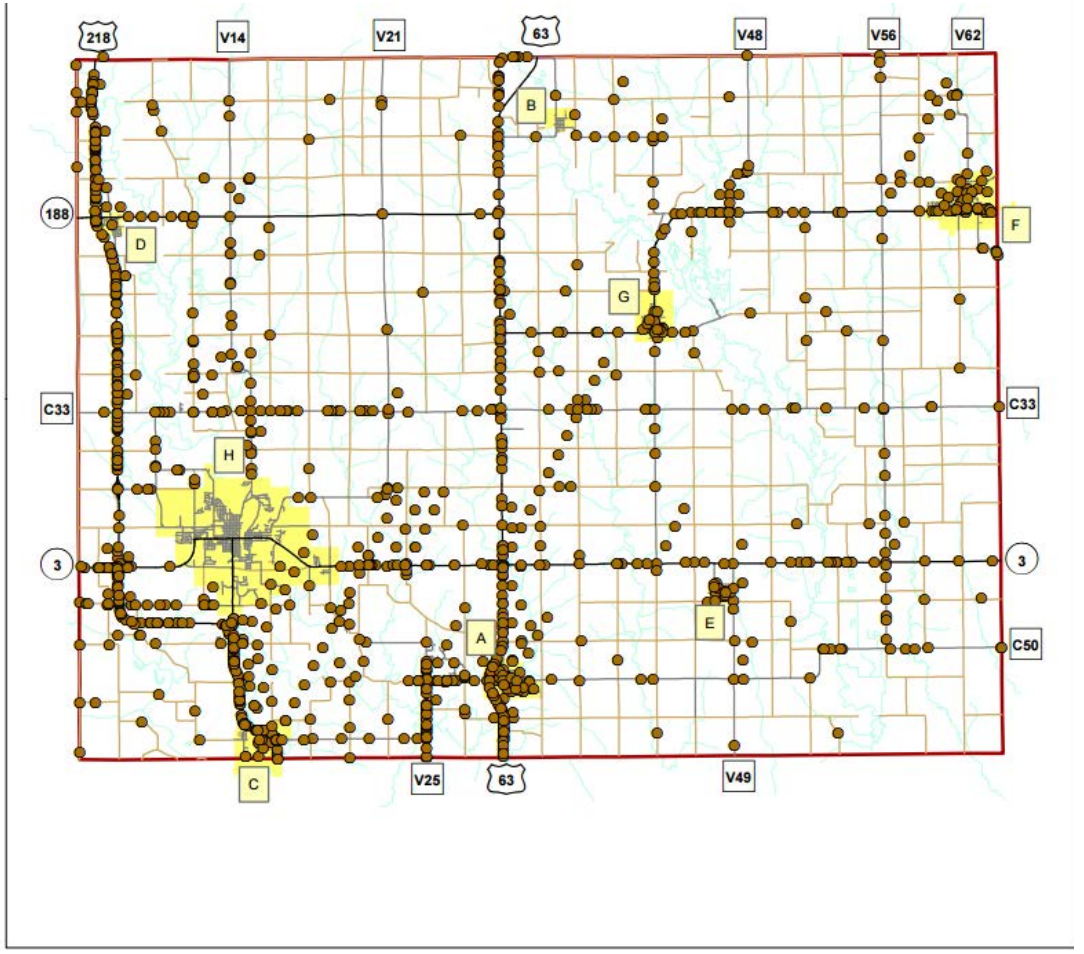
An ongoing initiative that will impact the region involves upgrading a portion of U.S. 218 in Black Hawk and Bremer Counties to a fully controlled-access highway. U.S. 218 was originally opened as a partial controlled-access facility from Cedar Falls to Waverly in 1995. This segment is designated as a part of the Avenue of Saints which is a four-lane route linking St. Paul, Minnesota to St. Louis, Missouri. Completion of this stretch of U.S. 218 resulted in substantial traffic growth as well as significant safety and operational issues. In 2005, the Iowa DOT initiated a Corridor Study to identify potential safety improvements and options for access control. Three projects that were identified include the construction of interchanges at the intersections of U.S. 218 and C-50 in Janesville, C-57 north of Cedar Falls, and 260th Street north of Janesville. As part of the proposed and completed improvements, all at-grade intersections within the corridor will be permanently closed. Construction of the interchange at C-50 was completed in 2012. Construction of the C-57 interchange began in 2015 and is anticipated to be complete by 2016. While funding has not been identified for the interchange at 260th Street, it is anticipated that this project will be constructed within the life of this Plan.

Rail Transportation

Two railroads travel through the western portion of the county. The Canadian National Railway Company enters the southern portion of the county, from Cedar Falls, before traveling through Waverly and then north through Plainfield before exiting the county. Figure 3.10 is a map of rail lines in Bremer County and the surrounding areas.

Iowa Northern Railway Company owns and operates tracks that pass through the southwestern portion of the county. This

FIGURE 3.9: Map of Crash Locations



Courtesy of Iowa Department of Transportation
http://www.iowadot.gov/crashanalysis/data/county/bremer.htm

section of rail connects Shell Rock (in Butler County) to Cedar Falls (Black Hawk County)

Waterways

A waterway incident is an accident involving any water vessel that threatens life, property, or adversely affects a community's capability to provide emergency services. Waterway incidents primarily involve pleasure craft on rivers and lakes. In the event of an incident involving a water vessel, the greatest threat would be drowning, fuel spillage, and/or property damage. Water rescue events are largely handled by first responding agencies. Waterway incidents may also include events in which a person, persons, or object falls through the ice on partially frozen bodies of water.

Historical Occurrence

Traffic accidents are fairly common occurrences in the county. According to the Iowa Department of Transportation[19], rural Bremer County experience 1,276 reported vehicular crashes from 2007 to 2011.

As shown in Table 3.26, from 2000-2013 there were ten train-vehicles accidents in the planning area, resulting in an average of 0.71 train crashes per year. No data sources indicating trail derailments in Bremer County were identified.

According the Des Moines Register's DataCentral there were only two boating accidents in Bremer County from 2006-2014. In 2012 there was a single boat accident at the Sweet Marsh waterbody near Tripoli. In 2008 there was a two-boat crash in the Wapsipinicon River.[20]

FIGURE 3.10: RAIL ROUTES THROUGH BREMER COUNTY

Courtesy of the Iowa Department of Transportation
http://www.iowadot.gov/iowarail/railroads/maps/maphome.htm

[19] Iowa Department of Transportation, Iowa Crash Data for Butler County, http://www.iowadot.gov/crashanalysis/data/county/bremer.htm, Retrieved September 2015.
[20] http://db.desmoinesregister.com/iowa-boating-accidents

Probability

Based of historic crash data shown in Table 3.25 and Figure 3.9, the County should expect several crashes each year, likely more than 200. Probability of a railway or air transportation events remain relatively low.

TABLE 3.26: TRAIN CRASHES IN BREMER COUNTY, 2007-2011

Date	Railroad	Location	# of Rail Cars	# of Injuries
12/12/2000	CEDR	Unincorporated	86	0
4/29/2003	CEDR	Waverly	44	1
12/2/2004	CEDR	Waverly	2	0
2/7/2005	CEDR	Waverly	6	0
11/2/2007	IANR	Shell Rock	1	0
10/28/2008	CEDR	Waverly	2	1
4/29/2009	CC	Unincorporated	21	1
9/5/2009	CC	Waverly	27	1
1/7/2011	CC	Unincorporated	101	0
7/27/2011	CC	Unincorporated	120	0

Source: Iowa Department of Transportation, retrieved 9/3/2015

Magnitude / Severity

Due to the large volume of roadway and intersections located in the planning area, there is a chance of a traffic accident, especially with large farm equipment entering and leaving agricultural lands. Persons driving on major thoroughfares are more vulnerable to traffic accidents due to the increase number of drivers on these roads and the corresponding speed limits. However, motorists on the county's rural roadways are also vulnerable to traffic incidents with farm equipment and just the rural nature of the roadway.

Jurisdictions (Janesville, Waverly and Plainfield) in close proximity to local rail lines are more vulnerable to be harmed in the event of a train derailment. Furthermore, at locations where local roadways intersect with the railroad the potential for an accident is higher.

All residents of the planning area have the potential to be vulnerable to an air traffic event. Most at risk to air traffic events are those who live or work in flight paths originating from the Waverly Municipal Airport or Waterloo Regional Airport or those near farms that use crop duster airplanes. Although this hazard is high, the number of people and amount of property directly affected is relatively low.

The exact areas that will be affected by a traffic event will likely be small, concentrated, and have a minimal impact on the residents as a whole, unless a large or extremely dangerous hazardous material spill should result from the event. The same can be said for a rail disaster. An air disaster may impact a larger portion of the county, depending on where the impact occurred and what type of aircraft actually wrecked. But for the most part, due to the planning area's rural environment, impact would be minimal.

Warning Time

Transportation incidents occur within seconds; therefore, there is no time to warn those in the pathway of the harmful effects.

Duration

The duration of time a transportation incident would impact the planning area is dependent upon the type and severity of the incident. For instance, a multiple-car incident could impact the surrounding community for a few hours, whereas a derailment blocking numerous crossing could impact the immediate area for a few days.

SECTION 4 – MITIGATION STRATEGY

COUNTYWIDE HAZARD MITIGATION PLAN GOALS

Broad-based goals were developed to address a multitude of hazards and encompass a variety of mitigation activities. The hazard mitigation plan goals identified are as follows:

1. Minimize to the greatest possible extent the number of injuries and/or loss of life associated with all identified hazards.
2. Reduce or eliminate property damage due to the occurrence of disasters.
3. Identify ways that response operations, in the event of a disaster, can be improved.
4. Return the community to either pre-disaster or improved conditions in a timely manner in the wake of a disaster.
5. Develop strategies that can be used to reduce the community's overall risk to the negative effects of natural, technological, and man-made disasters.
6. Reconvene the planning committee on an annual basis to review the plan document, check for compliance with the plan goals, and track progress in achieving the mitigation strategies.
7. Maintain the Countywide Multi-Jurisdictional format for future plan updates.

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

CURRENT HAZARD MITIGATION ACTIVITIES

Mitigation actions are grouped into six broad categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. The text box to the right provides clarification on these categories. Detailed information for each incorporated community can be found in their respective appendix.

Prevention Mitigation Actions

Bremer County currently has a Floodplain Management Ordinance which is administered by the County Zoning Administrator. All inquiries pertaining to construction areas in a floodplain are directed to the Administrator's Office and follow NFIP guidelines. The Iowa Department of Natural Resources and the Iowa Flood Center plan to have new flood maps available for Bremer County in 2012-2013. Bremer County has and enforces Zoning Ordinances. They issue building permits for the communities of Denver, Janesville, Tripoli and Readlyn. The County does issue Zoning Certificates for land areas under 35 acres. The Zoning and Subdivision Ordinance was adopted by the Bremer County Board of Supervisors in 1994 and is administrated by the County Zoning Administrator, Doug Bird.

Table 4.1, provides a compilation of the current planning and regulatory documents currently in place for each jurisdiction in Bremer County.

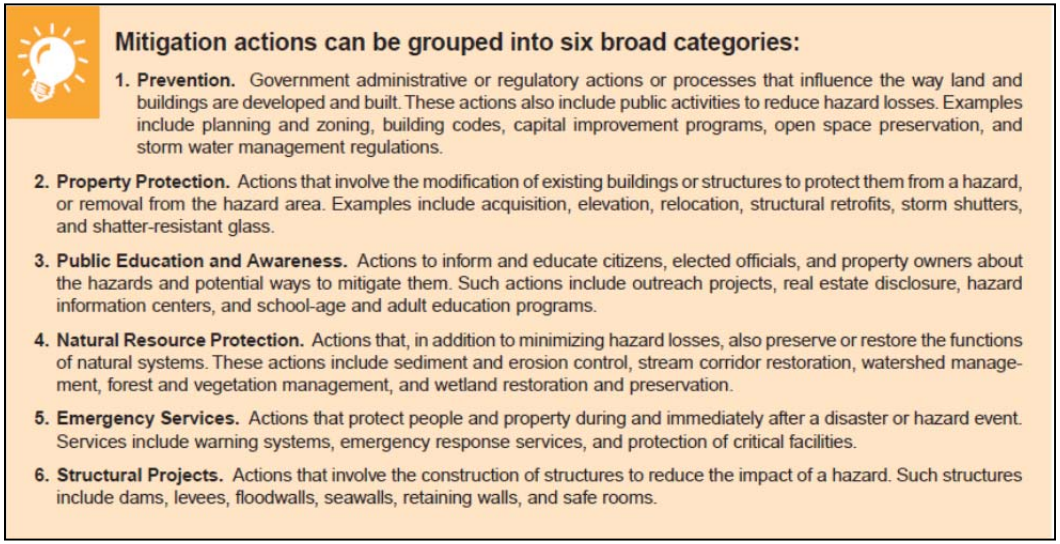


Figure 11: Six Broad Categories for Mitigation Actions
Source: FEMA

TABLE 4.1: CURRENT PLANNING AND REGULATORY DOCUMENTS FOR SELECTED COMMUNITIES

Community	Previous HMP	Comprehensive Plan	Building Code	Zoning Ordinance	Subdivision Regulations	Floodplain Management Ordinance	Tree-Trimming Ordinance	Storm Water Ordinance	Snow Removal Ordinance
City of Denver, IA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Frederika, IA	No	No	No	No	No	Yes	Yes	Yes	Yes
City of Janesville, IA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
City of Plainfield, IA	Yes	No	No	No	No	Yes	Yes	Yes	Yes
City of Readlyn, IA	Yes	Yes	Yes	Yes – RR	Yes	Yes	Yes	Yes	Yes
City of Sumner, IA	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
City of Tripoli, IA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
City of Waverly, IA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bremer County, IA	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes

Source: Local Communities
Notes: RR = Restricted Residential

Property Protection Mitigation Actions and Floodplain Management

On July 16th, 1990 Bremer County became active members in the National Flood Insurance Program (NFIP) by adopting its initial floodplain ordinance. The Federal Insurance Administration manages the insurance component of the NFIP, and works closely with FEMA's Mitigation Directorate, which oversees the floodplain management aspect of the program.

The study looked at the risk of having a 10, 50, 100, and 500 year flood event for both the unincorporated areas of the county and the communities of Denver, Frederika, Plainfield, Sumner, Tripoli and Waverly. A hydraulic analysis was conducted to establish the peak discharge-frequency relationships for each river in the study area. The county continues to enforce this ordinance in order to remain in good standing with the National Flood Insurance Program and to protect citizens and property from flooding. Bremer County has not participated in any buyout program. The only community that has participated in a FEMA buy-out program is Waverly (see Appendix H for additional information).

TABLE 4.2 NFIP STATISTICS IN BREMER COUNTY

Community	Participates in NFIP?	CID #	# of NFIP Policies	NFIP Insurance in Force ($)
Denver	Yes	190026	13	$1,812,200
Frederika	Yes	190027	2	$210,000
Janesville	Yes	190023	0	$0
Plainfield	Yes	190327	4	$370,800
Readlyn	Yes	190645	0	$0
Sumner	Yes	190029	15	$1,772,200
Tripoli	Yes	190669	3	$254,000
Waverly	Yes	190030	254	$38,810,000
Bremer County	Yes	190847	47	$5,655,000
Total	-	-	**338**	**$48,884,200**

Source: Federal Emergency Management Agency (FEMA); NFIP Statistics as of 12/31/2016

Table 4.2 lists the flood insurance information for the county and cities. All nine jurisdictions participate in the NFIP and have floodplain ordinances in place.

Table 4.3 displays the repetitive loss information for the county. As is apparent, the vast majority of the repetitive loss properties and damages are within the City of Waverly. Waverly is responsible for 84 percent of all repetitive loss instances and 91 percent of total losses.

TABLE 4.3: BREMER COUNTY REPETITIVE LOSS PROPERTIES						
Community	**Total number of RL Buildings**	**RL Buildings Insured**	**Total number of RL Instances**	**RL Instances Insured**	**Total RL Losses($)**	**RL Losses Insured ($)**
Denver	1	1	2	2	$17,715.66	$17,715.66
Frederika	-	-	-	-	-	-
Janesville	2	1	5	3	$29,886.75	$18,652.30
Plainfield	1	0	2	0	$22,511.90	$0.00
Readlyn	-	-	-	-	-	-
Sumner	2	1	4	2	$43,111.24	$39,735.45
Tripoli	1	0	2	0	$40,926.91	$0.00
Waverly	59	39	120	80	$2,500,017.12	$1,513,150.33
Bremer County	3	1	8	2	$87,047.84	$12,273.56
TOTAL	**69**	**43**	**143**	**89**	**$2,741,217.42**	**$1,601,527.30**
Source: Iowa Department of Natural Resources; Data does not include properties that have been mitigate; RL = Repetitive Loss; Data as of 11/30/2014						

Public Education and Awareness Mitigation Actions

Information regarding how to protect oneself in the event of a tornado is largely publicized in the form of flyers, radio, newspaper, and television announcements. The County provides basic safety information for various hazard events (i.e., tornados) and what to do before, during, and after an event.

The county also participates in the Alert Iowa notification program which allows citizens to sign up for the types of alerts they would like to receive. The best way to receive messages is via text message. Messages may contain photo, video and audio attachments to help subscribers better understand the situation at hand, or where to find additional information.[21]

Emergency Services Mitigation Actions

Bremer County's Emergency Management Coordinator is based out of the City of Waverly, the county seat. The Emergency Management Coordinator works in conjunction with local fire, rescue, police, and government officials to draft and implement workable emergency action plans in the community. The current Emergency Management Coordinator is Kip Ladage and current contact information is as follows: Bremer County Emergency Management Agency, 111 4th St. NE, Bremer-Waverly LEC, Waverly, Iowa 50677, (319) 352-0133, email: kladage@co.bremer.ia.us

[21] *http://homelandsecurity.iowa.gov/about_HSEMD/alert_iowa.html*

Law Enforcement

The Bremer County Sheriff's Office provides law enforcement for all of the unincorporated areas of the County along with providing assistance to the cities that have their own police force. The Bremer County Sheriff's Office has service contracts to provide law enforcement patrols with the communities of Frederika and Plainfield.

Fire Protection

Bremer County is divided into Fire Districts with 8 Fire Departments having coverage for every square mile of the County. Fire Departments serving Bremer County are Denver, Frederika, Janesville, Plainfield, Readlyn, Sumner, Tripoli and Waverly.

Ambulance

Much like the Fire Departments, the entire county is divided into Ambulance Districts. The entire county is covered just like with fire districts. Ambulance providers for Bremer County are: Denver Ambulance, Frederika Ambulance, Plainfield First Responders, Readlyn Ambulance, Sumner Ambulance, Tripoli Ambulance, and Waverly Ambulance. The County also receives Mutual Aid from Paramedic/Ambulance services from: Covenant Medical Center Ambulance Service, Sartori Ambulance Service, AMR Ambulance Service in Charles City, and Mason City Fire Department.

Medical Facilities

Bremer County has only one hospital within its boundaries – Waverly Health Center in Waverly; otherwise, residents go to neighboring counties for medical attention.

HAZMAT

All Bremer County jurisdictions contract with the Northeast Iowa Response Group for response to hazardous material spills. The Northeast Iowa Response Group is a division of Waterloo Fire Rescue as is the Hazardous Materials Regional Training Center. The Training Center provides training to fire departments and companies from around the state and country. Not only is this a training center it also serves as a hazardous materials quick response unit to Black Hawk County, surrounding counties, and many municipalities in a ten county region. The Unit provides local fire departments with hazard materials emergency procedures thus reducing additional contamination. An evacuation plan is also in place in conjunction with the activities with the local department. Contact information for the facility is as follows: Hazardous Materials Regional Training Center, 1925 Newell Street, Waterloo, Iowa 50707, Phone: (319) 291-4275, Toll Free: (800) 291-4682, Fax: (319) 291-4285

The jurisdictions also partners the Northeast Iowa Response Group for assistance in responding to any methamphetamine labs located in the city limits. The Response Group assists the Police Departments in containment of the site and disposal of the hazardous chemicals.

County Engineer and Secondary Roads Department

The Bremer County Engineer's Office is tasked with the maintenance of all roads within Bremer County. It is managed by Todd Fonkert, County Engineer, and the Secondary Roads Department is supervised by David Sharp and the shop equipment supervisor is Arlan Thoms. Bremer County has the following assets and in the Engineers/Secondary Roads Department: 12 motor graders, 15 dump trucks, 2 end loaders, 2 dozers, 1 semi-tractor/lowboy, 10 pickup trucks, and 2 rubber tire excavators.

Natural Resource Protection Mitigation Actions

The County currently does not have any projects underway.

Structural Projects Mitigation Actions

The County currently does not have any projects underway, but the County responds to natural disasters by checking roads and bridges for damage, providing traffic control and road closure if roadway facilities are damaged, and repairs minor damage as soon as possible. They also provide resources and transportation of materials to protect public infrastructure.

FUTURE HAZARD MITIGATION ACTIVITIES

While the existing mitigation activities discussed above detail the County's efforts to mitigate hazards when possible and to respond to hazards in a timely and efficient manner, the Committee also recognizes that there are many more mitigation activities and projects that would benefit residents. Thus, the Committee developed a list of future hazard mitigation activities that, if accomplished, would serve to further reduce the risk of hazards to the community. The list may include a combination of projects the Committee determined the community should try to accomplish and mitigation efforts that are ongoing that the Committee view as vital to the continued well-being of the public.

To prioritize the mitigation actions, the Committee discussed the STAPLEE prioritization criteria recommended by FEMA. STAPLEE is a tool used to assess the costs and benefits, and overall feasibility of mitigation actions. STAPLEE stands for the following: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Based on this analysis, each activity was ranked as High (H), Medium (M) or Low (L).

The STAPLEE criteria were discussed during the meeting and the Committee was asked to complete a scoring worksheet for the actions they would provide for inclusion in the plan. This process of identification and analysis of mitigation options allowed the Committee to come to consensus and to prioritize recommended mitigation actions. Emphasis was placed on the importance of a benefit-cost analysis in determining project priority; however, this was not a quantitative analysis. The Disaster Mitigation Act regulations state that benefit-cost review is the primary method by which mitigation projects should be prioritized. Recognizing the federal regulatory requirement to prioritize by benefit-cost, and the need for any publicly funded project to be cost-effective, the Committee decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Iowa Hazard Mitigation Plan. Cost-effectiveness will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

Based on the order in which they would like to see the actions implemented, committee members assigned a priority ranking of high, medium, or low. This ranking does not necessarily correspond to the results of the STAPLEE scoring system as the STAPLEE system considers all elements to be weighted the same; whereas, at the local level, in many cases, one or more elements may be more important to the Committee and the city driving certain projects to be ranked higher than others.

To prioritize the mitigation actions, the HMPC discussed the STAPLEE prioritization criteria recommended by FEMA. STAPLEE is a tool used to assess the costs and benefits, and overall feasibility of mitigation actions. STAPLEE stands for the following:

- **Social**: Will the action be acceptable to the community? Could it have an unfair effect on a particular segment of the population?
- **Technical**: Is the action technically feasible? Are there secondary impacts? Does it offer a long-term solution?
- **Administrative**: Are there adequate staffing, funding, and maintenance capabilities to implement the project?
- **Political**: Will there be adequate political and public support for the project?
- **Legal**: Does your jurisdiction have the legal authority to implement the action?
- **Economic**: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental**: Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

Committee members were asked to think about these questions while determining the priority for each action step. If the answer was “yes” to many of the above questions, then the action might take higher priority since it will have fewer complications, higher community support and the highest net beneficial impact on the community. INRCOG staff asked the committee to think about prioritization qualitatively, rather than quantitatively. Applying a score or number to each action may not provide an accurate gage since an action could score highly on many criteria, but in reality is a low priority since it’s not socially acceptable to the community.

Emergency management activities are action steps devised by the jurisdiction (s) that do not apply to any single hazard or hazards, per se. Rather, these steps advance the all or a majority of the plan goals and enhance the general safety of the community before and after a disaster. The steps identified are at the recommendation of the County Emergency Management Office and offer a general support function in disaster preparedness and recovery. Therefore, "Emergency Management" is not a profiled hazard, such as those found in Table 17. But they are action steps the jurisdictions currently engage in and are considered relevant mitigation activities.

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

ACTION PLAN FOR COUNTY

Funding

Although in the long-term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short-term each action will have an associated cost. The County and its municipalities will rely heavily on local funding sources to fulfill most of the plan obligations; however, they will also seek funds from State and Federal agencies for both pre- and post-disaster mitigation activities.

The estimated cost(s) for each mitigation action, program, or project is either: Minimal, Low, Moderate, or High depending upon various factors.

- Minimal: Cost estimate is $10,000 or less based on using current staff, time commitment, continuous of current duties, proposed action/program/ project, and funding sources.
- Low: Cost estimate for project range from $10,001 - $99,999 based on existing proposed treatment, time commitment, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.).
- Moderate: Cost estimate for project range from $100,000 - $299,999 based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.), and funding sources.
- High: Cost estimate for project range is $300,000 or higher based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, project components (permits, acquisition, coordination, etc.), and funding sources.

Implementation Strategy

Once the Committee identified and ranked the future hazard mitigation activities, the activities were then analyzed. In addition, the Committee identified a time line for each activity, identified the responsible party (ies) for each activity and finally related each activity to at least one of the five Hazard Mitigation Plan Goals listed above. Table 4.4 below is Bremer County's Implementation Strategy. Implementation Strategies / Action Plans for each municipality can be found in their respective appendix.

TABLE 4.4: BREMER COUNTY'S IMPLEMENTATION STRATEGY (UNINCORPORATED AREA)

Priority	Mitigation Action/Program/Project	Associated Hazard	Primary Agency Responsible for Implementation	Date for Completion	Estimated Cost (s)	Funding Source
Education/Public Awareness						
M	Educate the public	All	Bremer County EMA	On-Going	Minimal	Local
M	Implement early warning notification system, Alert Iowa	All	EMA, IHSEM	Active	Low	County, State
M	Encourage lead based paint and asbestos removal	HAZMAT	Building Department	On-Going	Minimal	Local
M	Encourage and maintain enrollment in emergency notification system	Thunderstorm/Lightning, Windstorm, Tornado, Communication Failure	Bremer County EMA	On-Going	Minimal	Local
M	Encourage home owners to keep emergency kits	Windstorm, Tornado	Bremer County EMA	On-Going	Minimal	Local
M	Encourage use of Iowa One call before digging	Communications Failure, Explosion	Building Department	On-Going	Minimal	Local
M	Encourage residents to keep smoke detectors, sprinkler systems and fire extinguishers maintained in their homes	Fire	Bremer County EMA	On-Going	Minimal	Local
M	Educate the public on maintaining their sump pumps	Flash Flood	County Roads Department	On-Going	Minimal	Local
M	Encourage the public to receive vaccinations	Disease	Bremer County EMA, Health Dept.	On-Going	Minimal	Local
M	Inform the public of reputable and ill reputable contractors following disasters	Emergency Management	Building Department	On-Going	Minimal	Local
M	Maintain the county website as a source of public information	Emergency Management	Staff	On-Going	Minimal to Low	Local
L	Notify the media on shelter locations	Severe Winter Storm, Extreme Heat, Tornado	Sheriff, EMA	On-Going	Minimal	Local
Emergency Services						
M	Continue training and education for fire departments, law enforcement agencies and ambulance crew personnel	All	Bremer County Supervisors and Roads Depts.	On-Going	Moderate	Local, State
M	Maintain and acquire materials and equipment for fire departments, law enforcement agencies and ambulance crew personnel	All	Bremer County Supervisors	On-Going	Minimal	Local, State
M	Maintain storm spotter training for local fire departments/deputies and EMS crews	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm	Bremer County EMA	On-Going	Minimal	Local
M	Make available a cleanup crew for after a storm	Thunderstorm/Lightning	Bremer County Supervisors, EMA	On-Going	Minimal to Low	Local
M	Acquire necessary response and detection equipment for	HAZMAT	Bremer County EMA	On-Going	Minimal	Local,

	city/county employees					State
M	Keep HAZMAT manuals/information current and easily accessible	HAZMAT	All County Departments	On-Going	Minimal	Local
M	Maintain list of potential translators to be called upon in case of an emergency	Communications Failure	Staff	On-Going	Low	Local
M	Maintain or install GPS units in all emergency service and city/county vehicles	Communications Failure	Staff	On-Going	Minimal	Local
M	Maintain automatic TTY TDD machines for emergency personnel and city/county employees	Communications Failure	Staff	On-Going	Minimal	Local
M	Maintain list of county emergency contacts	Communications Failure	Staff	On-Going	Minimal	Local
M	Continue cooperation between county roads department and local fire departments during snow emergencies	Severe Winter Storm	Roads Department	On-Going	Minimal	Local
M	Cooperate with any countywide mass vaccination plan	Disease	Bremer County EMA	On-Going	Minimal	Local
M	Develop and maintain staging area for dumping during cleanup	River Flood	Board of Supervisors, Public Works	On-Going	Minimal	Local
M	Set a designated number of people to be trained in post-disaster record keeping/damage assessments	Emergency Management	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Maintain and update emergency response plans	Emergency Management	Board of Supervisors, EMA	On-Going	Low to Moderate	Local
M	Maintain lists of personnel and equipment available to use with response plans	Emergency Management	Board of Supervisors, Staff	On-Going	Minimal	Local
L	Provide emergency shelters for evacuees	All	Bremer County EMA	On-Going	Minimal	Local
L	Provide fans and/or cooling shelter	Extreme Heat	County EMA	On-Going	Minimal to Low	Local
Natural Resource Protection						
M	Participate in Watershed Management Authority	Flash Flooding, River Flooding	Engineer, EMA	Active	Minimal	County
M	Participate in and cooperate with other jurisdictions in improving watersheds, including Watershed Management Authorities and Drainage Districts	Flash Flooding, River Flooding	EMA, Individual cities	Active	Minimal	County, State, Federal
M	Mitigate erosion along waterways and ditches through vegetation management	Landslide, Flash Flood, River Flooding	County IRVM	Active	Low	County
M	Maintain tree trimming program	Severe Winter Storm, Windstorm, Hailstorm	Bremer County Supervisors	On-Going	Low	Local
M	Maintain and/or develop a wellhead protection program	Groundwater Contamination	Board of Supervisors, Sheriff	On-Going	Low	Local, State
M	Monitor wells in areas of identified contamination	Groundwater Contamination	Board of Supervisors, EMA	On-Going	Low	Local
M	Monitor the drinking water supply	Groundwater Contamination, Disease	Board of Supervisors	On-Going	Moderate	Local
M	Identify and map areas of past contamination	Groundwater Contamination	Board of Supervisors	On-Going	Low	Local
M	Follow monitoring requirements set forth by the Iowa DNR	Groundwater Contamination	Board of Supervisors, Engineer	On-Going	Low	Local
M	Carry out conservation measures such as erosion control and work with the following organizations: Extension, NRCS, Farm Bureau, EPA, DNR, and Soil and water Conservation District	Terrorism	Board of Supervisors, Engineer	On-Going	Moderate	Local, State, Federal
M	Clear ditches, streams, and waterways on a regular basis	River Flood	Board of Supervisors, Public Works	On-Going	Minimal	Local
M	Purchase additional parkland in order to increase greens	River Flood	Board of Supervisors	On-Going	Minimal	Local

	space and reducing surface flow					
L	Restrict water usage should it be necessary	Drought	Board of Supervisors	On-Going	Minimal to Low	Local
L	Plant trees along water bodies and slopes	Landslides/Mudflows	Board of Supervisors, Public Works	On-Going	Minimal	Local
Prevention						
H	Maintain mutual aid agreements with the Northeast Iowa response Group	HAZMAT	Board County Supervisors	On-Going	Minimal	Local
H	Complete continuity of government plan	Communications Failure	Board of Supervisors	On-Going	Minimal	Local
M	Maintain mutual aid agreements	All	Bremer County EMA, Supervisors	On-Going	Minimal	Local
M	Maintain county roads department	Severe Winter Storm, Transportation	Bremer County Supervisors	On-Going	Minimal	Local
M	Determine locations for potential heating shelters and volunteer organization	Severe Winter Storm	Bremer County EMA	On-Going	Minimal	Local
M	Purchase and maintain backup generators	Severe Winter Storm, Thunderstorm/Lightning, Tornado, Emergency Management	Bremer County EMA	On-Going	Minimal	Local
M	Maintain public works equipment	Severe Winter Storm	Public Works	On-Going	Minimal	Local
M	Backup all digital data	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
M	Purchase NOAA weather radios	Thunderstorm/Lightning, Windstorm, Tornado, Radiological/Nuclear Event	Bremer County EMA	On-Going	Minimal	Local, State
M	Place alarms on storage facilities containing hazardous materials	Hazardous Materials (HAZMAT)	Bremer County EMA	On-Going	Minimal	Local
M	Maintain law enforcement monitoring of large storage supplies	HAZMAT	Sheriff	On-Going	Minimal	Local
M	Provide a local hazardous waste dropoff site	HAZMAT	Board of Supervisors	On-Going	Minimal to Low	Local
M	Maintain, test, and replace warning sirens	Windstorm, Tornado, Hailstorm, Thunderstorm/Lightning, Communications Failure	Bremer County EMA	On-Going	Minimal to Low	Local, State
M	Identify areas throughout the county that would substantially benefit from outdoor warning sirens	Windstorm, Tornado	Bremer County EMA	On-Going	Moderate	Local, State
M	Encourage backup power generation for local telephone systems and cellular operations	Communications Failure	Bremer County EMA	On-Going	Minimal	Local
M	Enhance Standard Operating Procedures for dissemination of information/press releases in the event of a disaster	Communications Failure	Bremer County EMA	On-Going	Minimal	Local
M	Continue training and promotion of the Incident Command System	Communications Failure	Bremer County EMA	On-Going	Minimal	Local, State
M	Upgrade radio communications equipment as needed	Communications Failure	Bremer County EMA	On-Going	Minimal	Local
M	Regularly review and amend fire and medical HAZMAT response standard operating procedures	Communications Failure	Bremer County EMA	On-Going	Minimal	Local
M	Improve standard operating procedures for schools	Communications Failure	Bremer County EMA, Schools	On-Going	Minimal	Local
M	Seek to improve communications with other agencies	Communications Failure, Terrorism	Bremer County Supervisors	On-Going	Minimal	Local
M	Keep supply of backup radios and cellphones	Communications Failure	Staff	On-Going	Minimal to Low	Local
M	Keep the county updated on personnel changes	Communications Failure	Staff	On-Going	Minimal to Low	Local

M	Stockpile sand and sandbags	Flash Flood, River Flood	Bremer County EMA	On-Going	Minimal to Low	Local
M	Maintain and improve signals/signage along roadways and at railroad crossings	Transportation	Roads Department, Sheriff	On-Going	Minimal	Local, State
M	Establish alternative transportation routes should a road need to be closed	Transportation	Bremer County EMA, Sheriff	On-Going	Minimal	Local
M	Ensure that all county road maintenance personnel are trained in the proper procedures for road preparation and repair	Transportation	Board of Supervisors, Roads Department	On-Going	Minimal	Local
M	Purchase emergency signs to be used in case of an incident	Transportation	Board of Supervisors, Sheriff, EMA	On-Going	Minimal	Local
M	Enforce no parking designations at special events	Transportation	Sheriff	On-Going	Low	Local
M	Identify fallout shelter locations	Radiological/Nuclear Event	Board of Supervisors	On-Going	Low	Local
M	Keep communication lines open with Nuclear Plant in Palo, IA	Radiological/Nuclear Event	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Maintain and update anti-virus software	Terrorism	Staff	On-Going	Minimal	Local
M	Secure vulnerable targets, as identified by the LEPC and County EMA with alarms, security cameras and fences	Fire, Explosion	Sheriff	On-Going	Minimal	Local
M	Continue contract with county public health nursing agency	Extreme Heat	Bremer County EMA, Health Dept.	On-Going	Minimal	Local
M	Monitor disease outbreak news from the CDC and Iowa Department of Public Health	Disease	Bremer County EMA, Sheriff	On-Going	Low to Moderate	Local
M	Initiate and enforce burn ban in times of drought or as needed	Drought	Board of Supervisors	On-Going	Minimal to Low	Local
M	Enforce a curfew	Riot/Violent Demonstration	Sheriff	On-Going	Minimal to Low	Local, State
M	Establish detour routes	Bridge Failure, Flash Flood, River Flood	Board of Supervisors, Sheriff	On-Going	Min. to Low	Local
M	Enforce the local zoning ordinances	Landslides/Mudflows	Building Department	On-Going	Minimal	Local
M	Update flood maps/flood studies for areas throughout the county	River Flood	Board of Supervisors	On-Going	Minimal	Local
M	Establish transportation evacuation routes and protocols	River Flood	Board of Supervisors, EMA, Sheriff	On-Going	Minimal	Local
M	Develop sandbagging procedures for the community	River Flood	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Continue cooperation with county in developing flood mitigation efforts	Flash Flood, River Flood	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Continue working with the Bremer County Recovery Coalition	Flash Flood, River Flood	Board of Supervisors, Health Department, EMA, Sheriff	On-Going	Minimal	Local
M	Encourage all communities to participate in their Local Emergency Planning Commission (LEPC)	Emergency Management	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Maintain communication with county contacts	Emergency Management	Board of Supervisors, Staff	On-Going	Moderate	Local
M	Maintain NIMS compliance	Emergency Management	Board of Supervisors, EMA	On-Going	Moderate	Local, State, Federal
L	Maintain air conditioner(s) in community buildings	Extreme Heat	Public Works	On-Going	Minimal	Local
L	Keep a supply of drinking water to distribute	Extreme Heat	Bremer County EMA	On-Going	Low	Local
L	Develop rationing procedures	Drought	Board of Supervisors	On-Going	Minimal	Local

Property Protection						
M	Maintain use of snow fences in the city/county	Severe Winter Storm	Public Works	On-Going	Minimal	Local
M	Use surge protectors to prevent electrical damage to critical and sensitive equipment	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
M	Enforce and update building codes, as needed	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm, Expansive Soils, Earthquake	Building Department	On-Going	Minimal	Local
M	Continue fire prevention program	Fire	Bremer County EMA	On-Going	Minimal	Local
M	Maintain membership in the NFIP	Flash Flood, River Flood	Board of Supervisors, EMA	On-Going	Minimal	Local
M	Maintain, enforce and update floodplain ordinance	Flash Flood, River Flood	Board of Supervisors	On-Going	Minimal	Local
M	Maintain and keep storm drains clear of debris	Flash Flood	Public Works	On-Going	Minimal	Local
M	Identify, purchase and remove structures from flood hazard areas	Flash Flood, River Flood	Bremer County EMA, Building Department	On-Going	Moderate	Local, Federal
M	Review and update fire codes as necessary	Fire, Explosion	Building Department	On-Going	Minimal	Local
M	Continue to cooperate with pipeline owners and operators to ensure locations are marked	Fire, Explosion	Board of Supervisors	On-Going	Minimal	Local
M	Encourage the use of proper materials and construction techniques	Expansive Soils	County Building Department	On-Going	Minimal to Low	Local
M	Place barricades to close dangerous bridges	Bridge Failure	Board of Supervisors, Sheriff	On-Going	Minimal to Low	Local
M	Identify and inventory potential sinkhole sites	Sinkholes	Public Works	On-Going	Minimal to Low	Local
M	Encourage floodproofing/elevating structures in the floodplain	River Flood	Board of Supervisors, Building Department, EMA	On-Going	Minimal	Local
M	Encourage construction of dikes, levees, dams, and retention ponds	River Flood	Board of Supervisors, Engineer	On-Going	Minimal	Local
L	Encourage utility providers and developers to place all utilities underground	Severe Winter Storm, Communications Failure, Thunderstorm/Lightning	Bremer County Supervisors	On-Going	Moderate	Local
L	Secure the area (around a sinkhole)	Sinkholes	Public Works	On-Going	Minimal	Local
L	Inspect any utility lines that are near a sinkhole	Sinkholes	Public Works	On-Going	Minimal	Local
Structural Projects						
H	Elevate roads and bridges to mitigate flooding	River Flooding, Flash Flooding, Infrastructure Failure	County Engineering	Short-Term	Medium	County
M	Acquire property, as needed, to implement capital improvement plan infrastructure mitigation actions	Infrastructure Failure	County Engineering	Active	Medium	County
M	Mitigate threats of low-head dams	Infrastructure Failure	County Engineering	Long-Term	Medium	County, State
M	Construct or designate a safe room or storm shelter	Windstorm, Tornado, Hailstorm	Bremer County EMA	On-Going	High	Local, State, Federal
M	Pursue partnership with rural water as the system expands	Fire, Explosion	Board of Supervisors	On-Going	Minimal	Local
M	Install tiling to help water move away from structures	Expansive Soils	County Building Department	On-Going	Minimal to Low	Local

M	Continue regular bridge inspections	Bridge Failure	Board of Supervisors, Engineer	On-Going	Minimal to Low	Local
M	Maintain embargos/weight limits as necessary	Bridge Failure	Board of Supervisors, Engineer	On-Going	Minimal to Low	Local, State
M	Receive education/training from DOT on the subject	Bridge Failure	Board of Supervisors, Building Department	On-Going	Minimal to Low	Local, State
M	Identify bridges and culverts than can cost effectively be reengineered to reduce future flooding	River Flood	Board of Supervisors, Engineer	On-Going	Minimal	Local
M	Regularly inspect dams and levees	Dam/Levee Failure	Board of Supervisors, Engineer	On-Going	Minimal to Low	Local
L	Acquire more water pumps	Flash Flood, River Flood, Dam Failure, Levee Failure	Bremer County EMA, Public Works	On-Going	Minimal	Local
L	Purchase additional trash pumps	Flash Flood, River Flood	Board of Supervisors	On-Going	Minimal	Local
L	Establish backup plan in case levees fail	Levee Failure	Board of Supervisors, EMA, Engineer	On-Going	Minimal	Local

SECTION 5 – PLAN MAINTENANCE

MONITORING, EVALUATING, AND UPDATING THE PLAN

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive plans or capital improvement plans, when appropriate.

Requirement §201.6(c)(4)(ii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Amendment

This is a five-year plan, commencing upon FEMA Certification, and any future amendments to the plan shall occur only after an official Public Notice has been posted in a local publication announcing a Public Hearing on the matter. After the public has had the opportunity to review the proposed amendments the Board of Supervisors may, by resolution, choose to accept any amendment to the plan. Once the Bremer County Board of Supervisors has adopted the amendment, the elected board of each participating municipality shall hold a public hearing to receive public input on the amendment prior to local adoption. Any and all amendments made to this plan should be shared with the Bremer County Emergency Management Agency and the Iowa Department of Homeland Security and Emergency Management Division. At a minimum, this Plan will be evaluated for consistency with FEMA and IHSEMD requirements and formally updated every five (5) years.

Phasing & Incorporation into Other Planning Mechanisms

Phasing is a process by which the completion of a project occurs over several budget cycles. It is recommended that this review be incorporated into the City's or County's annual Capital Improvements Program update procedure. For projects that require a local match commitment, the Council or Board of Supervisors should begin setting aside appropriate resources to meet their match liability.

Each jurisdiction will consider the findings from this document when updating other planning documents in the future. Examples of planning documents that would benefit from information provided in this plan include, but are not limited to: Comprehensive Land-Use Plans and Urban Renewal Plans. Existing and future Zoning and Subdivision Ordinances as well as Building Codes should consider the goals, guidelines, and actions presented in this Plan. In addition, the projects defined herein may be prioritized for funding through the jurisdictions' budgeting process. Finally, the information presented in the Plan may be used as documentation for grant and/or loan programs, including the Hazard Mitigation Grant Program (HMGP).

Each of the jurisdictions with previous HMPs (excludes Frederika) have incorporated their plans into their comprehensive land use plans. Although the wording differs in each plan, all the land use plans state the jurisdiction will protect the general health, safety and welfare of the community, adhere to the NFIP, avoid development in the floodplain, work with neighboring jurisdictions on planning issues of common interest. INRCOG develops transportation plans for the entire planning region and many jurisdictions include projects in the plan that will make the roadways safer and reduce accidents. The County Emergency Management Office works on disaster response and preparedness plans and regularly holds meetings with the jurisdictions.

Evaluation & Review Process

Ultimately, the Bremer County Emergency Management Coordinator and City Councils from all jurisdictions are responsible for the Hazard Mitigation Plan and implementation of the goals and actions contained herein, and they may seek assistance from other city or county staff, Council of Governments, and consultants in order to accomplish mitigation projects. To assist in the review process, the Hazard Mitigation Committee (as mentioned in Section 1) may reconvene annually upon the request of the Bremer County Emergency Management Coordinator. As mentioned in Section 1, said Committee will be comprised of representatives from each participating jurisdiction as well as from neighboring communities, schools, businesses, nonprofits, agencies, academia, and other interested parties and together they will be charged with reviewing and evaluating implementation progress of the mitigation plan. In addition, a public notice will be posted at all city and county government buildings, on jurisdictional websites, and in the local newspapers inviting the general public to participate as members of the Committee and/or to review the Plan and provide comments. Copies of the Plan and the Committee's review will be available at all government offices (city halls and courthouse). Following the Committee's completion of the annual review process, the findings of the review and recommended changes, if applicable, will be presented during a City Council and Board of Supervisors meeting, which is a public meeting. Evaluation forms to assist in the review, evaluation, and updating process can be found in Appendix M.

Appendix L details the progress each jurisdiction has made since the adoption of their previous plans. Since many activities fall under the normal duties of most city governments (e.g. funding and maintaining emergency services), not many activities were deleted.

Incorporation into Other Planning Mechanisms

Each county and city department will consider the findings from this document when updating other planning and operating documents in the future. Examples of planning documents that would benefit from information provided in this plan include, but are not limited to: Comprehensive Land-Use Plans and Urban Renewal Plans. Existing and future Zoning and Subdivision Ordinances as well as Building Codes should consider the goals, guidelines, and actions presented in this Plan.

Continued Public Participation

Bremer County is fortunate to have one of the most enthusiastic and experienced coordinators in Iowa. The cities typically do not initiate meetings with the public to discuss hazard mitigation issues, the Emergency Management Office conducts meetings, whereby the cities and public are invited to cover disaster response and recovery issues. The coordinator attends city council meetings in every jurisdiction to discuss and inform on these issues. The most common issues discussed include, tornado sirens, safe rooms, generators, storm spotter training and other training issues. The coordinator also ensures each jurisdiction regularly refers to their HMP, participate in any HMP development meetings and to monitor the plan expiration dates. The coordinator also sends each jurisdiction updates in the mail and email, regularly updates the county website and maintains an active Facebook account.

In order to ensure that the public remains involved in the future implementation of this Plan, it shall remain on hand at all participating city halls and the county courthouse. This Plan shall be made available to any party who requests to see it. If a jurisdiction intends to make or discuss amendments to the plan, a meeting with corresponding agenda shall be developed and posted; a newspaper notice shall be submitted and if necessary a legal notice will be published; and the Hazard Mitigation Committee members will be notified of the meeting via email, telephone, or regular mail. Also, the amendments shall also be made available prior to a City Council or Board of Supervisors action so that the public may be made aware. Consistent with the Iowa Open Meeting and Records Laws (Iowa Code Chapters 21 and 22), said meetings will be open to the public and all records shall be available for inspection. The coordinator will continue to work with each participating jurisdiction in ensuring the plan goals are followed and that these jurisdictions are properly prepared for any disaster that may come.

APPENDIX A: CITY OF DENVER

COMMUNITY PROFILE

Location

Denver is located in south-central Bremer County, in the northeastern quadrant of Iowa, at latitude 42.67 N x longitude 92.33 W and elevations ranging from 940 to 1,010 feet.

Natural Environment

The City of Denver is located between the Cedar River to the west and the Wapsipinicon River to the east. Two major highways serve the community. U.S. Highway 63 is a north-south route, which now bypasses the City to the west. The second is County Road C50, which is an east west route through the community.

The terrain on which Denver is built is generally the undulating topography that characterizes the agricultural areas of northeast Iowa. There are a few areas of steeper than normal slope with these being dispersed throughout the community adjacent to watercourses. The highest point in the community lies at approximately 1,010 feet above sea level and is located in the southeast are of town.

History

The City of Denver is located in Jefferson Township, which was originally inhabited by various tribes of Winnebago, Mesquakie, and Pottowattamie Indians. Many of these tribes camped near the Big Woods west of town along Quarter Section Run Creek.

In the spring of 1845, Charles McCaffree became the first white settler in the territory. He claimed an entire section within Jefferson Township, and raised 50 acres of sod corn in the first year.

TABLE A1: CITY OF DENVER DEMOGRAPHICS

Government Framework	Mayor – City Council
General Population, 2010 Census	
Total Population	1,780
Total Males	848
Total Females	932
Median Age	38.5
At-Risk Population, <18 Yrs	472
At-Risk Population, >64 Yrs	298
One Race-White	1,759
Black or African American	2
American Indian and Alaskan Native	1
Asian)	5
Other Race	5
Two or More Races	8
Hispanic or Latino	10
Total Household Population	1.749
Total Population in Group Quarters	31
Persons in Group Quarters – Institutionalized	31
Persons in Group Quarters – Noninstitutionalized	0
Housing Characteristics, 2009-2013 ACS	
Total Housing Units	742
Total Owner-Occupied Housing Units	549
Total Renter-Occupied Housing Units	152
Total Vacant Housing Units	30
Total 1-Unit Detached and Attached Structures	607
Total 2, 3, and 4-Unit Structures	59
Total 5 to 19-Unit Structures	73
Total Mobile Homes	3
Year Majority of Housing Units were Built	1939 or earlier (40%)
Average Household Size	2.50
Average Family Size	2.97

The major business at this time was the steam powered saw and gristmill located on Washington Street. The mill was grossing $100 to $125 a day at the height of its operation. A general mercantile store was established in 1855 that supplied settlers with the necessities of day-to-day life. Other businesses established from 1855 to 1900 included a lumber and grain mill, blacksmith shop, farmer's produce, livery stable, insurance company, and various bars and cafes.

Denver became incorporated in 1896 and the first Mayor, H. Braun, and City Council, composed of six members were elected. In 1902, the Waterloo-Cedar Falls Rail Transit extended service into Denver. The rail line ran where present day Transit Street lies. The new transportation facility made it possible for persons to ride from Denver to as far as Iowa City. However, in 1955, the passenger service was abandoned and the line was later dismantled. Nevertheless, the extension of the rail line in 1902 brought electrical service into the community from Waterloo, which enhanced the quality of life both socially and economically.

From 1906 to 1917, Denver was supplied with public facilities. On August 2, 1906, waterworks bonds were issued in the sum of $5,000 in order to build a water tower on the northeast corner of Main and Russell, with a reservoir capacity of 50,000 gallons. Denver bonded again in 1917 to install a sewage disposal system.

From 1960 on, Denver experienced accelerated economic and population growth and greater demands were placed on public facilities. In order to meet these demands, the city purchased a site in 1965 on the northeast corner of Fairview and Lincoln for the construction of a new water tower with a storage capacity of 250,000 gallons. This same year construction began on a new sewage disposal system located south of the city at a cost of $100,000.

TABLE A1.1: CITY OF DENVER DEMOGRAPHICS

Economics Characteristics, 2010-2014 ACS	
Population 16 years and over	1,386
Population In Labor Force (16 yrs and over)	1,002
Persons Employed	983
Persons Unemployed	19
Persons Employed in Management, Business, Science, and Arts Occupations	323
Persons Employed in Service Occupations	205
Persons Employed in Sales and Office Occupations	230
Persons Employed in Natural Resources, Construction, and Maintenance Occupations	63
Persons Employed in Production, Transportation, and Material Moving Occupations	162
Median Household Income	$57,688
Median Family Income	$67,830
Percent of Persons < 18 yrs. Below Poverty Level	8.0%
Percent of Persons 18-64 Yrs. Below Poverty Level	4.9%
Percent of Persons >65 Yrs. Below Poverty Level	2.5
Social Characteristics, 2010-2014 ACS	
School Enrollment (3 yrs and over)	473
Nursery School, Preschool	45
Kindergarten and Elementary School (grades 1-8)	182
High School (grades 9-12)	138
College or Graduate School	74
Education Attainment: Population 25 Years and Over	1,219
Less than High School Graduate	2.6%
High School Graduate (includes equivalency)	34.6%
Some College, Associate's Degree	35.5%
Bachelor's Degree or Higher	27.3%

A detailed early history of Denver may be found in the History of Butler and Bremer Counties, Iowa, published by the Union Publishing Company, Springfield, Illinois, 1983. Additional information can be found in the Denver Public Library.

Demographics

Population

Denver's demographic data is outlined in Tables A1 and A1.1. In the recent 2010 U.S. Census, Denver's population grew to 1,780, an increase of 9.4 percent over ten years. The previous U.S. Census, taken in 2000, recorded a population figure of 1,627 for Denver.

Community Services

The City of Denver has a municipal water supply with an elevated storage capacity of 576,000 gallons with an average capacity of 180,000 gallons. The peak demand is 285,000 gallons per day (gpd).

A primary sewer treatment plant serves Denver. Average load is 240,000 (gpd) with a peak load of 780,000 (gpd). The rated capacity of the sewer treatment plant is 2,500,000 gallons and is more than sufficient to handle Denver's current development as well as future development.

Table A2 shows the primary utility providers for the City of Denver

TABLE A2: DENVER UTILITY PROVIDERS						
Electric	**Natural Gas**	**Telephone/Internet**	**Cable**	**Water**	**Sewer**	**Sanitation**
City of Denver	MidAmerican Energy	Qwest	Mediacom	City of Denver	City of Denver	City of Denver

HAZARDS & RISK ASSESSMENT

Hazard Analysis

Section 3 identified and profiled the hazards for the entire planning area. However, each community analyzed their own vulnerability to those hazards applicable to their jurisdiction. Using the methodology outlined in Section 3 (Vulnerability Assessment), the City of Denver evaluated the risk associated with a specific hazard, defined by probability and frequency of occurrence, magnitude, severity, exposures, and consequences. Denver's vulnerability assessment provides in-depth knowledge of the hazards and vulnerabilities that affect the community. This analysis provides an all-hazard approach when evaluating the hazards of that affect the city, and the associated risks and impacts each hazard presents.

As mentioned previously in Section 3, the vulnerability assessment requires a five-year review with periodic updates, as needed. Potential future hazards and impacts may result from changing technology, new critical facilities, infrastructures, and development patterns, as well as demographic and socioeconomic

changes that occur within or outside the area.

Disaster frequency and its effects or severity are important as a basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, whereas manmade or technological events tend to change over time with advancement in technology and methods of operation. Five criteria were used by the Committee to assure a systematic and comprehensive approach to hazard analysis for their individual jurisdictions included: Historical Occurrence, Probability, Vulnerability, Maximum Geographic Extent, Severity of Impact, and Speed of Onset. Due to recent disasters and events that have impacted the planning area, Denver determined that even though the historical occurrences were low for certain hazards, the probability ranking for future occurrences should be higher.

Table A3 is the hazard analysis scores for the City of Denver.

As seen in Table A3, the top three hazards for Denver are Tornado/Windstorm, Severe Winter storm, and Thunderstorm/Lightning/Hail.

TABLE A3: CITY OF DENVER HAZARD RISK ASSESSMENT

Hazard Rank	Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Hazard Score
1	Tornado/Windstorm	3	4	4	4	**3.55**
2	Severe Winter Storm	4	3	3	3	**3.45**
3	Thunderstorm/Lightning/Hail	4	3	3	2	**3.35**
4	Flash Flood	3	3	3	2	**2.9**
5	Infrastructure Failure	2	4	4	1	**2.8**
6	HAZMAT Incident	2	2	4	4	**2.5**
7	River Flooding	2	3	2	2	**2.3**
8	Extreme Heat	2	3	1	3	**2.25**
9	Animal/Plant/Crop Disease	3	1	1	4	**2.2**
9	Grass/Wild Fire	2	2	4	1	**2.2**
9	Transportation Incident	3	2	1	1	**2.2**
12	Human Disease	2	2	3	2	**2.15**
13	Sinkholes	2	2	2	2	**2**
14	Terrorism	1	2	4	3	**1.95**
15	Landslide	1	1	4	3	**1.65**
16	Drought	1	2	1	4	**1.6**
17	Dam / Levee Failure	1	1	3	3	**1.5**
18	Earthquake	1	1	1	1	**1**
18	Expansive Soils	1	1	1	1	**1**
18	Radiological Incident	1	1	1	1	**1**

Vulnerability – Identifying Assets (Critical Facilities)

This section will describe the vulnerability for existing and future buildings, infrastructure, and critical facilities in those areas that can be impacted by the prioritized hazards. Since the majority of the hazards have an undefined hazard area (i.e., affecting an entire community or larger area) the following vulnerability assessment will only address those hazards that affect a specified area – flooding (river and flash). However, due to the community's historical occurrences of tornadoes and the ability of them to result from the community's top natural hazards (thunderstorms and lightning), this hazard was added to the assessment. The following discussion only considers the assets in the community of Denver.

Identifying the location of critical facilities and designated shelters (see Table A3) in Denver is important in order to assess their vulnerability to hazards since these facilities are important to the community's operations, quality of life, and are key components of the economic sector. For instance, high-density residential or commercial development, schools, police stations, government buildings, hospitals and care facilities, airports, gas stations, hardware stores, grocery stores, and water supply systems. It is important to know the threats each hazard poses to these facilities. Map *6B* illustrates the location of identified critical facilities throughout Denver.

According to the available data sources, Denver is projected to see an increase in population over the next thirty years. This population increase will most likely result in a greater need for additional critical facilities. However, the need for more critical facilities should be closely monitored these next 5-years and readdressed when this HMP is updated.

TABLE A3: CRITICAL FACILITIES IN DENVER

Denver Elementary School	Denver Middle School
Denver High School	St. John's Church
St. Paul's Church	Denver Baptist Church
St. Peter's Church	American Legion Post
Denver City Hall and Library	Water Tower and Treatment Plant

Source: Community

TABLE A4: CITY OF DENVER 100-YEAR FLOODPLAIN PROPERTIES

Number of Structures	109
Building Value	$ 2,984,910
Dwelling Value	$ 2,508,140
Total Value	$ 5,403,050

Source: INRCOG & Bremer County Assessor (2011 Values)

Previously, the city has utilized the Community Center as a cooling center during extreme heat events.

Flooding

A facility vulnerable to flooding is normally low, since these structures are not often constructed within the 100-year floodplain. According to the information provided, bridges and roadways would be impacted by flooding. This disruption in the transportation infrastructure would create a longer time period to receive and provide services and supplies to an area if a bridge was washed away due to flooding.

According to the data provided by INRCOG, Bremer County, and FEMA, there is approximately 215 acres of land within the 100-year floodplain. As shown on *Attachment 5A: Flood Scenario Map of the City,* this land is along a small creek on the west side of the community. Much of the community is located outside the floodplain to the east. However, flash flooding within the built areas of the community can cause property and potential injuries if the flash flood event is large. Measures should be taken to ensure problematic areas are dealt with to reduce future flash flooding events. According the *Flood Scenario Map*, there are

28 dwellings and 81 buildings located within the identified floodplain. The total value of these structures is given in Table A4. Using the average household size figure (2.46) from the 2000 Census for Denver, approximately 69 people are living in dwellings within the floodplain.

Tornadoes

As stated on the FEMA website[22], mobile homes are highly vulnerable to tornadoes. Even mobile homes that are tied down, offer little protection from tornadoes.

According to Census information and the Bremer County Treasurer's office, there are 2 mobile homes located in the City of Denver. General observation would suggest a recent increase in the number of manufactured homes in the area. This increased popularity has the potential to increase the potential risk of damage to people and property in the community. Currently, no FEMA certified tornado safe shelters are known to exist in the community.

The primary reason for the increased popularity of mobile and manufactured homes is affordability. Although HUD regulations and local building codes have increased the safety components of these types of houses significantly in recent history, this affordability has often been accompanied with a reduced level of safety. Based on national data on circumstance of tornado fatalities between 1985 and 1997, it was found that 38% of fatalities were occupants of mobile or manufactured homes, 27% were in permanent homes, 11% in vehicles, 9% outdoors (open), 4% in businesses, 4% in structures with long-span roofs, and 2% in schools. These data highlight the high exposure of occupants of mobile and manufactured homes (*AR State Hazard Mitigation Plan, 1999*).

Nursing homes or skilled living centers are also highly vulnerable to tornadoes. These facilities are designed for caring for the elderly population, majority of which use wheelchairs or other assistance devices, limiting mobility. Also, the majority of nursing homes are constructed as a single-level building with or without basements. Therefore, additional attention needs to be taken to ensure the safety of the residents and employees before, during, and after a tornado event. Denver Sunset Nursing Home has a capacity of 31 patients.

[22] Federal Emergency Management Agency (FEMA), http://www.fema.gov/areyouready/tornadoes.shtm

Vulnerability – Social Assets (Populations)

The social vulnerability assessment identified how the hazards affect the population of Denver and it is assumed that the identified populations are more likely to require assistance during times of disaster; therefore, are considered, generally speaking, more "at-risk" than the remaining population. The "at-risk" population must be identified and targeted in successful mitigation efforts. Table A5 presents an overview of the at-risk population in Denver according to information retrieved from the 2010 U.S. Census and Iowa Data Center.

TABLE A5: CITY OF DENVER'S "AT-RISK" POPULATION

	2010
Total Community Population (2010)	1,780
Elderly (65 yrs and older)	298
Youth (under 18 yrs old)	472
Householder Living Alone	167
Non-English Speaking Population (speaks English less than 'very well'	1.2%
Population Living in Poverty	5.4%
Population in Mobile Homes	8
Group Quarters Population	31

Source: U.S. Census, 2010, Iowa Data Center, and 2014 ACS 5-Year Averages

According to Table A5, 15 percent of residents are 65 years and older. There are also 31 persons living in group quarters or nursing or skilled health facilities in the community. Denver Sunset Home, located in the northern part of the city, is the only group care facility in the community.

Persons under the age of 18 are also at higher risk during some disasters. This is mostly due to the fact that young persons often are not aware of the proper actions to take in the event of a disaster. In addition, very young children would be more susceptible to a disaster such as a disease epidemic simply due to their age. In 2000, there was 24% of the city's total population under the age of 18.

In addition, persons living in mobile homes, also known as manufactured housing may also be at risk from tornadoes or high winds. According to American Community Survey (ACS) data, there are three mobile homes in the community; however, these units are not within a mobile home park, but as standalone units on parcels located throughout the city. Based on the average household size (2.50 persons), it can be estimated that approximately eight persons live in mobile homes within the city.

The planning committee identified the Denver Sunset Home, Denver Community Schools, and the Denver Public Library as facilities that may be more vulnerable due to gatherings and age groups of attendees (school-aged children or elderly persons).

Vulnerability – Estimating Potential Property Losses

Valuations are an important component of hazard mitigation planning insomuch as it provides measurable data that can be used to form some type of estimate as to the potential losses a community could face in the event of a catastrophic disaster.

TABLE A6: CITY OF DENVER VALUATIONS

Land Use Types	Total Valuation 100%	Average Valuation per Unit or Parcel
Residential Property	$86,794,100	$145,384 / parcel
Commercial Property	$8,159,030	$138,289 / parcel
Industrial Property	$3,501,400	$583,567 / parcel
Agricultural Buildings	$316,870	$105,623 / unit
Agricultural Land	$358,230	$1,119 / acre
Exemptions (military)	$203,720	
Gross Valuation	$98,925,910	

Source: City of Denver and Bremer County Assessor, as of 1/1/2010

The valuations for the City of Denver are available from the County Assessors and Auditors offices. It should be noted however that these dollar amounts do not include gas and electric

utility valuations. City of Denver's property valuations are in Table A6.

Future Development

Future development within identified hazard areas can change the threat level of an area by placing critical facilities, businesses, transportation networks, utilities, and populations within vulnerable areas. While it can be difficult to curb development in the planning area, it is the jurisdiction's advantage to be aware of development trends in order to successfully mitigation future hazards as risks increase. However, continued conformity with the State Building Codes and local land use ordinances and regulations (zoning, subdivision, floodplain management, etc.) will help to mitigate the effects hazards have on new and future development.

National Flood Insurance Program/Repetitive Loss Properties

The city participates in the National Flood Insurance Program (NFIP) and has a flood ordinance in place. As Table A7 shows, there are currently there a dozen NFIP policies in place within the city.

FEMA defines a repetitive loss property as an insurable building that has experienced two losses in a 10-year period in which each loss is $1,000 or more. River flooding is the most common cause of repetitive loss in Bremer County. Table A7 illustrates the number of repetitive loss properties in the city. Currently (as of 11/30/2014) there is one active repetitive loss building in the city.

TABLE A7: NFIP AND REPETITIVE LOSS DATA FOR DENVER

CID #	# of NFIP Policies	NFIP Insurance in Force ($)	Total # of RLB	RLB Insured	RLB Not Insured	Total RLB Losses ($)	RLB Losses Insured ($)
190026	12	$1,321,500	1	1	0	$17,725	$17,725

Source: Federal Emergency Management Agency (FEMA); Note: RLB = Repetitive Loss Building; NFIP data current as of 9/30/2016; Repetitive loss data current as of 11/30/2014

This HMP attempts to reduce loss by identifying potential natural and manmade hazards. As a result of many natural and manmade hazards, repairs and reconstruction area often completed in a way that returns the structure to pre-disaster condition yet does little to prevent a reoccurrence of damage. Replication of the pre-disaster conditions allows for the repetitive cycle of property damage, reconstruction, and re-damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction are analyzed, and sound, less vulnerable conditions are produced. Additionally, other mitigation strategies may be considered, such as voluntary property buy-outs.

MITIGATION STRATEGY

Hazard Mitigation Plan Goals

The hazard mitigation plan goals were reviewed by the Hazard Mitigation Planning Committee at their second committee meeting. The committee set as a priority the development of broad-based goals that would address a multitude of hazards and encompass a variety of mitigation activities. The hazard mitigation plan goals identified are as follows:

1. Reduce the chance of and impact of flooding in the community.
2. Take measures to minimize the occurrence of injuries and loss of life due to hazards.
3. Take measures to minimize or eliminate damages that may occur as a result of hazards.
4. Increase the city's ability to respond to natural disasters and man-made hazards.
5. Return to the community to similar or improved pre-event conditions as quickly as possible following a disaster event.
6. Incorporate the City Plan into the proposed Multi-Jurisdictional Plan.
7. Continually re-assess and re-evaluate the plan and mitigation activities.

Current Mitigation Actions

Prevention Mitigation Actions

The city and Quarter Section Run Creek that flows through the city are the subjects of a 1999 Department of Agriculture Natural Resources Conservation Service resource assessment and flood study, after a 1999 heavy rainfall event caused a 250-year flood in the city. The study concluded the embankment constructed for the Highway 63 bypass cut off a large portion of the floodway, causing water moving through it to "back up" during the 1999 rainfall event. Reconstruction of the bridge and embankment was necessary to prevent future flooding.

There is a snow removal policy which states snow must be removed from city sidewalks within 25-hours of a snowfall. Any snow removed from the sidewalks or drives shall be placed on the property owner's property, not on others or the streets, excluding Main Street, if necessary. Table A7 summarizes the current planning and regulatory documents for the City of Denver.

TABLE A7: CURRENT PLANNING AND REGULATORY DOCUMENTS FOR DENVER

Previous HMP	Comprehensive Plan	Building Code	Zoning Ordinance	Subdivision Regulations	Floodplain Management Ordinance	Tree-Trimming Ordinance	Storm Water Ordinance	Snow Removal Ordinance
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Local Community

Property Protection Mitigation Actions

Denver has not participated in any buyout or similar program. No actions or plans of property mitigation are planned under the city's jurisdiction.

Public Education and Awareness Mitigation Actions

The city publishes seasonal information such as instructions on what to do in case of tornadoes. The public is informed about any hazard or program for cleaning up after storms, etc. in the local newspaper.

On an annual basis, the visiting nurses provide flu shots to residents at the Community Center.

Emergency Services Mitigation Actions

The action to mitigate a natural disaster is communication first, following the chain of command: Mayor to Fire Chief, Ambulance, City Clerk, and Public Works. The EMS Departments of the City have written plans of action for natural disasters. The city has on outdoor warning siren. The siren is activated at the site of a tornado, or in case of an imminent threat of any kind. The fire department sounds a warning at the firth fire meeting each month. The fire chief sends a crew of firefighters out at the request of the sheriff if the National Weather Forecasts a chance of severe weather. The sheriff and fire chief communicate by radio ad does the team sent out to spot.

Denver works with the Bremer County Emergency Management Coordinator, based out of the City of Waverly, on various safety and emergency events. The Emergency Management Coordinator works in conjunction with local fire, rescue, police, and government officials to draft and implement workable emergency action plans in the community. The current Emergency Management Coordinator is Kip Ladage and current contact information is as follows: Bremer County Emergency Management Agency, 111 4th St. NE, Bremer-Waverly LEC, Waverly, Iowa 50677, (319) 352-0133, email: kladage@co.bremer.ia.us

Law Enforcement

Police protection is provided by the Denver Police Department, Bremer County Sheriff, and the Iowa State Patrol. Currently, there are a total of 3 officers serving the Police Department. The department currently operates 2 squad cars. Gary Everding is the current Police Chief for the department.

Fire Protection

Fire protection is provided for Denver by a force of 29 volunteer firemen. All of these firemen are HAZMAT operational. The fire station is located in the western portion of the City on Transit Street. Denver's fire insurance rating is six (6).

Equipment used by the Denver Fire Department includes the following: two tankers, three pumpers, eight total trucks, two "jaws of life", chains saws, air bags, tripod, and stabilizing jacks.

The City of Denver Fire Department has mutual aid agreements with every fire department in Bremer and Black Hawk Counties.

Ambulance & First Responders
Denver has a volunteer ambulance service that provides emergency rescue and ambulance services to the community. It is staffed by EMTS, with approximately 12 volunteers on staff. The department has two ambulances and uses Waverly Paramedics for mutual aid.

Medical Facilities
Denver has a medical clinic located at 160 E Main Street. The medical staff is comprised of a Physician, a nurse practitioner, and receptionist. There are three hospitals within 20 miles of the city: Waverly Health Clinic and Waterloo Allen and Covenant Hospitals. Covenant and Allen Memorial Hospital in Waterloo are within a half hour to forty-five minute drive from Denver. Rochester's Mayo Clinic is 90 miles.

HAZMAT
Denver contracts with Northeast Iowa Response Group for response to hazardous material spills. The Northeast Iowa Response Group is a division of Waterloo Fire Rescue as is the Hazardous Materials Regional Training Center. The Training Center provides training to fire departments and companies from around the state and country. Not only is this a training center it also serves as a hazardous materials quick response unit to Black Hawk County, surrounding counties, and many municipalities in a ten county region. The Unit provides local fire departments with hazard materials emergency procedures thus reducing additional contamination. An evacuation plan is also in place in conjunction with the activities with the local department. Contact information for the facility is as follows: Hazardous Materials Regional Training Center, 1925 Newell Street, Waterloo, Iowa 50707, Phone: (319) 291-4275, Toll Free: (800) 291-4682, Fax: (319) 291-4285

The jurisdictions also partners the Northeast Iowa Response Group for assistance in responding to any methamphetamine labs located in the city limits. The Response Group assists the Police Departments in containment of the site and disposal of the hazardous chemicals.

Public Works / Street Department
Denver has approximately 13 miles of streets and alleys. Snow and ice removal are considered essential in mitigation negatives of winter storms. The public works and street department employs five people. The department has several trucks, mowers, a street sweeper, chain saws, street painter, street saw, water/sewer samplers, water pumps, generators, two tractors and a trencher.

Warning Systems
The city has two warning sirens which are tested on a monthly basis. The city also participates in the ALERT IOWA program.

<u>Natural Resource Protection Mitigation Actions</u>
In response to Emerald Ash Borer, the city conducted a tree study, which identified Ash trees throughout the community. Some of the Ash trees will be treated while others will likely be removed. The city intends to replace trees with a diverse mix.

<u>Structural Projects Mitigation Actions</u>
The city is in the process of removing, or having removed, buildings that have been determined to be dangerous. A new dangerous building ordinance has

recently been adopted as part of the nuisance ordinances. There are no additional structural projects or construction projects at this time.

Future Mitigation Actions

While the existing mitigation activities discussed above detail the City's efforts to mitigate hazards when possible and to respond to hazards in a timely and efficient manner, the Committee also recognizes that there are many more mitigation activities and projects that would benefit county residents. Thus, the Committee developed a list of future hazard mitigation activities that, if accomplished, would serve to further reduce the risk of hazards to the community. The list may include a combination of projects the Committee feels the community should try to accomplish and mitigation efforts that are ongoing that the Committee view as vital to the continued well-being of the public.
The Committee analyzed the potential mitigation activities. This analysis included a discussion of the potential benefits of implementing the activity, some hurdles that the community may face in implementing the action step, and the drawbacks of implementation. The analysis utilized the STAPLEE feasibility criteria. The STAPLEE technique is a FEMA suggested method of evaluation. The STAPLEE approach assesses both positive and negative impacts on the following aspects of a county: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Based on this analysis, each activity was ranked as High (H), Medium (M) or Low (L). However, not all identified activities are applicable to all jurisdictions and is marked as such in Table A9.

Funding

Although in the long-term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short-term each action will have an associated cost. The City will rely heavily on local funding sources to fulfill most of the plan obligations; however, they will also seek funds from State and Federal agencies for both pre- and post-disaster mitigation activities.

The estimated cost(s) for each mitigation action, program, or project is either: Minimal, Low, Moderate, or High depending upon various factors.

- Minimal: Cost estimate is $10,000 or less based on using current staff, time commitment, continuous of current duties, proposed action/program/ project, and funding sources.
- Low: Cost estimate for project range from $10,001 - $99,999 based on existing proposed treatment, time commitment, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.).
- Moderate : Cost estimate for project range from $100,000 - $299,999 based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.), and funding sources.
- High : Cost estimate for project range is $300,000 or higher based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, project components (permits, acquisition, coordination, etc.), and funding sources.

Implementation Strategy

Once the Committee identified and ranked the future hazard mitigation activities, the activities were then analyzed. In addition, the Committee identified a time line for each activity, identified the responsible party (ies) for each activity and finally related each activity to at least one of the five Hazard Mitigation Plan Goals listed above. Table A9 below is the City of Denver's Implementation Strategy.

TABLE A9: CITY OF DENVER'S IMPLEMENTATION STRATEGY

Priority	Mitigation Action/Program/Project	Associated Hazard	Primary Agency Responsible for Implementation	Date for Completion	Estimated Cost	Funding Source
Education/Public Awareness						
H	Educate the public	All	City Council, Staff	On-Going	Minimal	Local
H	Maintain storm spotter training for local fire departments/deputies and EMS crews	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm	Fire Department	On-Going	Minimal	Local
H	Enhance Standard Operating Procedures for dissemination of information/press releases in the event of a disaster	Communications Failure	City Council, School Board	On-Going	Minimal	Local
H	Encourage use of Iowa One call before digging	Communications Failure, Explosion	City Council, Staff	On-Going	Minimal	Local
H	Encourage residents to keep smoke detectors, sprinkler systems and fire extinguishers maintained in their homes	Fire	City Council	On-Going	Minimal	Local
H	Cooperate with any countywide mass vaccination plan	Disease	City Council	On-Going	Minimal	Local
H	Educate city personnel to identify risk areas	Expansive Soils	Public Works	On-Going	Minimal to Low	Local
H	Educate city personnel to handle a sinkhole situation	Sinkholes	City Council	On-Going	Minimal to Low	Local
H	Inform the public of reputable and ill reputable contractors following disasters	Emergency Management	Building and Zoning	On-Going	Minimal	Local
M	Notify the media on shelter locations	Severe Winter Storm, Extreme Heat, Tornado	City Council	On-Going	Minimal	Local
M	Encourage and maintain enrollment in emergency notification system	Thunderstorm/Lightning, Windstorm, Tornado, Communication Failure	City Council, Fire Department	On-going	Minimal	Local
M	Encourage home owners to keep emergency kits	Windstorm, Tornado	City Council	On-Going	Moderate	Local
M	Encourage community to plant shade trees	Extreme Heat	City staff	On-Going	Minimal to Low	Local
M	Encourage the public to receive vaccinations	Disease	City Council, Fire Department	On-Going	Low	Local
M	Encourage all communities to participate in their Local Emergency Planning Commission (LEPC)	Emergency Management	City Council	On-Going	Minimal	Local
L	Encourage lead based paint and asbestos removal	HAZMAT	City Council, Police	On-Going	Minimal	Local
L	Educate the public on maintaining their sump pumps	Flash Flood	Fire Department, Public Works	On-Going	Minimal	Local

Emergency Services						
H	Continue training and education for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Provide emergency shelters for evacuees	All	City Council	On-Going	Low	Local
H	Determine locations for potential heating shelters and volunteer organization	Severe Winter Storm	City Council	On-Going	Minimal	Local
H	Make available a cleanup crew for after a storm	Thunderstorm/Lightning	City Council, EMA	On-Going	Minimal to Low	Local
H	Continue training and promotion of the Incident Command System	Communications Failure	City Council	On-Going	Minimal	Local
H	Complete continuity of government plan	Communications Failure	City Council, Staff	On-Going	Minimal	Local
H	Maintain list of county emergency contacts	Communications Failure	All City Departments	On-Going	Minimal	Local
H	Develop and maintain staging area for dumping during cleanup	River Flood	City Council	On-Going	Minimal	Local
H	Set a designated number of people to be trained in post-disaster record keeping/damage assessments	Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain lists of personnel and equipment available to use with response plans	Emergency Management	City Council, Staff	On-Going	Minimal	Local
M	Maintain or install GPS units in all emergency service and city/county vehicles	Communications Failure	City Council	On-Going	Minimal	Local
M	Purchase emergency signs to be used in case of an incident	Transportation	City Council	On-Going	Minimal	Local
L	Maintain automatic TTY TDD machines for emergency personnel and city/county employees	Communications Failure	City Council, EMA	On-Going	Minimal	Local
Natural Resource Protection						
H	Treat and/or remove Ash trees in response to Emerald Ash Borer Disease	Animal/Plant/Crop Disease	Mayor	Short-Term	Low	Local
H	Maintain tree trimming program	Severe Winter Storm, Windstorm, Hailstorm	City Council	On-Going	Minimal	Local
H	Monitor the drinking water supply	Groundwater Contamination, Disease	City Council, City Staff	On-Going	Moderate	Local
H	Maintain and/or develop storm water management program	Groundwater Contamination, Flash Flood	City Council, Public Works	On-Going	Low	Local, State
H	Eliminate and cap private and abandoned wells in the city	Groundwater Contamination	City Council, Police	On-Going	Moderate	Local, Federal
H	Eliminate the use of septic tank systems in the city limits	Groundwater Contamination	City Council	On-Going	Low	Local
H	Follow monitoring requirements set forth by the Iowa DNR	Groundwater Contamination	City Council	On-Going	Low	Local
H	Clear ditches, streams, and waterways on a regular basis	River Flood	City Council, Public Works	On-Going	Minimal	Local
M	Maintain and/or develop a wellhead protection program	Groundwater Contamination	City Council	On-Going	Low	Local
M	Monitor wells in areas of identified contamination	Groundwater Contamination	City Council	On-Going	Low	Local
M	Identify and map areas of past contamination	Groundwater Contamination	City Council, Public Works	On-Going	Low	Local

M	Carry out conservation measures such as erosion control and work with the following organizations: Extension, NRCS, Farm Bureau, EPA, DNR, and Soil and water Conservation District	Groundwater Contamination	City Council	On-Going	Minimal	Local, State, Federal
L	Plant trees along water bodies and slopes	Landslides/Mudflows	City Council, Staff	On-Going	Minimal	Local
L	Purchase additional parkland in order to increase greens space and reducing surface flow	River Flood	City Council	On-Going	Minimal	Local
Prevention						
H	Maintain and acquire materials and equipment for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Maintain mutual aid agreements	All	City Council	On-Going	Minimal	Local
H	Purchase and maintain backup generators	Severe Winter Storm, Thunderstorm/Lightning, Tornado, Emergency Management	City Council	On-Going	Moderate	Local
H	Maintain public works equipment	Severe Winter Storm	City Council	On-Going	Minimal	Local
H	Purchase NOAA weather radios	Thunderstorm/Lightning, Windstorm, Tornado, Radiological/Nuclear Event	City Council, Fire Department	On-Going	Minimal	Local
H	Maintain mutual aid agreements with the Northeast Iowa response Group	HAZMAT	City Council	On-Going	Minimal	Local
H	Keep HAZMAT manuals/information current and easily accessible	HAZMAT	All City personnel	On-Going	Minimal	Local
H	Regularly review and amend fire and medical HAZMAT response standard operating procedures	Communications Failure	Fire Department	On-Going	Minimal	Local
H	Seek to improve communications with other agencies	Communications Failure, Terrorism	City Council	On-Going	Minimal	Local
H	Keep the county updated on personnel changes	Communications Failure	City Staff, Council	On-Going	Minimal	Local
H	Continue cooperation between county roads department and local fire departments during snow emergencies	Severe Winter Storm	Staff	On-Going	Minimal to Low	Local
H	Maintain membership in the NFIP	Flash Flood, River Flood	City Council, Staff	On-Going	Minimal	Local
H	Maintain and keep storm drains clear of debris	Flash Flood	City Council	On-Going	Minimal	Local
H	Stockpile sand and sandbags	Flash Flood, River Flood	Fire Department, Police	On-Going	Minimal to Low	Local
H	Initiate and enforce burn ban in times of drought or as needed	Grass/Wildfire, Drought	City Council	On-Going	Minimal	Local
H	Establish alternative transportation routes should a road need to be closed	Transportation	City Council	On-Going	Minimal	Local
H	Identify fallout shelter locations	Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
H	Maintain and update anti-virus software	Terrorism	City Council, Staff	On-Going	Low	Local
H	Provide fans and/or cooling shelter	Extreme Heat	City Council	On-Going	Minimal	Local
H	Maintain air conditioner(s) in community buildings	Extreme Heat	City Council, Public Works	On-Going	Minimal	Local
H	Develop rationing procedures	Drought	City Council	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or	Drought	City Council, Fire Department	On-Going	Low to Moderate	Local

	as needed					
H	Restrict water usage should it be necessary	Drought	City Council, Zoning Administrator	On-Going	Minimal	Local
H	Secure the area (around a sinkhole)	Sinkholes	City Council, Police	On-Going	Minimal	Local
H	Inspect any utility lines that are near a sinkhole	Sinkholes	City Council, Staff	On-Going	Minimal	Local
H	Update flood maps/flood studies for areas throughout the county	River Flood	City Council	On-Going	Minimal	Local
H	Develop sandbagging procedures for the community	River Flood	City Council, Staff	On-Going	Minimal	Local
H	Maintain and update emergency response plans	Emergency Management	Staff	On-Going	Minimal	Local
H	Maintain communication with county contacts	Emergency Management	Staff	On-Going	Minimal	Local
H	Maintain NIMS compliance	Emergency Management	City Council, Staff	On-Going	Minimal	Local
M	Acquire necessary response and detection equipment for city/county employees	HAZMAT	City Council	On-Going	Minimal	Local
M	Maintain, test, and replace warning sirens	Windstorm, Tornado, Hailstorm, Thunderstorm/Lightning, Communications Failure	County EMA	On-Going	Minimal to Low	Local
M	Upgrade radio communications equipment as needed	Communications Failure	City Staff	On-Going	Minimal	Local
M	Maintain and improve signals/signage along roadways and at railroad crossings	Transportation	City staff	On-Going	Minimal	Local
M	Keep communication lines open with Nuclear Plant in Palo, IA	Radiological/Nuclear Event	City Council	On-Going	Low	Local
M	Continue to cooperate with pipeline owners and operators to ensure locations are marked	Fire, Explosion	City Council, Public Works	On-Going	Minimal	Local
M	Purchase a new tanker and/or pumper	Fire, Explosion	City Council	On-Going	Minimal	Local
M	Monitor disease outbreak news from the CDC and Iowa Department of Public Health	Disease	City Council	On-Going	Minimal	Local
M	Establish detour routes	Bridge Failure, Flash Flood, River Flood	Public Works	On-Going	Minimal to Low	Local
M	Enforce the local zoning ordinances	Landslides/Mudflows	City Council, Staff	On-Going	Minimal	Local
M	Establish transportation evacuation routes and protocols	River Flood	City Council	On-Going	Minimal	Local
M	Continue cooperation with county in developing flood mitigation efforts	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
M	Continue working with the Bremer County Recovery Coalition	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
L	Enforce sidewalk clearance ordinance	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Maintain use of snow fences in the city/county	Severe Winter Storm	City Staff	On-Going	Minimal	Local
L	Backup all digital data	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
L	Place alarms on storage facilities containing hazardous materials	Hazardous Materials (HAZMAT)	City Council	On-Going	Minimal	Local
L	Maintain law enforcement monitoring of large storage supplies	HAZMAT	City Council, Police	On-Going	Minimal	Local
L	Provide a local hazardous waste dropoff site	HAZMAT	City Council	On-Going	Minimal to Low	Local, State
L	Identify areas throughout the county that would substantially benefit from outdoor warning sirens	Windstorm, Tornado	City Council, Staff	On-Going	Moderate	Local, State
L	Maintain list of potential translators to be called upon	Communications Failure	City Council, Staff	On-Going	Minimal	Local

	in case of an emergency					
L	Improve standard operating procedures for schools	Communications Failure	City Council, Staff	On-Going	Minimal	Local
L	Keep supply of backup radios and cellphones	Communications Failure	Staff	On-Going	Minimal	Local
L	Enforce no parking designations at special events	Transportation	Police Department	On-Going	Minimal	Local
L	Secure vulnerable targets, as identified by the LEPC and County EMA with alarms, security cameras and fences	Terrorism	City staff, Police	On-Going	Moderate	Local
L	Keep a supply of drinking water to distribute	Extreme Heat	Staff	On-Going	Minimal	Local
L	Enforce a curfew	Riot/Violent Demonstration	Public Works	On-Going	Minimal to Low	Local
L	Identify and inventory potential sinkhole sites	Sinkholes	City Council	On-Going	Minimal to Low	Local
Property Protection						
H	Use surge protectors to prevent electrical damage to critical and sensitive equipment	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
H	Placement of lighting arrestors on power lines	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
H	Encourage backup power generation for local telephone systems and cellular operations	Communications Failure	City Council	On-Going	Minimal	Local
H	Continue an annual inspection program for commercial and industrial properties	Fire	City Council	On-Going	Low to Moderate	Local
H	Continue fire prevention program	Fire	City Council, Staff	On-Going	Minimal	Local
H	Maintain, enforce and update floodplain ordinance	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Acquire more water pumps	Flash Flood, River Flood, Dam Failure, Levee Failure	City Staff	On-Going	Minimal	Local
H	Purchase additional trash pumps	Flash Flood, River Flood	All City Departments	On-Going	Minimal	Local
H	Continue regular bridge inspections	Bridge Failure	City Council	On-Going	Minimal to Low	Local, State
H	Place barricades to close dangerous bridges	Bridge Failure	City Council	On-Going	Minimal to Low	Local
H	Maintain pump station	River Flood	City Council, Staff	On-Going	Minimal	Local
H	Regularly inspect levees	Levee Failure	City Council, Staff	On-Going	Minimal	Local
M	Review and update fire codes as necessary	Fire, Explosion	City staff	On-Going	Minimal	Local
M	Maintain embargos/weight limits as necessary	Bridge Failure	Police	On-Going	Minimal to Low	Local
M	Regularly inspect dams	Dam Failure	City Council, Staff	On-Going	Minimal	Local
L	Install a snow fence around the wastewater treatment facility	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Identify, purchase and remove structures from flood hazard areas	Flash Flood, River Flood	City Council, staff	On-Going	Moderate	Local, Federal
L	Install rip rap around wastewater treatment facility	Flash Flood	City Council	On-Going	Minimal	Local
L	Receive education/training from DOT on embargos/weight limits	Bridge Failure	Police	On-Going	Minimal to Low	Local, State
L	Encourage floodproofing/elevating structures in the floodplain	River Flood	City Council	On-Going	Minimal	Local
L	Establish backup plan in case levees fail	Levee Failure	City Council, Public Works	On-Going	Minimal to Low	Local
Structural Projects						
H	Continue enforcement of city sump pump discharge ordinance	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
H	Maintain a list of potential storm sewer projects	Thunderstorm/Lightning	City Council, Staff	On-Going	Minimal	Local

H	Construct or designate a safe room or storm shelter	Windstorm, Tornado, Hailstorm	City Council	On-Going	High	Local, State, Federal
H	Continue with improvement to the storm water system	Flash Flood	City Council	On-Going	Minimal	Local, State
H	Prevent inflow and infiltration into the sanitary sewer	Flash Flood, River Flood	City Council	On-Going	Minimal to low	Local
H	Encourage the use of proper materials and construction techniques	Expansive Soils	City Council, Police	On-Going	Minimal to Low	Local
H	Install tiling to help water move away from structures	Expansive Soils	Public Works	On-Going	Minimal to Low	Local
M	Encourage utility providers and developers to place all utilities underground	Severe Winter Storm, Communications Failure, Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
M	Enforce and update building codes, as needed	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm, Expansive Soils, Earthquake	City Council, City Staff	On-Going	Minimal	Local
M	Improve water system to enhance firefighting capacity/ability	Fire	City Staff	On-Going	Minimal	Local
L	Pursue partnership with rural water as the system expands	Fire, Explosion	City Council	On-Going	Minimal	Local
L	Encourage construction of dikes, levees, dams, and retention ponds	River Flood	City Council	On-Going	Minimal	Local

APPENDIX B: CITY OF FREDERIKA

COMMUNITY PROFILE

Location

Frederika is located in north-central Bremer County, in the northeastern quadrant of Iowa, at latitude 42.88 N x longitude 92.30 W and elevations ranging from 950 to 1,030.

Geography

The City is bordered on all sides by farmland and the Wapsipinicon River runs along its western border. The land within the City is gently sloping with a few areas of steeper grade near the river, but is generally flat. Two highways serve the City of Frederika; County Road C16, which leads to Highway 63, and County Road V5C, which leads to Highway 93.

History

The area around present-day Frederika was settled by two families in 1852. They built a saw mill and a grist mill on the Wapsipinicon River. The demand for lumber and flour by surrounding settlers allowed both mills to prosper. Soon after, a limestone quarry was established which provided stone for construction of homes, businesses and infrastructure.

TABLE B1: CITY OF FREDERIKA DEMOGRAPHICS

Government Framework	Mayor – City Council
General Population, 2010 Census	
Total Population	183
Median Age	49.9
At-Risk Population, <18 Years	20
At-Risk Population, >64 Years	44
Total Males	98
Total Females	85
One Race-White	180
Black of African American	0
American Indian and Alaskan Native	1
Asian	1
Two or More Races	0
Housing Characteristics, 2010 Census	
Total Households	96
Households with children <18 Yrs.	12
Households with persons >65 Yrs.	33
Average Household Size	1.91
Average Family Size	2.42
Total Housing Units	118
Occupied Housing Units	96
Vacant Housing Units	22
Owner-Occupied Housing Units	78
Renter-Occupied Housing Units	18
Persons Living in Group Quarters	0

In 1868, the land was surveyed and soon after a post office was established and by 1896 the town was officially incorporated. Various settlers over the years had established a variety of businesses, some of which still exist today, although ownership has changed several times. Before refrigeration, a successful ice mill operated on the Wapsipinicon River.

Today, Frederika remains as a rural, farming community, with a Farmers Coop and grain storage bins serving nearby farmers. The city serves as a bedroom community for residents who enjoy a close-knit community, but want the benefits of a secluded, small-town atmosphere. Many resident s find work in the Waterloo-Cedar Falls metro or in cities such as Charles City and New Hampton.

Demographics

Population

Frederika's demographic data is outlined in Tables B1 and B1.1. In the recent 2010 U.S. Census, Frederika's population declined to 183, a decrease of 8 percent over ten years. The previous U.S. Census, taken in 2000, recorded a population figure of 199 for Frederika. Much of the data included in the tables are from the 2000 U.S. Census, since detailed data from the 2010 Census is not yet available.

TABLE B1.1: CITY OF FREDERIKA DEMOGRAPHICS

Government Framework	Mayor – City Council
General Population, 2010 Census	
Total Population	183
Median Age	49.9
At-Risk Population, <18 Yrs	23
At-Risk Population, >64 Yrs	44
Total Males	98
Total Females	85
One Race-White	180
Black of African American	0
American Indian and Alaskan Native	1
Asian	2
Two or More Races	0
Total Households	96
Households with children <18 Yrs.	12
Households with persons >65 Yrs.	33
Average Household Size	1.91
Average Family Size	2.42
Total Housing Units	118
Occupied Housing Units	96
Vacant Housing Units	22
Owner-Occupied Housing Units	78
Renter-Occupied Housing Units	18
Persons Living in Group Quarters	0

Community Services

The City of Frederika does not have a municipal water supply as each resident has their own well as a source of water.

A primary sewer treatment plant serves Frederika. Average load is 16,000 (gpd) with a peak load of 20,000 (gpd). The rated capacity of the sewer treatment plant is 25,000 gallons and is more than sufficient to handle Frederika's current development as well as future development.

HAZARDS & RISK ASSESSMENT

Hazard Analysis

Section 3 identified and profiled the hazards for the entire planning area. However, each community analyzed their own vulnerability to those hazards applicable to their jurisdiction. Using the methodology outlined in Section 3 (Vulnerability Assessment), the City of Frederika evaluated the risk associated with a specific hazard, defined by probability and frequency of occurrence, magnitude, severity, exposures, and consequences. Frederika's vulnerability assessment provides in-depth knowledge of the hazards and vulnerabilities that affect the community. This analysis provides an all-hazard approach when evaluating the hazards of that affect the city, and the associated risks and impacts each hazard presents.

As mentioned previously in Section 3, the vulnerability assessment requires a five-year review with periodic updates, as needed. Potential future hazards and impacts may result from changing technology, new critical facilities, infrastructures, and development patterns, as well as demographic and socioeconomic changes that occur within or outside the area.

Disaster frequency and its effects or severity are important as a basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, whereas manmade or technological events tend to change over time with advancement in technology and methods of operation.

Five criteria were used by the Committee to assure a systematic and comprehensive approach to hazard analysis for their individual jurisdictions including: Historical Occurrence, Probability, Magnitude or Severity, Warning Time, and Duration.

The Committee assessed the defined hazards relevant to potential impact on the city. Using the scoring criteria previously defined (Tables 19-22) the city assessed each of the identified hazards based on probability, magnitude/severity, warning time, and duration. The scores for each of the factors were weighted using the formula below to develop the final hazard assessment score.

(Probability x .45) + (Magnitude/Severity x. 30) + (Warning Time x .15) + (Duration x .10) = Final Hazard Assessment Score

Table B2 is the analysis scores for the City of Frederika. As shown in the table, the top four hazards for the city are: River flooding, Thunderstorm/Lightning/Hail, Tornado/Windstorm, and Severe Winter Storm.

TABLE B2: CITY OF FREDERIKA'S HAZARD RISK ASSESSMENT

Hazard Rank	Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Hazard Score
1	River Flooding	3	3	1	3	**2.7**
2	Thunderstorm/Lightning/Hail	3	2	2	3	**2.55**
2	Tornado/Windstorm	2	3	3	3	**2.55**
2	Severe Winter Storm	3	2	2	3	**2.55**
5	Flash Flood	2	2	4	1	**2.2**
6	Animal/Plant/Crop Disease	3	1	1	2	**2**
7	Transportation Incident	2	2	1	1	**1.75**
8	Extreme Heat	2	1	1	3	**1.65**
8	Landslide	2	1	1	3	**1.65**
10	Infrastructure Failure	1	2	1	3	**1.5**
11	Grass/Wild Fire	1	2	1	2	**1.4**
12	Drought	1	1	1	4	**1.3**
12	Earthquake	1	1	1	4	**1.3**
12	Human Disease	1	1	1	4	**1.3**
15	Dam / Levee Failure	1	1	1	3	**1.2**
15	Expansive Soils	1	1	1	3	**1.2**
15	Sinkholes	1	1	1	3	**1.2**
15	HAZMAT Incident	1	1	1	3	**1.2**
15	Radiological Incident	1	1	1	3	**1.2**
15	Terrorism	1	1	1	3	**1.2**

Disaster frequency and its effects or severity are important as a basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, whereas manmade or technological events tend to change over time with advancement in technology and methods of operation. Five criteria were used by the Committee to assure a systematic and comprehensive approach to hazard analysis for their individual jurisdictions included: Historical Occurrence, Probability, Vulnerability, Maximum Geographic Extent, Severity of Impact, and Speed of Onset. Due to recent disasters and events that have impacted the planning area, Frederika determined that even though the historical occurrences were low for certain hazards, the probability ranking for future occurrences should be higher.

Table B2 is the analysis scores for the City of Frederika. As seen in Table B2, the top natural hazards (using the analysis scores) for Frederika are Severe Winter Storms and Thunderstorms and Lightning.

TABLE B3: CRITICAL FACILITIES IN FREDERIKA

St. John's Lutheran Church (Shelter)	Frederika Methodist Church (Shelter)
City Hall (Shelter)	Fire Station
Wastewater Treatment Plant	Farmer's Co-op

Source: Community

Vulnerability – Identifying Assets (Critical Facilities)

This section will describe the vulnerability for existing and future buildings, infrastructure, and critical facilities in those areas that can be impacted by the prioritized hazards. Since the majority of the hazards have an undefined hazard area (i.e., affecting an entire community or larger area) the following vulnerability assessment will only address those hazards that affect a specified area – flooding (river and flash). However, due to the historical occurrences of thunderstorms and lightning, and tornadoes, this hazard was added to the assessment. The following discussion only considers the assets in the community of Frederika.

Identifying the location of critical facilities and designated shelters (see Table B3) in Frederika is important in order to assess their vulnerability to hazards since these facilities are important to the community's operations and are key components of the economic sector. For instance, high-density residential or commercial development, schools, police stations, government buildings, hospitals and care facilities, airports, gas stations, hardware stores, grocery stores, and water supply systems.
It is important to know the threats each hazard poses to these facilities. *Attachment 6C* illustrates the location of identified critical facilities throughout the city.

TABLE B4: CITY OF FREDERIKA 100-YEAR FLOODPLAIN PROPERTIES

Number of Structures	9
Building Value	$ 239,660
Dwelling Value	$ 62,000
Total Value	$ 301,660

Source: INRCOG & Bremer County Assessor

The highest risk of mass injury and/or casualty would be in homes without basements, inhabited by the elderly and/or those with small children. The Frederika Haven is a small apartment complex for families and is the only multi-family complex in the city.
While there are no facilities officially designated as shelters, there are two local churches and City Hall could also be used in an emergency.

According available data, Frederika is projected to see a decrease in population over the next thirty years. This population decrease most likely result in a lesser need for additional critical facilities such as schools, daycare centers, or healthcare centers. However, the need for more critical facilities should be closely monitored these next 5-years and readdressed when this HMP is updated.

Flooding

A facility vulnerable to flooding is normally low, since these structures are not often constructed within the 100-year floodplain. According to the information provided, bridges and roadways was be impacted by flooding. This disruption in the transportation infrastructure would create a longer time period to receive and provide services and supplies to an area if a bridge was washed away due to flooding.

Approximately 64 acres of land is located within the 100-year floodplain. Table B4 provides a breakdown for those acres. As shown on *Attachment 5C: Flood Scenario Map of City,* the eastern portion of the community is along the Wapsipinicon River. According to the data provided by INRCOG, Bremer County, and FEMA, there is approximately 215 acres of land within the 100-year floodplain. As shown on *Attachment 5C: Flood Scenario Map of the City,* this land is along the Wapsipinicon River on the west side of the community. Much of the community is located outside the floodplain to the east. However, flash flooding within the built areas of the community can cause property and potential injuries if the flash flood event is large. Measures should be taken to ensure problematic areas are dealt with to reduce future flash flooding events. According the *Flood Scenario Map*, there is one dwelling and 8 buildings located within the identified floodplain. The total value of these structures is given in Table B4. Using the average household size figure (2.07) from the 2000 Census for Frederika, approximately 2 people are living in dwellings within the floodplain.

Tornadoes

As stated on the FEMA website[23], mobile homes are highly vulnerable to tornadoes. Even mobile homes that are tied down, offer little protection from tornadoes.

According to Census, there are no mobile homes located in Frederika. General observation would suggest a recent increase in the number of manufactured homes in the area. This increased popularity has the potential to increase the potential risk of damage to people and property in the community. Currently, no FEMA certified tornado safe shelters are known to exist in the community.

The primary reason for the increased popularity of mobile and manufactured homes is affordability. Although HUD regulations and local building codes have increased the safety components of these types of houses significantly in recent history, this affordability has often been accompanied with a reduced level of safety. Based on national data on circumstance of tornado fatalities between 1985 and 1997, it was found that 38% of fatalities were occupants of mobile or manufactured homes, 27% were in permanent homes, 11% in vehicles, 9% outdoors (open), 4% in businesses, 4% in structures with long-span roofs, and 2% in schools. These data highlight the high exposure of occupants of mobile and manufactured homes (*AR State Hazard Mitigation Plan, 1999*).

[23] Federal Emergency Management Agency (FEMA), http://www.fema.gov/areyouready/tornadoes.shtm

Nursing homes or skilled living centers are also highly vulnerable to tornadoes. These facilities are designed for caring for the elderly population, majority of which use wheelchairs or other assistance devices, limiting mobility. Also, the majority of nursing homes are constructed as a single-level building with or without basements. Therefore, additional attention needs to be taken to ensure the safety of the residents and employees before, during, and after a tornado event.

Vulnerability – Social Assets (Populations)

The social vulnerability assessment identified how the hazards affect the population of Frederika and it is assumed that the identified populations are more likely to require assistance during times of disaster; therefore, are considered, generally speaking, more "at-risk" than the remaining population. The "at-risk" population must be identified and targeted in successful mitigation efforts. Table B5 presents an overview of the at-risk population in Frederika according to information retrieved from the 2000 U.S. Census and Iowa Data Center.

TABLE B5: CITY OF FREDERIKA "AT-RISK" POPULATION

	2010
Total Community Population (2010)	183
Elderly (65 yrs and older)	58
Youth (under 18 yrs old)	32
Householder Living Alone	35
Non-English Speaking Population (speaks English less than 'very well'	0
Population Living in Poverty	26
Population in Mobile Homes	0
Group Quarters Population	0

Source: U.S. Census, 2000 and Iowa Data Center

According to Table B5, 32% of rural residents are 65 years and older. There are no persons in the community living in group quarters. As mentioned previously, nursing homes and similar institutions are vulnerable to tornados, as well as other hazards.

Persons under the age of 18 are also at higher risk during some disasters. This is mostly due to the fact that young persons often are not aware of the proper actions to take in the event of a disaster. In addition, very young children would be more susceptible to a disaster such as a disease epidemic simply due to their age. In 2000, there was 17% of Frederika's total population under the age of 18.

In addition, persons living in mobile homes, also known as manufactured housing may also be at risk from tornadoes or high winds. At the time of the 2000 Census, there were no mobile homes in the city.

As mentioned earlier, approximately 64 acres of Frederika are highly vulnerable to floods (within the 100-year floodplain) along the Wapsipinicon River. Flooding puts the entire population at some level of risk, whether through the flooding of their homes, businesses, or places of employment, or the road, sewer, and water infrastructure that serve them daily. High floodwaters can devastate homeowners with property damage, property loss, and extensive, time-consuming cleanup. Secondary effects caused by flooding can add to the property damage. Power loss can leave citizens without heat or air conditioning for extended periods of time. The transportation infrastructure of the community can be impacted by flooding events, which can endanger citizens attempting to travel or evacuate the area, as well as leave those remaining without goods and services.

Persons living in the 100-year floodplain are also at risk of sustaining personal injury or property damage. As mentioned previously, there is one dwelling within the 100-year floodplain. In a worst case scenario, if the identified dwelling was flooded and using the average persons per household, 2.07, approximately 2 persons could be living in the floodplain.

Vulnerability – Estimating Potential Property Losses

Valuations are an important component of hazard mitigation planning insomuch as it provides measurable data that can be used to form some type of estimate as to the potential losses a community could face in the event of a catastrophic disaster. The valuations for the City of Frederika are available from the County Assessors and Auditors offices. City of Frederika's property valuations are in Table B6.

TABLE B6: CITY OF FREDERIKA'S VALUATION AS OF JANUARY 1, 2010

	Total Valuation	Average Valuation per Unit or Parcel
Residential Property	$ 7,801,530	$ 82,121 per unit
Commercial Property	$ 689,440	$ 86,180 per unit
Industrial Property	$ 38,180	$ 19,090 per unit
Agricultural Buildings	$ 69,680	$ 69,680 per unit
Agricultural Land	$ 106,680	$ 1,189 per acre
Utilities	$ 151,134	n/a
Railroads	n/a	n/a
Exemptions (military)	$ 40,744	n/a
Gross Valuation	$ 8,856,644	n/a
Total Net Valuation	**$ 8,815,900**	**n/a**

Source: City of Frederika & Bremer County Assessor

Future Development

Future development within identified hazard areas can change the threat level of an area by placing critical facilities, businesses, transportation networks, utilities, and populations within vulnerable areas. While it can be difficult to curb development in the planning area, it is the jurisdiction's advantage to be aware of development trends in order to successfully mitigation future hazards as risks increase. However, continued conformity with the State Building Codes and local land use ordinances and regulations (zoning, subdivision, floodplain management, etc.) will help to mitigate the effects hazards have on new and future development.

National Flood Insurance Program/Repetitive Loss Properties

The city participates in the National Flood Insurance Program (NFIP) and has a flood ordinance in place. As Table B7 shows, there are currently two NFIP policies in place within the city.

FEMA defines a repetitive loss property as an insurable building that has experienced two losses in a 10-year period in which each loss is $1,000 or more. According to FEMA's data, Frederika participates in the National Flood Insurance Program. However, Frederika does not have any repetitive loss properties.

TABLE B7: NFIP AND REPETITIVE LOSS DATA FOR FREDERIKA

CID #	# of NFIP Policies	NFIP Insurance in Force ($)	Total # of RLB	RLB Insured	# of Active RLB	Total RLB Losses ($)	RLB Losses Insured ($)
190027	2	$210,000	0	0	0	$0	$0

Source: Federal Emergency Management Agency (FEMA); Note: RLB = Repetitive Loss Building; NFIP data current as of 9/30/2016; Repetitive loss data current as of 11/30/2014

This HMP attempts to reduce loss by identifying potential natural and manmade hazards. As a result of many natural and manmade hazards, repairs and reconstruction area often completed in a way that returns the structure to pre-disaster condition yet does little to prevent a reoccurrence of damage. Replication of the pre-disaster conditions allows for the repetitive cycle of property damage, reconstruction, and re-damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction are analyzed, and sound, less vulnerable conditions are produced. Additionally, other mitigation strategies may be considered, such as voluntary property buy-outs.

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MITIGATION STRATEGY

Hazard Mitigation Plan Goals

The hazard mitigation plan goals were reviewed by the Hazard Mitigation Planning Committee at their second committee meeting. The committee set as a priority the development of broad-based goals that would address a multitude of hazards and encompass a variety of mitigation activities. The hazard mitigation plan goals identified are as follows:

1. Reduce the chance of and impact of flooding in the community.
2. Take measures to minimize the occurrence of injuries and loss of life due to hazards.
3. Take measures to minimize or eliminate damages that may occur as a result of hazards.
4. Increase the city's ability to respond to natural disasters and man-made hazards.
5. Return to the community to similar or improved pre-event conditions as quickly as possible following a disaster event.
6. Incorporate the City Plan into the proposed Multi-Jurisdictional Plan.
7. Continually re-assess and re-evaluate the plan and mitigation activities.

Current Mitigation Actions

Prevention Mitigation Actions

The City of Frederika has several planning and regulatory ordinances to assist with prevention mitigation. Table B7 summarizes these documents.

TABLE B7: FREDERIKA'S CURRENT PLANNING AND REGULATORY DOCUMENTS

Previous HMP	Comprehensive Plan	Building Code	Zoning Ordinance	Subdivision Regulations	Floodplain Management Ordinance	Tree-Trimming Ordinance	Storm Water Ordinance	Snow Removal Ordinance
No	No	No	No	No	Yes	Yes	Yes	Yes

Source: Community

Property Protection Mitigation Actions
None

Public Education & Awareness Mitigation Actions
Information regarding how to protect citizens in the event of a tornado or other weather event is largely publicized in the form of flyers, radio, newspaper, and television announcements. The City of Frederika provides basic safety information for various hazard events (i.e., tornados) and what to do before, during, and after an event.

Natural Resource Protection Mitigation Actions
Frederika currently has no natural resource protection mitigation activities.

Emergency Services Mitigation Actions

Warning Systems & Communication
Frederika currently does not have a warning siren to notify the public of potentially dangerous weather conditions. Volunteer fire and local law enforcement personnel serve as weather spotters. Frederika also utilizes early warning communication methods via pagers, hand-held radios, cellular and land-line telephones, and local radio and television media. Frederika also participates in E-911 Emergency Assistance.

Frederika works with the Bremer County Emergency Management Coordinator, based out of the City of Waverly, on various safety and emergency events. The Emergency Management Coordinator works in conjunction with local fire, rescue, police, and government officials to draft and implement workable emergency action plans in the community. The current Emergency Management Coordinator is Kip Ladage and current contact information is as follows: Bremer County Emergency Management Agency, 111 4th St. NE, Bremer-Waverly LEC, Waverly, Iowa 50677, (319) 352-0133, email: kladage@co.bremer.ia.us

Fire Department
The city currently operates a small, all-volunteer fire department. The number of volunteers serving the city and equipment used is not currently available.

Law Enforcement Department
Frederika does not have an established police force and currently contracts with the Bremer County Sheriff for law enforcement.

HAZMAT

Frederika contracts with Northeast Iowa Response Group for response to hazardous material spills. The Northeast Iowa Response Group is a division of Waterloo Fire Rescue as is the Hazardous Materials Regional Training Center. The Training Center provides training to fire departments and companies from around the state and country. Not only is this a training center it also serves as a hazardous materials quick response unit to Black Hawk County, surrounding counties, and many municipalities in a ten county region. The Unit provides local fire departments with hazard materials emergency procedures thus reducing additional contamination. An evacuation plan is also in place in conjunction with the activities with the local department. Contact information for the facility is as follows: Hazardous Materials Regional Training Center, 1925 Newell Street, Waterloo, Iowa 50707, Phone: (319) 291-4275, Toll Free: (800) 291-4682, Fax: (319) 291-4285

The jurisdictions also partners the Northeast Iowa Response Group for assistance in responding to any methamphetamine labs located in the city limits. The Response Group assists the Police Departments in containment of the site and disposal of the hazardous chemicals.

Public Works / Streets Department

The city currently operates a small public works department. The number of employees serving the city and equipment used is not currently available.

Ambulance and First Responders

The city currently operates a small, all-volunteer ambulance service. The number of volunteers serving the city and equipment used is not currently available.

Medical Facilities

There are currently no medical facilities within the community.

Structural Projects Mitigation Actions

None

Future Mitigation Actions

While the existing mitigation activities discussed above detail the City's efforts to mitigate hazards when possible and to respond to hazards in a timely and efficient manner, the Committee also recognizes that there are many more mitigation activities and projects that would benefit county residents. Thus, the Committee developed a list of future hazard mitigation activities that, if accomplished, would serve to further reduce the risk of hazards to the community. The list may include a combination of projects the Committee feels the community should try to accomplish and mitigation efforts that are ongoing that the Committee view as vital to the continued well-being of the public.

The Committee analyzed the potential mitigation activities. This analysis included a discussion of the potential benefits of implementing the activity, some hurdles that the community may face in implementing the action step, and the drawbacks of implementation. The analysis utilized the STAPLEE feasibility criteria. The STAPLEE technique is a FEMA suggested method of evaluation. The STAPLEE approach assesses both positive and negative impacts on the following aspects of a county: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Based on this analysis, each activity was ranked as High (H), Medium (M)or Low (L). However, not all identified activities are applicable to all jurisdictions and is marked as such in Table B9.

Funding

Although in the long-term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short-term each action will have an associated cost. The City will rely heavily on local funding sources to fulfill most of the plan obligations; however, they will also seek funds from State and Federal agencies for both pre- and post-disaster mitigation activities.

The estimated cost(s) for each mitigation action, program, or project is either: Minimal, Low, Moderate, or High depending upon various factors.

- Minimal: Cost estimate is $10,000 or less based on using current staff, time commitment, continuous of current duties, proposed action/program/ project, and funding sources.
- Low: Cost estimate for project range from $10,001 - $99,999 based on existing proposed treatment, time commitment, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.).
- Moderate : Cost estimate for project range from $100,000 - $299,999 based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.), and funding sources.
- High : Cost estimate for project range is $300,000 or higher based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, project components (permits, acquisition, coordination, etc.), and funding sources.

Implementation Strategy

Once the Committee identified and ranked the future hazard mitigation activities, the activities were then analyzed. In addition, the Committee identified a time line for each activity, identified the responsible party (ies) for each activity and finally related each activity to at least one of the five Hazard Mitigation Plan Goals listed above. Table B9 below is the City of Frederika's Implementation Strategy.

TABLE B9: CITY OF FREDERIKA'S IMPLEMENTATION STRATEGY						
Priority	**Mitigation Action/Program/Project**	**Associated Hazard**	**Primary Agency Responsible for Implementation**	**Date for Completion**	**Estimated Cost (s)**	**Funding Source**
Education/Public Awareness						
H	Educate the public	All	City Council, Staff	On-Going	Minimal	Local
H	Notify the media on shelter locations	Severe Winter Storm, Extreme Heat, Tornado	City Council	On-Going	Minimal	Local
H	Encourage use of Iowa One call before digging	Communications Failure, Explosion	City Council, Staff	On-Going	Minimal	Local
H	Encourage residents to keep smoke detectors, sprinkler systems and fire extinguishers maintained in their homes	Fire	City Council	On-Going	Minimal	Local
H	Educate the public on maintaining their sump pumps	Flash Flood	City Council	On-Going	Minimal to low	Local
H	Encourage the public to receive vaccinations	Disease	City Council	On-Going	Minimal	Local
H	Encourage the use of proper materials and construction techniques	Expansive Soils	City Council, Fire Department	On-Going	Low to Moderate	Local
H	Set a designated number of people to be trained in post-disaster record keeping/damage assessments	Emergency Management	City Council	On-Going	Minimal	Local
M	Encourage utility providers and developers to place all utilities underground	Severe Winter Storm, Communications Failure, Thunderstom/Lightning	City Council	On-Going	Minimal	Local
M	Encourage and maintain enrollment in emergency notification system	Thunderstorm/Lightning, Windstorm, Tornado, Communication Failure	City Council, Staff	On-Going	Moderate	Local, State
M	Encourage home owners to keep emergency kits	Windstorm, Tornado	City Council	On-Going	Minimal	Local
M	Encourage community to plant shade trees	Extreme Heat	City Council	On-Going	Minimal	Local
M	Educate city personnel to identify risk areas	Expansive Soils	City Council, Zoning Administrator	On-Going	Minimal	Local
M	Educate city personnel to handle a sinkhole situation	Sinkholes	Public Works	On-Going	Minimal to Low	Local
M	Inform the public of reputable and ill reputable contractors following disasters	Emergency Management	City Council, Staff	On-Going	Minimal	Local
L	Encourage lead based paint and asbestos removal	HAZMAT	City Council	On-Going	Minimal	Local
Emergency Services						
H	Continue training and education for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Purchase emergency signs to be used in case of an incident	Transportation	City staff	On-Going	Minimal	Local
H	Maintain and update emergency response plans	Emergency Management	City Council, staff	On-Going	Minimal to Low	Local
H	Maintain lists of personnel and equipment available to use with response plans	Emergency Management	City Council	On-Going	Minimal	Local
M	Maintain and acquire materials and equipment for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
M	Provide emergency shelters for evacuees	All	City Council	On-Going	Low	Local

M	Determine locations for potential heating shelters and volunteer organization	Severe Winter Storm	City Council	On-Going	Minimal	Local
M	Maintain storm spotter training for local fire departments/deputies and EMS crews	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm	City Council, City Staff	On-Going	Minimal	Local
M	Make available a cleanup crew for after a storm	Thunderstorm/Lightning	City Council, Staff	On-Going	Minimal	Local
M	Acquire necessary response and detection equipment for city/county employees	HAZMAT	City Council, Police	On-Going	Minimal	Local
M	Maintain or install GPS units in all emergency service and city/county vehicles	Communications Failure	City Council, Staff	On-Going	Minimal	Local
M	Maintain automatic TTY TDD machines for emergency personnel and city/county employees	Communications Failure	City Council	On-Going	Minimal	Local
M	Enhance Standard Operating Procedures for dissemination of information/press releases in the event of a disaster	Communications Failure	City Council, EMA	On-Going	Minimal	Local
M	Continue training and promotion of the Incident Command System	Communications Failure	City Council, School Board	On-Going	Minimal	Local
M	Complete continuity of government plan	Communications Failure	City Council	On-Going	Minimal	Local
M	Maintain list of county emergency contacts	Communications Failure	Staff	On-Going	Minimal	Local
M	Develop and maintain staging area for dumping during cleanup	River Flood	City Council	On-Going	Minimal	Local
L	Maintain list of potential translators to be called upon in case of an emergency	Communications Failure	City Council	On-Going	Minimal	Local
Natural Resource Protection						
H	Monitor wells in areas of identified contamination	Groundwater Contamination	City Council	On-Going	Low	Local
H	Monitor the drinking water supply	Groundwater Contamination, Disease	City Council	On-Going	Low	Local
H	Follow monitoring requirements set forth by the Iowa DNR	Groundwater Contamination	City Council, Public Works	On-Going	Moderate	Local, Federal
M	Maintain and/or develop a wellhead protection program	Groundwater Contamination	City Council	On-Going	Minimal	Local
M	Identify and map areas of past contamination	Groundwater Contamination	City Council	On-Going	Low	Local
M	Maintain and/or develop storm water management program	Groundwater Contamination, Flash Flood	City Council, City Staff	On-Going	Moderate	Local
M	Carry out conservation measures such as erosion control and work with the following organizations: Extension, NRCS, Farm Bureau, EPA, DNR, and Soil and water Conservation District	Groundwater Contamination	City Council	On-Going	Low	Local, State, Federal
M	Restrict water usage should it be necessary	Drought	City Council	On-Going	Minimal	Local
M	Plant trees along water bodies and slopes	Landslides/Mudflows	City Council, Staff	On-Going	Minimal	Local
M	Clear ditches, streams, and waterways on a regular basis	River Flood	City Council, Staff	On-Going	Minimal	Local
L	Eliminate and cap private and abandoned wells in the city	Groundwater Contamination	City Council, Public Works	On-Going	Low	Local
L	Eliminate the use of septic tank systems in the city	Groundwater Contamination	City Council, Public Works	On-Going	Low	Local, State

	limits					
L	Purchase additional parkland in order to increase greens space and reducing surface flow	River Flood	City Council	On-Going	Minimal	Local
Prevention						
H	Maintain mutual aid agreements	All	City Council	On-Going	Minimal	Local
H	Purchase and maintain backup generators	Severe Winter Storm, Thunderstorm/Lightning, Tornado, Emergency Management	City Council	On-Going	Moderate	Local
H	Maintain mutual aid agreements with the Northeast Iowa response Group	HAZMAT	City Council	On-Going	Minimal to Low	Local, State
H	Keep HAZMAT manuals/information current and easily accessible	HAZMAT	City Council	On-Going	Minimal	Local
H	Maintain, test, and replace warning sirens	Windstorm, Tornado, Hailstorm, Thunderstorm/Lightning, Communications Failure	City staff	On-Going	Minimal	Local
H	Encourage backup power generation for local telephone systems and cellular operations	Communications Failure	City Council	On-Going	Moderate	Local
H	Upgrade radio communications equipment as needed	Communications Failure	City Council, Staff	On-Going	Minimal	Local
H	Regularly review and amend fire and medical HAZMAT response standard operating procedures	Communications Failure	City Staff	On-Going	Minimal	Local
H	Keep the county updated on personnel changes	Communications Failure	All City Departments	On-Going	Minimal	Local
H	Continue cooperation between county roads department and local fire departments during snow emergencies	Severe Winter Storm	City Staff, Council	On-Going	Minimal	Local
H	Establish alternative transportation routes should a road need to be closed	Transportation	City Council	On-Going	Minimal	Local
H	Identify fallout shelter locations	Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
H	Keep communication lines open with Nuclear Plant in Palo, IA	Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
H	Provide fans and/or cooling shelter	Extreme Heat	City Council, Public Works	On-Going	Minimal	Local
H	Maintain air conditioner(s) in community buildings	Extreme Heat	City Council	On-Going	Minimal	Local
H	Keep a supply of drinking water to distribute	Extreme Heat	City staff	On-Going	Minimal to Low	Local
H	Cooperate with any countywide mass vaccination plan	Disease	City Council	On-Going	Minimal	Local
H	Monitor disease outbreak news from the CDC and Iowa Department of Public Health	Disease	City Council, Fire Department	On-Going	Low	Local
H	Establish detour routes	Bridge Failure, Flash Flood, River Flood	Police	On-Going	Minimal to Low	Local
H	Establish transportation evacuation routes and protocols	River Flood	City Council	On-Going	Minimal	Local
H	Continue cooperation with county in developing flood mitigation efforts	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
H	Maintain communication with county contacts	Emergency Management	Building and Zoning	On-Going	Minimal	Local

H	Maintain NIMS compliance	Emergency Management	City Council	On-Going	Minimal	Local
M	Purchase NOAA weather radios	Thunderstorm/Lightning, Windstorm, Tornado, Radiological/Nuclear Event	City Council, Fire Department	On-Going	Minimal	Local
M	Provide a local hazardous waste dropoff site	HAZMAT	City Council, Police	On-Going	Minimal	Local
M	Identify areas throughout the county that would substantially benefit from outdoor warning sirens	Windstorm, Tornado	County EMA	On-Going	Minimal to Low	Local
M	Seek to improve communications with other agencies	Communications Failure, Terrorism	City Council, Staff	On-Going	Minimal	Local
M	Keep supply of backup radios and cellphones	Communications Failure	City Council	On-Going	Minimal	Local
M	Stockpile sand and sandbags	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
M	Maintain and improve signals/signage along roadways and at railroad crossings	Transportation	City Council	On-Going	Minimal	Local
M	Enforce no parking designations at special events	Transportation	City Council	On-Going	Minimal	Local
M	Develop rationing procedures	Drought	City Council	On-Going	Minimal	Local
M	Enforce the local zoning ordinances	Landslides/Mudflows	City Council, Police	On-Going	Minimal	Local
M	Develop sandbagging procedures for the community	River Flood	City Council, Staff	On-Going	Minimal	Local
L	Maintain public works equipment	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Enforce sidewalk clearance ordinance	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Backup all digital data	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
L	Place alarms on storage facilities containing hazardous materials	Hazardous Materials (HAZMAT)	City Council	On-Going	Minimal	Local
L	Maintain law enforcement monitoring of large storage supplies	HAZMAT	City Council	On-Going	Minimal	Local
L	Improve standard operating procedures for schools	Communications Failure	Fire Department	On-Going	Minimal	Local
L	Maintain and update anti-virus software	Terrorism	City Council	On-Going	Low	Local
L	Secure vulnerable targets, as identified by the LEPC and County EMA with alarms, security cameras and fences	Terrorism	City Council	On-Going	Minimal	Local, State, Federal
L	Purchase a new tanker and/or pumper	Fire, Explosion	City staff	On-Going	Minimal	Local
L	Enforce a curfew	Riot/Violent Demonstration	Public Works	On-Going	Minimal to Low	Local
L	Update flood maps/flood studies for areas throughout the county	River Flood	City Council	On-Going	Minimal	Local
L	Continue working with the Bremer County Recovery Coalition	Flash Flood, River Flood	City Council, Staff	On-Going	Minimal	Local
L	Encourage all communities to participate in their Local Emergency Planning Commission (LEPC)	Emergency Management	City Council, Staff	On-Going	Minimal	Local
Property Protection						
H	Continue enforcement of city sump pump discharge ordinance	Thunderstorm/Lightning	Fire Department	On-Going	Minimal	Local
H	Continue fire prevention program	Fire	City Council	On-Going	Low to Moderate	Local,
H	Maintain membership in the NFIP	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Maintain, enforce and update floodplain ordinance	Flash Flood, River Flood	City Council, Staff	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or as needed	Grass/Wildfire, Drought	City Council	On-Going	Minimal	Local

H	Initiate and enforce burn ban in times of drought or as needed	Drought	City Council	On-Going	Minimal	Local
H	Place barricades to close dangerous bridges	Bridge Failure	Public Works	On-Going	Minimal to Low	Local
H	Secure the area (around a sinkhole)	Sinkholes	City Council	On-Going	Minimal to Low	Local
H	Inspect any utility lines that are near a sinkhole	Sinkholes	City Council	On-Going	Minimal to Low	Local
M	Maintain tree trimming program	Severe Winter Storm, Windstorm, Hailstorm	City Council	On-Going	Minimal	Local
M	Placement of lighting arrestors on power lines	Thunderstorm/Lightning	City Council, EMA	On-Going	Minimal to Low	Local
M	Continue an annual inspection program for commercial and industrial properties	Fire	City Council	On-Going	Minimal	Local
M	Review and update fire codes as necessary	Fire, Explosion	City Council, Staff	On-Going	Low	Local
M	Identify and inventory potential sinkhole sites	Sinkholes	Police, Fire Department	On-Going	Minimal to Low	Local
L	Install a snow fence around the wastewater treatment facility	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Maintain use of snow fences in the city/county	Severe Winter Storm	City Staff	On-Going	Minimal	Local
L	Use surge protectors to prevent electrical damage to critical and sensitive equipment	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
L	Identify, purchase and remove structures from flood hazard areas	Flash Flood, River Flood	City Council, Staff	On-Going	Moderate	Local, Federal
L	Purchase additional trash pumps	Flash Flood, River Flood	City Council, staff	On-Going	Low	Local
L	Continue to cooperate with pipeline owners and operators to ensure locations are marked	Fire, Explosion	City staff	On-Going	Low	Local
L	Encourage floodproofing/elevating structures in the floodplain	River Flood	City Council, Staff	On-Going	Minimal	Local
Structural Projects						
H	Maintain a list of potential storm sewer projects	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
H	Acquire more water pumps	Flash Flood, River Flood, Dam Failure, Levee Failure	City Staff	On-Going	Minimal	Local
H	Continue with improvement to the storm water system	Flash Flood	City Staff	On-Going	Minimal	Local
H	Maintain and keep storm drains clear of debris	Flash Flood	Fire Department, Public Works	On-Going	Minimal	Local
H	Maintain pump station	River Flood	City Council, Staff	On-Going	Minimal	Local
M	Construct or designate a safe room or storm shelter	Windstorm, Tornado, Hailstorm	City Council, Fire Department	On-going	Minimal	Local
M	Pursue partnership with rural water as the system expands	Fire, Explosion	Staff	On-Going	Minimal to Low	Local
M	Improve water system to enhance firefighting capacity/ability	Fire	City Council, Staff	On-Going	Minimal	Local
M	Install tiling to help water move away from structures	Expansive Soils	City Council, Police	On-Going	Minimal to Low	Local
M	Continue regular bridge inspections	Bridge Failure	Public Works	On-Going	Minimal to Low	Local
M	Maintain embargos/weight limits as necessary	Bridge Failure	City Council	On-Going	Minimal to Low	Local, State
M	Encourage construction of dikes, levees, dams, and retention ponds	River Flood	City Council, Public Works	On-Going	Minimal	Local
M	Regularly inspect dams	Dam Failure	City Council	On-Going	Minimal	Local
L	Prevent inflow and infiltration into the sanitary sewer	Flash Flood, River Flood	City Council	On-Going	Minimal	Local, State

L	Identify bridges and culverts than can cost effectively be reengineered to reduce future flooding	River Flood	City Council	On-Going	Minimal	Local

APPENDIX C: CITY OF JANESVILLE

COMMUNITY PROFILE

Location

Janesville is located in southwest Bremer County (with a small portion within Black Hawk County), in the northeastern quadrant of Iowa, at latitude 42.64 N x longitude 92.46 W and elevations ranging from 950 to 1,020.

Natural Environment

The city is bisected by the Cedar River, which flows from north to south, with the east side of the community having been developed earlier. U.S. Highway 218 is the primary transportation route to and from the City of Janesville. The city is situated approximately 4.5 miles north-northwest of the Waterloo/Cedar Falls metropolitan area and approximately three miles south of the City of Waverly. These distances are calculated from city limit lines as opposed to developed area measurements.

History

Janesville was incorporated in 1854, five years after its founder John T. Barrick laid out the area. Janesville is the oldest town in Bremer County. The land that Janesville is located on is part of 17,780 acres that was purchased from the Sauk and Fox Indians in 1842.

In 1849, John Barrick and his family moved from Sturgis Falls (now known as Cedar Falls) up the Cedar River to an undeveloped area that would eventually become the City of Janesville. According to historical accounts, at times there were as many as 1,700 Indian warriors who made camp next to the Barrick farmstead. Barrick, who was a carpenter by trade, is credited with building the first mill in Bremer County and the first farmhouse in Janesville. Barrick had aspirations of making Janesville the Bremer County seat, but land grabbing by political figures in Black Hawk County dashed his hopes. However, Barrick took solace in the fact that he was able to name the city after his beloved wife, Jane.

TABLE C1: CITY OF JANESVILLE DEMOGRAPHICS

Government Framework	Mayor – City Council
General Population, 2010 Census	
Total Population	930
Median Age	40.2
At-Risk Population, <18 Yrs	225
At-Risk Population, >64 Yrs	175
Total Males	461
Total Females	469
One Race-White	915
Black of African American	6
American Indian and Alaskan Native	0
Asian	2
Two or More Races	7
Housing Characteristics, 2010 Census	
Total Households	398
Households with children <18 Yrs.	116
Households with persons >65 Yrs.	126
Average Household Size	2.34
Average Family Size	2.90
Total Housing Units	409
Occupied Housing Units	398
Vacant Housing Units	11
Owner-Occupied Housing Units	324
Renter-Occupied Housing Units	74
Persons Living in Group Quarters	0

The first schoolhouse in the City of Janesville was built in 1851. It was a log cabin and the first classes were taught by Reverend S.T. Vail

As a means of proportion, the largest single disaster to have ever struck the City of Janesville occurred in 1856. That year an epidemic of typhoid fever spread throughout the community and eventually claimed approximately one third of the population of the city.

The City of Janesville experienced a substantial change when, between the years of 1993 and 1995, U.S. Highway 218 was rebuilt to expressway status. This stretch of highway now provides four lane access from the City of Janesville to points in the neighboring larger communities of Waverly (to the north) and the Waterloo/Cedar Falls metropolitan area (to the south). The highway has also been designated/marketed as the "Avenue of the Saints", which is a 600 mile corridor extending from the north side of St. Paul Minnesota to the south side of St. Louis, Missouri. From a development standpoint, perhaps the largest impact that the completed expressway may have in the future is the easy access to the federal Interstate system.

While the community no doubt serves as a residential midpoint for the larger surrounding communities, they also maintain their own manufacturing base. Furthermore, the town boasts a successful school system, and a surviving central business district.

TABLE C1.1: CITY OF JANESVILLE DEMOGRAPHICS

Economics Characteristics, 2010-2014 ACS	
Population 16 years and over	718
Population In Labor Force (16 yrs and over)	513
Persons Employed	481
Persons Unemployed	32
Persons Employed in Management, Business, Science, and Arts Occupations	102
Persons Employed in Service Occupations	106
Persons Employed in Sales and Office Occupations	102
Persons Employed in Natural Resources, Construction, and Maintenance Occupations	36
Persons Employed in Production, Transportation, and Material Moving Occupations	135
Median Household Income	$53,542
Median Family Income	$57,498
Percent of Persons < 18 yrs. Below Poverty Level	2.9%
Percent of Persons 18-64 Yrs. Below Poverty Level	2.3%
Percent of Persons >65 Yrs. Below Poverty Level	7.1%
Social Characteristics, 2010-2014 ACS	
School Enrollment (3 yrs and over)	244
Nursery School, Preschool	12
Kindergarten and Elementary School (grades 1-8)	109
High School (grades 9-12)	67
College or Graduate School	46
Education Attainment: Population 25 Years and Over	600
Less than High School Graduate	31
High School Graduate (includes equivalency)	234
Some College, Associate's Degree	214
Bachelor's Degree or Higher	121

Demographics

Population

Janesville's demographic data is outlined in Tables C1 and C1.1. In the recent 2010 U.S. Census, Janesville's population grew to 930, an increase of 12 percent over ten years. The previous U.S. Census, taken in 2000, recorded a population figure of 829 for Janesville. Much of the data included in the tables are from the 2000 U.S. Census, since detailed data from the 2010 Census is not yet available.

Community Services

The City of Janesville has a municipal water supply with an elevated storage capacity of 200,000 gallons with an average capacity of 75,000 gallons. The rated capacity of the overall system is 480,000 gallons per day (gpd). The peak demand is 90,000 gpd.

A primary sewer treatment plant serves Janesville. Average load is 100,000 (gpd) with a peak load of 150,000 (gpd). The rated capacity of the sewer treatment plant is 165,000 gpd and is more than sufficient to handle Janesville's current development as well as future development.

Table C2 shows the primary utility providers for the city.

TABLE C2: JANESVILLE UTILITY PROVIDERS						
Electric	**Natural Gas**	**Telephone/Internet**	**Cable**	**Water**	**Sewer**	**Sanitation**
MidAmerican Energy		Windstream	Windstream	City of Janesville	City of Janesville	City of Janesville

HAZARDS & RISK ASSESSMENT

Hazard Analysis

Section 3 identified and profiled the hazards for the entire planning area. However, each community analyzed their own vulnerability to those hazards applicable to their jurisdiction. Using the methodology outlined in Section 3 (Vulnerability Assessment), the City of Janesville evaluated the risk associated with a specific hazard, defined by probability and frequency of occurrence, magnitude, severity, exposures, and consequences. Janesville's vulnerability assessment provides in-depth knowledge of the hazards and vulnerabilities that affect the community. This analysis provides an all-hazard approach when evaluating the hazards of that affect the city, and the associated risks and impacts each hazard presents. As mentioned previously in Section 3, the vulnerability assessment requires a five-year review with periodic updates, as needed. Potential future hazards and impacts may result from changing technology, new critical facilities, infrastructures, and development patterns, as well as demographic and socioeconomic changes that occur within or outside the area.

Disaster frequency and its effects or severity are important as a basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, whereas manmade or technological events tend to change over time with advancement in technology and methods of operation. Five criteria were used by the Committee to assure a systematic and comprehensive approach to hazard analysis for their individual jurisdictions including: Historical Occurrence, Probability, Magnitude or Severity, Warning Time, and Duration.

The Committee assessed the defined hazards relevant to potential impact on the city. Using the scoring criteria previously defined (Tables 19-22) the city assessed each of the identified hazards based on probability, magnitude/severity, warning time, and duration. The scores for each of the factors were weighted using the formula below to develop the final hazard assessment score.

(Probability x .45) + (Magnitude/Severity x. 30) + (Warning Time x .15) + (Duration x .10) = Final Hazard Assessment Score

Table C3 is the analysis scores for the City of Janesville. As shown in the table, the five hazards for the city are: Infrastructure Failure, Thunderstorm/Lightning/Hail, Radiological Incident, Tornado/Windstorm, and Transportation Incident.

TABLE C3: CITY OF JANESVILLE HAZARD RISK ASSESSMENT

Hazard Rank	Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Hazard Score
1	Infrastructure Failure	1	4	4	4	**2.65**
2	Thunderstorm/Lightning/Hail	2	3	4	1	**2.50**
3	Radiological Incident	1	3	4	4	**2.35**
4	Tornado/Windstorm	2	2	4	1	**2.20**
4	Transportation Incident	3	2	1	1	**2.20**
6	River Flooding	2	2	1	3	**1.95**
6	Severe Winter Storm	2	2	1	3	**1.95**
8	Grass/Wild Land Fire	1	1	4	4	**1.75**
8	Sinkholes	1	1	4	4	**1.75**
8	Drought	2	1	1	4	**1.75**
11	Dam / Levee Failure	1	1	4	3	**1.65**
11	Landslide	1	1	4	3	**1.65**
11	HAZMAT Incident	1	1	4	3	**1.65**
11	Extreme Heat	2	1	1	3	**1.65**
11	Flash Flood	2	1	1	3	**1.65**
16	Terrorism	1	1	4	2	**1.55**
17	Human Disease	1	1	1	4	**1.30**
18	Animal/Plant/Crop Disease	1	1		4	**1.15**
19	Earthquake	1	1	1	1	**1.00**
19	Expansive Soils	1	1	1	1	**1.00**

Vulnerability – Identifying Assets (Critical Facilities)

This section will describe the vulnerability for existing and future buildings, infrastructure, and critical facilities in those areas that can be impacted by the prioritized hazards. Since the majority of the hazards have an undefined hazard area (i.e., affecting an entire community or larger area) the following vulnerability assessment will only address those hazards that affect a specified area – flooding (river and flash). However, due to the historical occurrences of tornadoes, this hazard was added to the assessment. The following discussion only considers the assets in the community only.

TABLE C3: CRITICAL FACILITIES IN JANESVILLE

Janesville Library	City Hall
Fire Station	Wastewater Treatment Plant
Janesville Community School (Shelter)	Janesville Methodist Church (Shelter)
Messiah Lutheran Church (shelter)	Ohler Pump (shelter)

Source: Community

Identifying the location of critical facilities and designated shelters (see TableC3) in Janesville is important in order to assess their vulnerability to hazards since these facilities are important to the community's operations and are key components of the economic sector. For instance, high-density residential or commercial development, schools, police stations, government buildings, hospitals and care facilities, airports, gas stations, hardware stores, grocery stores, and water supply systems. It is important to know the threats each hazard poses to these facilities. *Attachment 6D* illustrates the location of identified critical facilities throughout the city.

According to available data, Janesville is projected to see an increase in population over the next thirty years. This population increase most likely result in a greater need for additional critical facilities such as schools, daycare centers, or healthcare centers. However, the need for more critical facilities should be closely monitored these next 5-years and readdressed when this HMP is updated.

Flooding

A facility vulnerable to flooding is normally low, since these structures are not often constructed within the 100-year floodplain. According to the information provided, bridges and roadways was be impacted by flooding. This disruption in the transportation infrastructure would create a longer time period to receive and provide services and supplies to an area if a bridge was washed away due to flooding.

TABLE C4: CITY OF JANESVILLE 100-YEAR FLOODPLAIN PROPERTIES

Number of Structures	55
Building Value	$ 1,682,070
Dwelling Value	$ 1,022,460
Total Value	$ 2,704,530

Source: INRCOG & Bremer County Assessor (2011 $)

Table C4 lists the number properties in Janesville that are located within the 100-year floodplain. According to staff map analysis, Janesville has 32 dwellings and approximately 76 persons living within the flood hazard area (estimating using 2000 Census Average Household Size Data). According to the data provided by INRCOG and Bremer County, there are 55 structures located within the 100-year floodplain. See *Attachment 5D: Flood Scenario Map of the City* and Table C4.

Tornadoes

As stated on the FEMA website[24], mobile homes are highly vulnerable to tornadoes. Even mobile homes that are tied down, offer little protection from tornadoes.

According to Census information, there are 27 mobile homes located in Janesville. General observation would suggest a recent increase in the number of manufactured homes in the area. This increased popularity has the potential to increase the potential risk of damage to people and property in the community. Currently, no FEMA certified tornado safe shelters are known to exist in the community.

The primary reason for the increased popularity of mobile and manufactured homes is affordability. Although HUD regulations and local building codes have increased the safety components of these types of houses significantly in recent history, this affordability has often been accompanied with a reduced level of safety. Based on national data on circumstance of tornado fatalities between 1985 and 1997, it was found that 38% of fatalities were occupants of mobile or manufactured homes, 27% were in permanent homes, 11% in vehicles, 9% outdoors (open), 4% in businesses, 4% in structures with long-span roofs, and 2% in schools. These data highlight the high exposure of occupants of mobile and manufactured homes (*AR State Hazard Mitigation Plan, 1999*).

Vulnerability – Social Assets (Populations)

The social vulnerability assessment identified how the hazards affect the population of Janesville and it is assumes that the identified populations are more likely to require assistance during times of disaster; therefore, are considered, generally speaking, more "at-risk" than the remaining population. The "at-risk" population must be identified and targeted in successful mitigation efforts. Table C5 presents an overview of the at-risk population in Janesville according to information retrieved from the 2000 U.S. Census and Iowa Data Center.
According to Table C5, 14% of Janesville residents are 65 years and older. There are no persons in the community living in group quarters.

Persons under the age of 18 are also at higher risk during some disasters. This is mostly due to the fact that young persons often are not aware of the proper actions to take in the event of a disaster. In addition, very young children would be more susceptible to a disaster such as a disease epidemic simply due to their age. In 2000, there was 20% of the county's total population under the age of 18.

TABLE C5: CITY OF JANESVILLE "AT-RISK" POPULATION

	2010
Total City Population (2010)	930
Elderly (65 yrs and older)	132
Youth (under 18 yrs old)	188
Householder Living Alone	90
Non-English Speaking Population (speaks English less than 'very well'	2
Population Living in Poverty	29
Population in Mobile Homes	53
Group Quarters Population	0
Persons with Disabilities (age 5+)	184

Source: U.S. Census, 2000 and Iowa Data Center

[24] Federal Emergency Management Agency (FEMA), http://www.fema.gov/areyouready/tornadoes.shtm

In addition, persons living in mobile homes, also known as manufactured housing may also be at risk from tornadoes or high winds brought on by thunderstorms. At the time of the 2000 Census, there were 27 mobile homes in the city. Using the 2000 Census sampling data, there are 53 people residing in mobile homes in Janesville.

Flooding

Portions of Janesville are highly vulnerable to floods. Flooding puts the entire population at some level of risk, whether through the flooding of their homes, businesses, or places of employment, or the road, sewer, and water infrastructure that serve them daily. High floodwaters can devastate homeowners with property damage, property loss, and extensive, time-consuming cleanup. Secondary effects caused by flooding can add to the property damage. Power loss can leave citizens without heat or air conditioning for extended periods of time. The transportation infrastructure of the community can be impacted by flooding events, which can endanger citizens attempting to travel or evacuate the area, as well as leave those remaining without goods and services.

Relying on aerial map analysis, Janesville has approximately 76 persons located in the flood hazard area. Populations living in the 100-year floodplain are also at risk of sustaining personal injury or property damage. As mentioned previously, there are 32 dwellings in the community within the 100-year floodplain. In a worst case scenario, if all the identified dwellings were flooded and using the average persons per household, 2.38, approximately 76 persons could be living in the floodplain.

Vulnerability – Estimating Potential Property Losses

Valuations are an important component of hazard mitigation planning insomuch as it provides measurable data that can be used to form some type of estimate as to the potential losses a community could face in the event of a catastrophic disaster.

The valuations for the City of Janesville are available from the County Assessors and Auditors offices. City of Janesville's property valuations are in Table C6. Future Development

Future development within identified hazard areas can change the threat level of an area by placing critical facilities, businesses, transportation networks, utilities, and populations within vulnerable areas. While it can be difficult to curb development in the planning area, it is the jurisdiction's advantage to be aware of development trends in order to successfully mitigation future hazards as risks increase. However, continued conformity with the State Building Codes and local land use ordinances and regulations (zoning, subdivision, floodplain management, etc.) will help to mitigate the effects hazards have on new and future development.

TABLE C6: CITY OF JANESVILLE'S VALUATION

	Total Valuation	Average Valuation per Unit or Parcel
Residential Property	$ 34,511,080	$ 119,416 /parcel
Commercial Property	$ 2,055,990	$ 85,666/unit
Industrial Property	$ 2,566,320	$ 427,720/unit
Agricultural Buildings	$ 288,020	$ 96,007/unit
Agricultural Land	$ 199,500	$ 926/acre
Utilities, G & E	$ 1,088,955	N/A
Railroads	$ 54,598	N/A
Exemptions (military)	$ 137,048	N/A
Gross Valuation	$ 40,764,463	N/A
Total Valuation	**$ 40,627,415**	

Source: Bremer County Assessor, as of 1/1/2010

National Flood Insurance Program/Repetitive Loss Properties

The city participates in the National Flood Insurance Program (NFIP) and has a flood ordinance in place. As Table C7 shows, there are three NFIP policies in place within the city.

FEMA defines a repetitive loss property as an insurable building that has experienced two losses in a 10-year period in which each loss is $1,000 or more. There is one repetitive loss property in the city.

River flooding is the most common cause of repetitive loss in Bremer County. Table C7 illustrates the number of repetitive loss properties for Tripoli. Currently (as of 11/30/2014) there are no active repetitive loss building in the city.

Table G9 shows relevant NFIP and Repetitive Loss statistics for the city.

TABLE C7: NFIP AND REPETITIVE LOSS DATA FOR JANESVILLE

CID #	# of NFIP Policies	NFIP Insurance in Force ($)	Total # of RLB	RLB Insured	# of Active RLB	Total RLB Losses ($)	RLB Losses Insured ($)
190023	3	$313,000	0	0	0	$0	$0

Source: Federal Emergency Management Agency (FEMA); Note: RLB = Repetitive Loss Building; NFIP data current as of 9/30/2016; Repetitive loss data current as of 11/30/2014

This HMP attempts to reduce loss by identifying potential natural and manmade hazards. As a result of many natural and manmade hazards, repairs and reconstruction area often completed in a way that returns the structure to pre-disaster condition yet does little to prevent a reoccurrence of damage. Replication of the pre-disaster conditions allows for the repetitive cycle of property damage, reconstruction, and re-damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction are analyzed, and sound, less vulnerable conditions are produced. Additionally, other mitigation strategies may be considered, such as voluntary property buy-outs.

MITIGATION STRATEGY

Hazard Mitigation Plan Goals

The hazard mitigation plan goals were reviewed by the Hazard Mitigation Planning Committee at their second committee meeting. The committee set as a priority the development of broad-based goals that would address a multitude of hazards and encompass a variety of mitigation activities. The hazard mitigation plan goals identified are as follows:

1. Reduce the chance of and impact of flooding in the community.
2. Take measures to minimize the occurrence of injuries and loss of life due to hazards.
3. Take measures to minimize or eliminate damages that may occur as a result of hazards.
4. Increase the city's ability to respond to natural disasters and man-made hazards.
5. Return to the community to similar or improved pre-event conditions as quickly as possible following a disaster event.
6. Incorporate the City Plan into the proposed Multi-Jurisdictional Plan.
7. Continually re-assess and re-evaluate the plan and mitigation activities.

Current Mitigation Actions

Prevention Mitigation Actions

The City of Janesville has and enforces a Flood Plain Ordinance. In accordance with NFIP guidelines, the ordinance does not allow for new construction within the floodplain without approval from the Department of Natural Resources and the Janesville City Council. In addition, it requires those structures within the floodway fringe to: (a.) "be adequately anchored to prevent flotation, collapse or lateral movement of the structure"; (b.) "use construction methods and practices that will minimize flood damage" and; (c) "use construction materials and utility equipment that are resistant to flood damage."

The Federal Insurance Administration manages the insurance component of the NFIP, and works closely with FEMA's Mitigation Directorate, which oversees the floodplain management aspect of the program. Janesville remains in good standing with the National Flood Insurance Program.

Table C8 summarizes Janesville's preventive mitigation actions.

TABLE C8: CURRENT PLANNING AND REGULATORY DOCUMENTS FOR JANESVILLE

Previous HMP	Comprehensive Plan	Building Code	Zoning Ordinance	Subdivision Regulations	Floodplain Management Ordinance	Tree-Trimming Ordinance	Storm Water Ordinance	Snow Removal Ordinance
Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Source: City, Note: RR=Restricted Residential

Property Protection Mitigation Actions

Janesville has not participated in any buyout program. However, the city participates in the National Flood Insurance Program and remains in good standing. Nonstructural methods of flood protection in the form of land use regulations are being utilized to aid in the prevention of future flood damage. The city provides sandbags to citizens wishing to make personnel efforts to preserve their property during high water events. No other flood protection measures are known to exist within the city.

Public Education and Awareness Mitigation Actions

Information regarding protecting oneself is highly publicized in flyers, billboards, and on the radio.

Emergency Services Mitigation Actions

Janesville works with the Bremer County Emergency Management Coordinator, based out of the City of Waverly, on various safety and emergency events. The Emergency Management Coordinator works in conjunction with local fire, rescue, police, and government officials to draft and implement workable emergency action plans in the community. The current Emergency Management Coordinator is Kip Ladage and current contact information is as follows: Bremer County Emergency Management Agency, 111 4th St. NE, Bremer-Waverly LEC, Waverly, Iowa 50677, (319) 352-0133, email: kladage@co.bremer.ia.us

Law Enforcement

Police protection is provided by the Janesville Police Department, Black Hawk County Sheriff's Department, Bremer County Sheriff's Department, and the Iowa State Patrol. Currently, there are two full time officers and one part time officer on staff in the Janesville Police Department.

The Police Department is created as an executive branch of the City Government by City Ordinance.

The approach of the Janesville Police Department is intended to be proactive rather than reactive, with police managers anticipating events through planning, and delivering a whole range of police services to the community.

Fire Protection

The Janesville Fire Department is a volunteer force that currently includes 25 members and has six vehicles to protect the community. The vehicles currently owned and operated by the department include the following:

- 2000 Pierce Tanker
- 2010 Class A Pumper
- 1987 Chevy Mini-Pumper
- 2011 Tanker (2000 Gallon Capacity)
- 1990 Dodge 4x4 Grass Rig

The Department takes pride in being an efficient, well-trained, and equipped organization. It provides fire and rescue services from one main station, which is connected to the City Library and City Hall. The fire department has in place 28E agreements with surrounding communities to provide and receive assistance as needed on a mutual aid basis. The communities that the Janesville Volunteer Fire Department maintains 28E agreements include all communities in Black Hawk and Bremer Counties and Waterloo HAZMAT Response Team.

In addition to firefighting services, the department provides light rescue service, vehicle rescue, operations hazmat, structure fire suppression, and grass fire suppression.

Ambulance

The city currently operates a small ambulance service, but the number of volunteers serving the city and equipment used is not available at this time.

Medical Facilities

Janesville does not have any medical facilities. The community is in close proximity to medical facilities in Waverly or Cedar Falls/Waterloo.

HAZMAT

Janesville contracts with Northeast Iowa Response Group for response to hazardous material spills. The Northeast Iowa Response Group is a division of Waterloo Fire Rescue as is the Hazardous Materials Regional Training Center. The Training Center provides training to fire departments and companies from around the state and country. Not only is this a training center it also serves as a hazardous materials quick response unit to Black Hawk County, surrounding counties, and many municipalities in a ten county region. The Unit provides local fire departments with hazard materials emergency procedures thus reducing additional contamination. An evacuation plan is also in place in conjunction with the activities with the local department.

Contact information for the facility is as follows: Hazardous Materials Regional Training Center, 1925 Newell Street, Waterloo, Iowa 50707, Phone: (319) 291-4275, Toll Free: (800) 291-4682, Fax: (319) 291-4285

The jurisdictions also partners the Northeast Iowa Response Group for assistance in responding to any methamphetamine labs located in the city limits. The Response Group assists the Police Departments in containment of the site and disposal of the hazardous chemicals.

Public Works / Street Department
The City of Janesville contracts for snow removal. The Town Council oversees all snow removal and ice prevention. The city does employ a small public works department for routine maintenance of city property. Information on the number of employees and equipment used is not available at this time.

Natural Resource Protection Mitigation Actions
Janesville does not have nor done any natural resource protection mitigation actions.

Structural Projects Mitigation Actions
Janesville does not have nor done any structural projects.

Future Mitigation Actions

While the existing mitigation activities discussed above detail the city's efforts to mitigate hazards when possible and to respond to hazards in a timely and efficient manner, the Committee also recognizes that there are many more mitigation activities and projects that would benefit county residents. Thus, the Committee developed a list of future hazard mitigation activities that, if accomplished, would serve to further reduce the risk of hazards to the community. The list may include a combination of projects the Committee feels the community should try to accomplish and mitigation efforts that are ongoing that the Committee view as vital to the continued well-being of the public.

The Committee analyzed the potential mitigation activities. This analysis included a discussion of the potential benefits of implementing the activity, some hurdles that the community may face in implementing the action step, and the drawbacks of implementation. The analysis utilized the STAPLEE feasibility criteria. The STAPLEE technique is a FEMA suggested method of evaluation. The STAPLEE approach assesses both positive and negative impacts on the following aspects of a county: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Based on this analysis, each activity was ranked as High (H), Medium (M)or Low (L). However, not all identified activities are applicable to all jurisdictions and is marked as such in Table C10.

Funding

Although in the long-term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short-term each action will have an associated cost. The City will rely heavily on local funding sources to fulfill most of the plan obligations; however, they will also seek funds from State and Federal agencies for both pre- and post-disaster mitigation activities.

The estimated cost(s) for each mitigation action, program, or project is either: Minimal, Low, Moderate, or High depending upon various factors.

- Minimal: Cost estimate is $10,000 or less based on using current staff, time commitment, continuous of current duties, proposed action/program/ project, and funding sources.
- Low: Cost estimate for project range from $10,001 - $99,999 based on existing proposed treatment, time commitment, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.).
- Moderate : Cost estimate for project range from $100,000 - $299,999 based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.), and funding sources.
- High : Cost estimate for project range is $300,000 or higher based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, project components (permits, acquisition, coordination, etc.), and funding sources.

Implementation Strategy

Once the Committee identified and ranked the future hazard mitigation activities, the activities were then analyzed. In addition, the Committee identified a time line for each activity, identified the responsible party (ies) for each activity and finally related each activity to at least one of the five Hazard Mitigation Plan Goals listed above. Table C10 below is the City of Janesville's Implementation Strategy.

TABLE C10: CITY OF JANESVILLE'S IMPLEMENTATION STRATEGY						
Priority	**Mitigation Action/Program/Project**	**Associated Hazard**	**Primary Agency Responsible for Implementation**	**Date for Completion**	**Estimated Cost (s)**	**Funding Source**
Education/Public Awareness						
H	Educate the public	All	City Council, Staff	On-Going	Minimal	Local
H	Notify the media on shelter locations	Severe Winter Storm, Extreme Heat, Tornado	City Council	On-Going	Minimal	Local
H	Keep HAZMAT manuals/information current and easily accessible	HAZMAT	City Council	On-Going	Minimal	Local
H	Encourage use of Iowa One call before digging	Communications Failure, Explosion	City Council, Staff	On-Going	Minimal	Local
H	Encourage residents to keep smoke detectors, sprinkler systems and fire extinguishers maintained in their homes	Fire	City Council, Fire Department	On-Going	Minimal	Local
H	Encourage the public to receive vaccinations	Disease	City Council, County	On-Going	Minimal	Local
H	Educate city personnel to identify risk areas	Expansive Soils	City Council	On-Going	Low	Local
H	Inform the public of reputable and ill reputable contractors following disasters	Emergency Management	City Council	On-Going	Minimal	Local
M	Encourage lead based paint and asbestos removal	HAZMAT	City Staff	On-Going	Minimal	Local
M	Encourage and maintain enrollment in emergency notification system	Thunderstorm/Lightning, Windstorm, Tornado, Communication Failure	City Council	On-Going	Low	Local
M	Encourage home owners to keep emergency kits	Windstorm, Tornado	City Staff	On-Going	Minimal	Local
M	Educate the public on maintaining their sump pumps	Flash Flood	City Council, Fire Department	On-Going	Minimal	Local
M	Encourage community to plant shade trees	Extreme Heat	City Council	On-Going	Minimal	Local
Emergency Services						
H	Continue training and education for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Maintain and acquire materials and equipment for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Provide emergency shelters for evacuees	All	City Council	On-Going	Minimal	Local
H	Maintain storm spotter training for local fire departments/deputies and EMS crews	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm	Fire Department	On-Going	Minimal	Local
H	Enhance Standard Operating Procedures for dissemination of information/press releases in the event of a disaster	Communications Failure	City Council, Schools	On-Going	Minimal	Local
H	Maintain list of county emergency contacts	Communications Failure	City Council, Staff	On-Going	Minimal	Local
H	Set a designated number of people to be trained in post-disaster record keeping/damage assessments	Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain and update emergency response plans	Emergency Management	City Council, Staff	On-Going	Minimal	Local

H	Maintain lists of personnel and equipment available to use with response plans	Emergency Management	City Council, Public Works	On-Going	Minimal to Low	Local
M	Make available a cleanup crew for after a storm	Thunderstorm/Lightning	City Council, Staff	On-Going	Minimal	Local
M	Continue training and promotion of the Incident Command System	Communications Failure	City Council, EMA	On-Going	Minimal	Local
M	Keep a supply of drinking water to distribute	Extreme Heat	City Council, Staff	On-Going	Minimal	Local
M	Cooperate with any countywide mass vaccination plan	Disease	City Council, County	On-Going	Minimal	Local
L	Maintain list of potential translators to be called upon in case of an emergency	Communications Failure	Bremer County EMA, Staff	On-Going	Minimal	Local
L	Maintain or install GPS units in all emergency service and city/county vehicles	Communications Failure	Staff	On-Going	Minimal	Local
L	Maintain automatic TTY TDD machines for emergency personnel and city/county employees	Communications Failure	Bremer County EMA, Staff	On-Going	Low	Local
L	Complete continuity of government plan	Communications Failure	City Council	On-Going	Minimal	Local
Natural Resource Protection						
H	Maintain and/or develop a wellhead protection program	Groundwater Contamination	City Council	On-Going	Low	Local
H	Monitor wells in areas of identified contamination	Groundwater Contamination	City Council	On-Going	Low	Local
H	Monitor the drinking water supply	Groundwater Contamination, Disease	City Council, Public Works	On-Going	Low	Local
H	Identify and map areas of past contamination	Groundwater Contamination	City Council, City Staff	On-Going	Minimal	Local
H	Maintain and/or develop storm water management program	Groundwater Contamination, Flash Flood	City Council, Public Works	On-Going	Low	Local
H	Eliminate and cap private and abandoned wells in the city	Groundwater Contamination	City Council, Public Works	On-Going	Low	Local
H	Follow monitoring requirements set forth by the Iowa DNR	Groundwater Contamination	City Council	On-Going	Low	Local
H	Restrict water usage should it be necessary	Drought	City Council	On-Going	Minimal	Local
H	Clear ditches, streams, and waterways on a regular basis	River Flood	Public Works	On-Going	Minimal	Local
M	Eliminate the use of septic tank systems in the city limits	Groundwater Contamination	City Council	On-Going	Moderate	Local, Federal
M	Carry out conservation measures such as erosion control and work with the following organizations: Extension, NRCS, Farm Bureau, EPA, DNR, and Soil and water Conservation District	Groundwater Contamination	City Council	On-Going	Low	Local, State, Federal
M	Plant trees along water bodies and slopes	Landslides/Mudflows	City Council, Staff	On-Going	Minimal	Local
L	Purchase additional parkland in order to increase greens space and reducing surface flow	River Flood	City Council, Staff	On-Going	Moderate	Local

Prevention						
H	Maintain mutual aid agreements	All	City Council	On-Going	Minimal	Local
H	Determine locations for potential heating shelters and volunteer organization	Severe Winter Storm	Bremer County EMA, City Council	On-Going	Minimal	Local
H	Purchase and maintain backup generators	Severe Winter Storm, Thunderstorm/Lightning, Tornado, Emergency Management	City Council	On-Going	Low	Local
H	Maintain public works equipment	Severe Winter Storm	City Council	On-Going	Low	Local
H	Purchase NOAA weather radios	Thunderstorm/Lightning, Windstorm, Tornado, Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
H	Place alarms on storage facilities containing hazardous materials	Hazardous Materials (HAZMAT)	City Council	On-Going	Minimal	Local
H	Maintain law enforcement monitoring of large storage supplies	HAZMAT	City Council, Police	On-Going	Minimal	Local
H	Maintain mutual aid agreements with the Northeast Iowa response Group	HAZMAT	City Council, Fire Department	On-Going	Minimal to Low	Local
H	Maintain, test, and replace warning sirens	Windstorm, Tornado, Hailstorm, Thunderstorm/Lightning, Communications Failure	Staff, EMA	On-Going	Minimal to Low	Local
H	Upgrade radio communications equipment as needed	Communications Failure	City Council, Staff	On-Going	Minimal to Low	Local
H	Regularly review and amend fire and medical HAZMAT response standard operating procedures	Communications Failure	City Staff	On-Going	Minimal	Local
H	Seek to improve communications with other agencies	Communications Failure, Terrorism	City Council, Staff	On-Going	Minimal	Local
H	Keep the county updated on personnel changes	Communications Failure	All City Departments	On-Going	Minimal	Local
H	Continue cooperation between county roads department and local fire departments during snow emergencies	Severe Winter Storm	City Staff, Council	On-Going	Minimal	Local
H	Pursue partnership with rural water as the system expands	Fire, Explosion	City Council, Staff	On-Going	Minimal to Low	Local
H	Maintain and update anti-virus software	Terrorism	Staff	On-Going	Minimal	Local
H	Secure vulnerable targets, as identified by the LEPC and County EMA with alarms, security cameras and fences	Terrorism	City Council, Fire Department, Police	On-Going	Minimal	Local
H	Provide fans and/or cooling shelter	Extreme Heat	City Council, Staff	On-Going	Minimal	Local
H	Develop rationing procedures	Drought	City Council	On-Going	Minimal	Local
H	Establish detour routes	Bridge Failure, Flash Flood, River Flood	City Council	On-Going	Minimal to Low	Local
H	Update flood maps/flood studies for areas throughout the county	River Flood	City Council, Staff	On-Going	Minimal	Local
H	Establish transportation evacuation routes and	River Flood	City Council, Police	On-Going	Minimal	Local

	protocols					
H	Develop sandbagging procedures for the community	River Flood	City Council, Fire Department	On-Going	Minimal	Local
H	Develop and maintain staging area for dumping during cleanup	River Flood	City Council, Staff	On-Going	Minimal	Local
H	Continue cooperation with county in developing flood mitigation efforts	Flash Flood, River Flood	City Council, Staff	On-Going	Minimal	Local
H	Continue working with the Bremer County Recovery Coalition	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
H	Encourage all communities to participate in their Local Emergency Planning Commission (LEPC)	Emergency Management	City Council, Staff	On-Going	Minimal	Local
H	Maintain communication with county contacts	Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain NIMS compliance	Emergency Management	City Council, Fire Department	On-Going	Minimal	Local
M	Acquire necessary response and detection equipment for city/county employees	HAZMAT	City Council	On-Going	Minimal	Local
M	Provide a local hazardous waste dropoff site	HAZMAT	City Council	On-Going	Minimal	Local
M	Identify areas throughout the county that would substantially benefit from outdoor warning sirens	Windstorm, Tornado	Staff, EMA	On-Going	Minimal to Low	Local
M	Improve standard operating procedures for schools	Communications Failure	City Council, Schools, Staff	On-Going	Minimal	Local
M	Keep supply of backup radios and cellphones	Communications Failure	Bremer County EMA, City	On-Going	Minimal	Local
M	Stockpile sand and sandbags	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
M	Maintain and improve signals/signage along roadways and at railroad crossings	Transportation	Police Department	On-Going	Minimal	Local
M	Establish alternative transportation routes should a road need to be closed	Transportation	Fire Department, Police	On-Going	Minimal	Local
M	Purchase emergency signs to be used in case of an incident	Transportation	City Council	On-Going	Low	Local
M	Enforce no parking designations at special events	Transportation	City Council, Police	On-Going	Minimal	Local
M	Keep communication lines open with Nuclear Plant in Palo, IA	Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
M	Maintain air conditioner(s) in community buildings	Extreme Heat	City Council	On-going	Minimal	Local
M	Monitor disease outbreak news from the CDC and Iowa Department of Public Health	Disease	City Council, County	On-Going	Minimal	Local
M	Enforce a curfew	Riot/Violent Demonstration	City Council, Police	On-Going	Minimal to Low	Local
M	Enforce the local zoning ordinances	Landslides/Mudflows	City Council, Zoning Admin	On-Going	Minimal to Low	Local
L	Enforce sidewalk clearance ordinance	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Backup all digital data	Thunderstorm/Lightning	Staff	On-Going	Minimal	Local
L	Identify fallout shelter locations	Radiological/Nuclear Event	City Council	On-Going	Minimal	Local
L	Purchase a new tanker and/or pumper	Fire, Explosion	Council, Fire Dept.	On-Going	Moderate	Local
Property Protection						
H	Use surge protectors to prevent electrical damage to critical and sensitive equipment	Thunderstorm/Lightning	City Council, Staff	On-Going	Minimal	Local
H	Continue an annual inspection program for commercial and industrial properties	Fire	Staff, Council	On-Going	Minimal to Low	Local
H	Continue fire prevention program	Fire	City Council, Fire Department	On-Going	Low to Moderate	Local, State
H	Improve water system to enhance firefighting	Fire	City Council, Fire Department	On-Going	Moderate	Local

	capacity/ability					
H	Maintain membership in the NFIP	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Maintain, enforce and update floodplain ordinance	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or as needed	Grass/Wildfire, Drought	Fire Department	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or as needed	Drought	Fire Department	On-Going	Minimal	Local
H	Encourage the use of proper materials and construction techniques	Expansive Soils	City Staff	On-Going	Minimal	Local
H	Place barricades to close dangerous bridges	Bridge Failure	Public Works	On-Going	Minimal to Low	Local
H	Maintain embargos/weight limits as necessary	Bridge Failure	Public Works	On-Going	Minimal to Low	Local
H	Receive education/training from DOT on the subject	Bridge Failure	City Council	On-Going	Minimal to Low	Local, State
H	Secure the area (around a sinkhole)	Sinkholes	City Council, Police, Fire Dept.	On-Going	Minimal	Local
H	Inspect any utility lines that are near a sinkhole	Sinkholes	City Council, Public Works	On-Going	Minimal	Local
H	Maintain pump station	River Flood	City Council, Public Works	On-Going	Minimal	Local
M	Encourage utility providers and developers to place all utilities underground	Severe Winter Storm, Communications Failure, Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
M	Continue enforcement of city sump pump discharge ordinance	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
M	Encourage backup power generation for local telephone systems and cellular operations	Communications Failure	Bremer County EMA	On-Going	Moderate	Local, State, Federal
M	Identify, purchase and remove structures from flood hazard areas	Flash Flood, River Flood	City Council, Staff	On-Going	Moderate	Local, Federal
M	Install rip rap around wastewater treatment facility	Flash Flood	All City Departments	On-Going	Minimal	Local
M	Review and update fire codes as necessary	Fire, Explosion	City Council, Fire Dept.	On-Going	Low	Local
M	Continue to cooperate with pipeline owners and operators to ensure locations are marked	Fire, Explosion	City Council	On-Going	Low	Local
M	Identify and inventory potential sinkhole sites	Sinkholes	City Council	On-Going	Minimal to Low	Local
M	Educate city personnel to handle a sinkhole situation	Sinkholes	City Council	On-Going	Minimal to Low	Local
M	Encourage floodproofing/elevating structures in the floodplain	River Flood	All City Departments	On-Going	Minimal	Local
L	Install a snow fence around the wastewater treatment facility	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Maintain use of snow fences in the city/county	Severe Winter Storm	Public Works	On-Going	Minimal	Local
L	Placement of lighting arrestors on power lines	Thunderstorm/Lightning	City Council	On-Going	Minimal to Low	Local
Structural Projects						
H	Prevent inflow and infiltration into the sanitary sewer	Flash Flood, River Flood	City Council, Fire Department	On-Going	Moderate	Local
H	Continue regular bridge inspections	Bridge Failure	Public Works	On-Going	Minimal to Low	Local
H	Identify bridges and culverts than can cost effectively be reengineered to reduce future flooding	River Flood	City Council, Staff	On-Going	Minimal	Local
H	Regularly inspect dams	Dam Failure	City Council, Staff	On-Going	Minimal	Local
M	Maintain a list of potential storm sewer projects	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
M	Construct or designate a safe room or storm shelter	Windstorm, Tornado, Hailstorm	City Council	On-going	High	Local, State, Federal

M	Acquire more water pumps	Flash Flood, River Flood, Dam Failure, Levee Failure	City Staff	On-Going	Minimal to Low	Local
M	Continue with improvement to the storm water system	Flash Flood	City Staff	On-Going	Low to Moderate	Local
M	Maintain and keep storm drains clear of debris	Flash Flood	Fire Department, Public Works	On-Going	Minimal	Local
M	Purchase additional trash pumps	Flash Flood, River Flood	City Council, Fire Department	On-Going	Minimal to Low	Local
M	Install tiling to help water move away from structures	Expansive Soils	City Council, Zoning Administrator	On-Going	Minimal	Local, State
M	Encourage construction of dikes, levees, dams, and retention ponds	River Flood	City Council, Staff	On-Going	Minimal	Local

APPENDIX D: CITY OF PLAINFIELD

TABLE D1: CITY OF PLAINFIELD DEMOGRAPHICS	
Government Framework	Mayor – City Council
General Population, 2010 Census	
Total Population	436
Median Age	37.8
At-Risk Population, <18 Yrs	118
At-Risk Population, >64 Yrs	67
Total Males	219
Total Females	217
One Race-White	427
Black of African American	2
American Indian and Alaskan Native	0
Asian	0
Two or More Races	5
Housing Characteristics, 2010 Census	
Total Households	185
Households with children <18 Yrs.	56
Households with persons >65 Yrs.	48
Average Household Size	2.36
Average Family Size	2.90
Total Housing Units	197
Occupied Housing Units	185
Vacant Housing Units	12
Owner-Occupied Housing Units	149
Renter-Occupied Housing Units	36
Persons Living in Group Quarters	0

COMMUNITY PROFILE

Geography

Plainfield is located in northwest Bremer County, in the northeastern quadrant of Iowa, at latitude 42.84 N x longitude 92.53 W. The majority of Plainfield lies at an elevation of between 940 and 950 feet, *see Attachment 1: Topographic Map of the City*. The Cedar River runs to the east of the community, which is served by two major highways, U.S. Highway 218 and State Highway 188.

The terrain on which Plainfield is built is generally flat topography due to the city's location within a basin. There are very few areas of steeper than normal slope with these being dispersed throughout the community. The highest points of the community lie at approximately 950 feet above sea level.

History

The earliest non-American Indians to settle in the Plainfield area arrived in 1854. Five settlers originally founded the settlement, the first in Polk Township. The Town of Plainfield was platted in 1866, with the Post Office established in the same year. In the two years following the establishment of the Post Office, Plainfield would experience significant development. This included the construction of the first school, the Cedar Falls Minnesota Railroad depot, and a telegraph station.

Plainfield was incorporated in 1895. This was followed shortly thereafter by the establishment of the Plainfield Savings Bank. In 1904 the community hired the first mail carriers that were designated to serve the rural areas outside of Plainfield. Another date of significance was the dedication of the new brick High School and Gymnasium in 1934.

The City of Plainfield has been no stranger to disaster throughout its history, suggesting the importance of hazard mitigation efforts. The history of such events in Plainfield is as follows:

1871: A large prairie fire burns through the Plainfield area.
1893: The west side of Main Street is destroyed by fire.
1905: A tornado of significant strength hits town.
1918: The Pearl Rock tornado sweeps through town, destroying several
1936: A major snow storm buries the town, during a record winter for snowfall.
1943: Downtown Plainfield is destroyed by fire.
1962-63: Plainfield savings bank is robbed on three occasions.

Demographics

Population

Plainfield's demographic data is outlined in Tables D1 and D1.1. In the recent 2010 U.S. Census, Plainfield's population declined to 436, a decrease of 0.46% percent over ten years. The previous U.S. Census, taken in 2000, recorded a population figure of 438 for Plainfield. Much of the data included in the tables are from the 2000 U.S. Census, since detailed data from the 2010 Census is not yet available.

Community Services

The City of Plainfield has a municipal water supply with an elevated storage capacity of 50,000 gallons with an average capacity of 50,000 gallons. The rated capacity of the overall system is 50,000 gallons per day (gpd). The peak demand is 35,000 gpd.

A primary sewer treatment plant serves Plainfield. Average load is 35,000 (gpd) with a peak load of 40,000 (gpd). The rated capacity of the sewer treatment plant is 50,000 gpd and is more than sufficient to handle Plainfield's current level of development as well as future development.

TABLE D1.1: CITY OF PLAINFIELD DEMOGRAPHICS

Economics Characteristics, 2010-2014 ACS	
Population 16 years and over	343
Population In Labor Force (16 yrs and over)	238
Persons Employed	227
Persons Unemployed	11
Persons Employed in Management, Business, Science, and Arts Occupations	44
Persons Employed in Service Occupations	25
Persons Employed in Sales and Office Occupations	60
Persons Employed in Natural Resources, Construction, and Maintenance Occupations	45
Persons Employed in Production, Transportation, and Material Moving Occupations	53
Median Family Income	$67,083
Mean Family Income	$67,560
Percent of Persons < 18 yrs. Below Poverty Level	2.8%
Percent of Persons 18-64 Yrs. Below Poverty Level	5.1%
Percent of Persons >65 Yrs. Below Poverty Level	2.5%
School Enrollment (3 yrs and over)	103
Nursery School, Preschool	13
Kindergarten and Elementary School (grades 1-8)	62
High School (grades 9-12)	16
College or Graduate School	12
Education Attainment: Population 25 Years and Over	306
Less than High School Graduate	5.9%
High School Graduate (includes equivalency)	50.7%
Some College, Associate's Degree	20.4%
Bachelor's Degree or Higher	13.1%

Table D2 shows the primary utility providers for the city.

TABLE C2: PLAINFIELD UTILITY PROVIDERS

Electric	Natural Gas	Telephone/Internet	Cable	Water	Sewer	Sanitation
MidAmerican Energy	MidAmerican Energy	Butler-Bremer Communications	Butler-Bremer Communications	City of Plainfield	City of Plainfield	Jendro Sanitation

HAZARDS & RISK ASSESSMENT

Section 3 identified and profiled the hazards for the entire planning area. However, each community analyzed their own vulnerability to those hazards applicable to their jurisdiction. Using the methodology outlined in Section 3 (Vulnerability Assessment), the City of Plainfield evaluated the risk associated with a specific hazard, defined by probability and frequency of occurrence, magnitude, severity, exposures, and consequences. Plainfield's vulnerability assessment provides in-depth knowledge of the hazards and vulnerabilities that affect the community. This analysis provides an all-hazard approach when evaluating the hazards of that affect the city, and the associated risks and impacts each hazard presents.

As mentioned previously in Section 3, the vulnerability assessment requires a five-year review with periodic updates, as needed. Potential future hazards and impacts may result from changing technology, new critical facilities, infrastructures, and development patterns, as well as demographic and socioeconomic changes that occur within or outside the area.

Disaster frequency and its effects or severity are important as a basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, whereas manmade or technological events tend to change over time with advancement in technology and methods of operation. Five criteria were used by the Committee to assure a systematic and comprehensive approach to hazard analysis for their individual jurisdictions including: Historical Occurrence, Probability, Magnitude or Severity, Warning Time, and Duration.

The Committee assessed the defined hazards relevant to potential impact on the city. Using the scoring criteria previously defined (Tables 19-22) the city assessed each of the identified hazards based on probability, magnitude/severity, warning time, and duration. The scores for each of the factors were weighted using the formula below to develop the final hazard assessment score.

(Probability x .45) + (Magnitude/Severity x. 30) + (Warning Time x .15) + (Duration x .10)
= Final Hazard Assessment Score

Table C3 is the analysis scores for the City of Plainfield. As shown in the table, the five hazards for the city are Thunderstorm/Lightning/Hail, Severe Winter Storm, River Flooding, Transportation Incident, and Tornado/Windstorm.

TABLE C3: CITY OF PLAINFIELD HAZARD RISK ASSESSMENT

Hazard Rank	Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Hazard Score
1	Thunderstorm/Lightning/Hail	4	2	3	1	**2.95**
2	Severe Winter Storm	4	1	1	3	**2.55**
3	River Flooding	3	2	1	4	**2.50**
4	Transportation Incident	3	1	4	1	**2.35**
5	Tornado/Windstorm	1	3	4	1	**2.05**
6	Infrastructure Failure	2	1	4	2	**2.00**
7	Flash Flood	2	1	3	3	**1.95**
8	Terrorism	1	2	4	2	**1.85**
9	Human Disease	2	1	2	3	**1.80**
10	Drought	2	1	1	4	**1.75**
10	Extreme Heat	2	1	1	4	**1.75**
12	Radiological Incident	1	3	1	2	**1.70**
13	HAZMAT Incident	1	1	4	2	**1.55**
14	Dam / Levee Failure	1	1	3	3	**1.50**
15	Earthquake	1	1	4	1	**1.45**
15	Grass/Wild Fire	1	1	4	1	**1.45**
15	Sinkholes	1	1	4	1	**1.45**
15	Animal/Plant/Crop Disease	2	1	1	1	**1.45**
19	Expansive Soils	1	1	1	4	**1.30**
19	Landslide	1	1	1	4	**1.30**

Once the Planning Committee had identified and scored the hazards, they examined each hazard in relation to the risk that hazard presented to the community. Hazards were given priority based on the ranking completed in the Hazard Analysis section of the plan. High Risk Hazards scored in the top one third of all hazards, Medium Risk Hazards scored in the middle two thirds, and Low Risk scored in the lower three thirds. Table D2 lists the hazards based on their risk for the City of Plainfield.

Vulnerability – Identifying Assets (Critical Facilities)

This section will describe the vulnerability for existing and future buildings, infrastructure, and critical facilities in those areas that can be impacted by the prioritized hazards. Since the majority of the hazards have an undefined hazard area (i.e., affecting an entire community or larger area) the following vulnerability assessment will only address those hazards that affect a specified area – flooding (river and flash). However, due to the historical occurrences of tornadoes, this hazard was added to the assessment.

Identifying the location of critical facilities and designated shelters (City Hall is the only designated shelter) in Plainfield is important in order to assess their vulnerability to hazards. These critical facilities are important to the operation of a community, quality of life, and the key components of the economic sector. For instance, high-density residential or commercial development, schools, police stations, government buildings, hospitals and care facilities, airports, gas stations, hardware stores, grocery stores, and water supply systems. It is important to know the threats each hazard poses to these facilities. *Attachment 6E* illustrates the location of identified critical facilities throughout Plainfield.

According to available data, Plainfield is projected to see a decrease in population over the next thirty years. This population decrease most likely result in a lesser need for additional critical facilities such as schools, daycare centers, or healthcare centers. However, the need for more critical facilities should be closely monitored these next 5-years and readdressed when this HMP is updated.

TABLE D3: CRITICAL FACILITIES IN PLAINFIELD

Nashua-Plainfield Community School (shelter)	Plainfield Methodist Church (shelter)
First Baptist Church (shelter)	Fire Station (shelter)
Farmer's Co-op	Wastewater Treatment Plant
Public Library	Public Works Building

Source: Community

TABLE D4: CITY OF PLAINFIELD 100-YEAR FLOODPLAIN PROPERTIES

Number of Structures	8
Building Value	$ 151,860
Dwelling Value	$ 108,270
Total Value	$ 260,130

Source: INRCOG & Bremer County Assessor (2011 $)

Flooding

A facility vulnerable to flooding is normally low, since these structures are not often constructed within the 100-year floodplain. According to the information provided, bridges and roadways was be impacted by flooding. This disruption in the transportation infrastructure would create a longer time period to receive and provide services and supplies to an area if a bridge was washed away due to flooding.

According to the data provided by INRCOG and Bremer County (see Table D4), there are 8 structures with a total assessed value of $ 151,860 located within the

100-year floodplain. See *Attachment 5E: Flood Scenario Map of the City.*

Tornadoes

As stated on the FEMA website[25], mobile homes are highly vulnerable to tornadoes. Even mobile homes that are tied down, offer little protection from tornadoes.

According to Census information, there are 8 mobile homes (also referred to as manufactured homes) located in the Plainfield. According to 2010 US Census, the average household size in the city was 2.36 persons. Using this information, it is estimated that 19 persons live General observation would suggest a recent increase in the number of manufactured homes in the area. This increased popularity has the potential to increase the potential risk of damage to people and property in the community. Currently, no FEMA certified tornado safe shelters are known to exist in the community.

The primary reason for the increased popularity of mobile and manufactured homes is affordability. Although HUD regulations and local building codes have increased the safety components of these types of houses significantly in recent history, this affordability has often been accompanied with a reduced level of safety. Based on national data on circumstance of tornado fatalities between 1985 and 1997, it was found that 38% of fatalities were occupants of mobile or manufactured homes, 27% were in permanent homes, 11% in vehicles, 9% outdoors (open), 4% in businesses, 4% in structures with long-span roofs, and 2% in schools. These data highlight the high exposure of occupants of mobile and manufactured homes (*AR State Hazard Mitigation Plan, 1999*).

TABLE D5: CITY OF PLAINFIELD "AT-RISK" POPULATION

	2010
Total City Population (2010)	436
Elderly (65 yrs and older)	67
Youth (under 18 yrs old)	118
Householder Living Alone	52
Non-English Speaking Population (speaks English less than 'very well')	0.5%
Population Living in Poverty	4.1%
Population in Mobile Homes	19
Group Quarters Population	0

Source: U.S. Census, 2010, 2010-2014 ACS and Iowa Data Center

Vulnerability – Social Assets (Populations)

The social vulnerability assessment identified how the hazards affect the population of Plainfield and it is assumed that the identified populations are more likely to require assistance during times of disaster; therefore, are considered, generally speaking, more "at-risk" than the remaining population. The "at-risk" population must be identified and targeted in successful mitigation efforts.

According to Table D5, 15% of residents are 65 years and older. There are no persons living in group quarters.

Persons under the age of 18 are also at higher risk during some disasters. This is mostly due to the fact that young persons often are not aware of the proper actions to take in the event of a disaster. In addition, very young children would be more susceptible to a disaster such as a disease epidemic simply

[25] Federal Emergency Management Agency (FEMA), http://www.fema.gov/areyouready/tornadoes.shtm

due to their age. In 2010, there was 27% of the city's total population under the age of 18.

In addition, persons living in mobile homes, also known as manufactured housing may also be at risk from tornadoes or high winds. It is estimated that there are 14 mobile homes in the city. Based on the average household size (2.36) it is estimated that there are approximately 33 persons living in mobile homes.

Flooding

Portions of Bremer County are highly vulnerable to floods, especially along the Cedar River in Plainfield. Flooding puts the entire population at some level of risk, whether through the flooding of their homes, businesses, or places of employment, or the road, sewer, and water infrastructure that serve them daily. High floodwaters can devastate homeowners with property damage, property loss, and extensive, time-consuming cleanup. Secondary effects caused by flooding can add to the property damage. Power loss can leave citizens without heat or air conditioning for extended periods of time. The transportation infrastructure of the community can be impacted by flooding events, which can endanger citizens attempting to travel or evacuate the area, as well as leave those remaining without goods and services.

As shown on the city's Flood Plain Map (Map 3I) only the far eastern edge of the city is within a floodplain. However, in recent years the city has experienced increased flooding in the western and central parts of the community. Plainfield is situated between Highway 218 (west of the city) and the Cedar River (east of the city).

During high rain and flood events, the city takes on water via runoff from approximately 1,700 acres west/northwest of the city, which drains to the Cedar River. This is particularly problematic when the water table is high due to flooding. When this occurs, water cannot properly drain from west to east (through the city) to the Cedar River.

In late September of 2016 the city experienced significant flooding due to heavy rain, on top of already high water levels in the Cedar River, throughout the western and central portions of the city due to this drainage issue. Several residences and buildings experienced water in their basements. Nashua-Plainfield Middle School sustained an estimated $80,000 in damage due to flooding. Two months after the rain event, water was still being pumped out of basements as it would not drain due to the high water table.

Flooding on the western/central part of the city is further compounded by limited capacity of the city's storm water drains. Runoff from the five culverts that drain from Highway 218 must pass through/around the city on its way to the Cedar River. The city began to notice an increase in runoff when Highway 218 was redone in the early 2000s. The city's existing storm water system does not have the capacity to handle this increased runoff.

Vulnerability – Estimating Potential Property Losses

Valuations are an important component of hazard mitigation planning insomuch as it provides measurable data that can be used to form some type of estimate as to the potential losses a community could face in the event of a catastrophic disaster.

The valuations for the City of Plainfield are available from the County Assessors and Auditors offices. City of Plainfield's property valuations are in Table D6.

Future Development

Future development within identified hazard areas can change the threat level of an area by placing critical facilities, businesses, transportation networks, utilities, and populations within vulnerable areas. While it can be difficult to curb development in the planning area, it is the jurisdiction's advantage to be aware of development trends in order to successfully mitigation future hazards as risks increase. However, continued conformity with the State Building Codes and local land use ordinances and regulations (zoning, subdivision, floodplain management, etc.) will help to mitigate the effects hazards have on new and future development.

National Flood Insurance Program/Repetitive Loss Properties

The city of Plainfield participates in the National Flood Insurance Program (NFIP) and has a flood ordinance in place. As Table D7 shows, there are currently four NFIP policies in place within the city.

FEMA defines a repetitive loss property as an insurable building that has experienced two losses in a 10-year period in which each loss is $1,000 or more. There is one repetitive loss property in the city. River flooding is the most common cause of repetitive loss in Bremer County. Table D7 illustrates the number of repetitive loss properties for the city. Currently (as of 11/30/2014) there is one active repetitive loss building in the city.

TABLE D6: CITY OF PLAINFIELD'S VALUATION

	Total Valuation	Average Valuation per Unit or Parcel
Residential Property	$ 15,203,960	$85,898/parcel
Commercial Property	$ 1,552,050	$ 77,603/unit
Industrial Property	$ 122,210	$ 122,210/unit
Agricultural Buildings	$ 75,870	$ 75,870/unit
Agricultural Land	$ 45,920	$ 975/acre
Utilities, G & E	$ 379,926	N/A
Railroads	$ 51,387	N/A
Exemptions (military)	$ 59,264	N/A
Gross Valuation	$ 17,431,323	N/A
Total Valuation	**$ 17,372,059**	**N/A**

Source: Bremer County Assessor, as of 1/1/2010

TABLE D7: NFIP AND REPETITIVE LOSS DATA FOR PLAINFIELD							
CID #	# of NFIP Policies	NFIP Insurance in Force ($)	Total # of RLB	RLB Insured	# of Active RLB	Total RLB Losses ($)	RLB Losses Insured ($)
190327	4	$370,800	1	0	1	$22,512	$0

Source: Federal Emergency Management Agency (FEMA); Note: RLB = Repetitive Loss Building; NFIP data current as of 9/30/2016; Repetitive loss data current as of 11/30/2014

This HMP attempts to reduce loss by identifying potential natural and manmade hazards. As a result of many natural and manmade hazards, repairs and reconstruction area often completed in a way that returns the structure to pre-disaster condition yet does little to prevent a reoccurrence of damage. Replication of the pre-disaster conditions allows for the repetitive cycle of property damage, reconstruction, and re-damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction are analyzed, and sound, less vulnerable conditions are produced. Additionally, other mitigation strategies may be considered, such as voluntary property buy-outs.

River flooding is the most common cause of repetitive loss in Bremer County. The City of Plainfield participates in the NFIP has one repetitive loss property.

MITIGATION STRATEGY

Hazard Mitigation Plan Goals

The hazard mitigation plan goals were reviewed by the Hazard Mitigation Planning Committee at their second committee meeting. The committee set as a priority the development of broad-based goals that would address a multitude of hazards and encompass a variety of mitigation activities. The hazard mitigation plan goals identified are as follows:

1. Reduce the chance of and impact of flooding in the community.
2. Take measures to minimize the occurrence of injuries and loss of life due to hazards.
3. Take measures to minimize or eliminate damages that may occur as a result of hazards.
4. Increase the city's ability to respond to natural disasters and man-made hazards.
5. Return to the community to similar or improved pre-event conditions as quickly as possible following a disaster event.
6. Incorporate the City Plan into the proposed Multi-Jurisdictional Plan.
7. Continually re-assess and re-evaluate the plan and mitigation activities.

Current Mitigation Actions

Prevention Mitigation Actions

Table D7 summarizes Plainfield's preventive mitigation actions.

TABLE D7: CURRENT PLANNING AND REGULATORY DOCUMENTS FOR PLAINFIELD

Previous HMP	Comprehensive Plan	Building Code	Zoning Ordinance	Subdivision Regulations	Floodplain Management Ordinance	Tree-Trimming Ordinance	Storm Water Ordinance	Snow Removal Ordinance
Yes	No	No	No	No	Yes	Yes	Yes	Yes

Source: Local Communities, Note: RR=Restricted Residential

Property Protection Mitigation Actions

While the City has explored a number of property protection alternatives in this plan, the primary protection efforts historically, in regard to flooding, have been to the wastewater treatment facility. In 2001, the city raised the facility by 2' so that floodwaters would not as easily impact the structure. Furthermore, they have installed independent power generation at the facility so that it can continue to operate in the event of a power failure.

Public Education and Awareness Mitigation Actions

The outdoor early warning siren system consists of a single siren located in the southern half of Plainfield. The siren is located between old 218 and Railroad Street, just north of Jefferson Street.

NOAA Weather Radio broadcasts are also available in the community. NOAA Radio's provide up to the minute weather related alerts. Other locations that warnings and watches can be found are television, Internet, and radio (KWAY broadcasts out of Waverly).

Emergency Services Mitigation Actions

Plainfield works with the Bremer County Emergency Management Coordinator, based out of the City of Waverly, on various safety and emergency events. The Emergency Management Coordinator works in conjunction with local fire, rescue, police, and government officials to draft and implement workable emergency action plans in the community. The current Emergency Management Coordinator is Kip Ladage and current contact information is as follows: Bremer County Emergency Management Agency, 111 4th St. NE, Bremer-Waverly LEC, Waverly, Iowa 50677, (319) 352-0133, email: kladage@co.bremer.ia.us

Law Enforcement

The Bremer County Sheriff's Department and the Iowa State Patrol provide police protection in the City of Plainfield. The Bremer County Sheriff's Department is located in Waverly, the county seat.***Fire Protection*** Fire protection is provided for Plainfield with a force of 24 volunteer firemen. Fire equipment used by the city includes a total of five vehicles. The fire station is located in the northeastern part of the city on the corner of East Street and County Road 188. Plainfield's rating for insurance is Class 7 within city limits.

TABLE D8: FIRE & FLOOD INFORMATION FOR PLAINFIELD

Fire Insurance Rating	National Flood Insurance Program (NFIP) *(Y or N & Year Joined)*	NFIP CID #
7	Yes, Current Map 3/4/08; Joined 3/1/86	190327

Source: Communities and FEMA

Equipment used by the Plainfield Fire Department includes the following:

- 1996 Chevy Kodiak pumper
- 2000 Chevy C8500 tanker
- 2006 Chevy Kodiak rescue van
- 2008 Ford 1 ton grass unit
- 2008 International pumper

Ambulance

Plainfield does not have an ambulance service. Services are provided by the hospital in Waverly.

Medical Facilities

Plainfield does not have any medical facilities.

HAZMAT

Plainfield contracts with Northeast Iowa Response Group for response to hazardous material spills. The Northeast Iowa Response Group is a division of Waterloo Fire Rescue as is the Hazardous Materials Regional Training Center. The Training Center provides training to fire departments and companies from around the state and country. Not only is this a training center it also serves as a hazardous materials quick response unit to Black Hawk County, surrounding counties, and many municipalities in a ten county region. The Unit provides local fire departments with hazard materials emergency procedures thus reducing additional contamination. An evacuation plan is also in place in conjunction with the activities with the local department. Contact information for the facility is as follows: Hazardous Materials Regional Training Center, 1925 Newell Street, Waterloo, Iowa 50707, Phone: (319) 291-4275, Toll Free: (800) 291-4682, Fax: (319) 291-4285

The jurisdiction also partners the Northeast Iowa Response Group for assistance in responding to any methamphetamine labs located in the city limits. The Response Group assists the Police Departments in containment of the site and disposal of the hazardous chemicals.

<u>Natural Resource Protection Mitigation Actions</u>

Plainfield does not have nor done any natural resource protection mitigation actions.

Structural Projects Mitigation Actions

Plainfield does not have nor done any structural projects mitigation actions.

Future Mitigation Actions

While the existing mitigation activities discussed above detail the City's efforts to mitigate hazards when possible and to respond to hazards in a timely and efficient manner, the Committee also recognizes that there are many more mitigation activities and projects that would benefit county residents. Thus, the Committee developed a list of future hazard mitigation activities that, if accomplished, would serve to further reduce the risk of hazards to the community. The list may include a combination of projects the Committee feels the community should try to accomplish and mitigation efforts that are ongoing that the Committee view as vital to the continued well-being of the public.

The Committee analyzed the potential mitigation activities. This analysis included a discussion of the potential benefits of implementing the activity, some hurdles that the community may face in implementing the action step, and the drawbacks of implementation. The analysis utilized the STAPLEE feasibility criteria. The STAPLEE technique is a FEMA suggested method of evaluation. The STAPLEE approach assesses both positive and negative impacts on the following aspects of a county: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Based on this analysis, each activity was ranked as High (H), Medium (M)or Low (L). However, not all identified activities are applicable to all jurisdictions and is marked as such in Table D9.

Funding

Although in the long-term hazard mitigation actions will save money by avoiding the loss of lives or property damages, in the short-term each action will have an associated cost. The City will rely heavily on local funding sources to fulfill most of the plan obligations; however, they will also seek funds from State and Federal agencies for both pre- and post-disaster mitigation activities.

The estimated cost(s) for each mitigation action, program, or project is either: Minimal, Low, Moderate, or High depending upon various factors.

- Minimal: Cost estimate is $10,000 or less based on using current staff, time commitment, continuous of current duties, proposed action/program/ project, and funding sources.
- Low: Cost estimate for project range from $10,001 - $99,999 based on existing proposed treatment, time commitment, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.).
- Moderate : Cost estimate for project range from $100,000 - $299,999 based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, and project components (permits, acquisition, coordination, etc.), and funding sources.
- High : Cost estimate for project range is $300,000 or higher based on existing conditions, time commitment, proposed action/ program/project, any further study that is needed, and level of engineering, project components (permits, acquisition, coordination, etc.), and funding sources.

Implementation Strategy

Once the Committee identified and ranked the future hazard mitigation activities, the activities were then analyzed. In addition, the Committee identified a time line for each activity, identified the responsible party (ies) for each activity and finally related each activity to at least one of the five Hazard Mitigation Plan Goals listed above. Table D9 below is the City of Plainfield's Implementation Strategy.

TABLE D9: CITY OF PLAINFIELD'S IMPLEMENTATION STRATEGY						
Priority	**Mitigation Action/Program/Project**	**Associated Hazard**	**Primary Agency Responsible for Implementation**	**Date for Completion**	**Estimated Cost (s)**	**Funding Source**
Education/Public Awareness						
H	Continue training and education for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Moderate	Local
H	Encourage use of Iowa One call before digging	Communications Failure, Explosion	City Council, Staff	On-Going	Minimal	Local
H	Keep the county updated on personnel changes	Communications Failure	City Staff	On-Going	Minimal	Local
H	Maintain and improve signals/signage along roadways and at railroad crossings	Transportation	City Council	On-Going	Minimal	Local
H	Cooperate with any countywide mass vaccination plan	Disease	City Council, Fire Department	On-Going	Low	Local
H	Educate city personnel to identify risk areas	Expansive Soils	Staff	On-Going	Minimal to Low	Local
H	Inform the public of reputable and ill reputable contractors following disasters	Emergency Management	City Council, Staff	On-Going	Minimal	Local
H	Encourage all communities to participate in their Local Emergency Planning Commission (LEPC)	Emergency Management	City Council, Public Works	On-Going	Minimal	Local
M	Educate the public	All	City Council, Staff	On-Going	Minimal	Local
M	Encourage utility providers and developers to place all utilities underground	Severe Winter Storm, Communications Failure, Thunderstorm/Lightning	City Council	On-Going	Moderate	Local
M	Notify the media on shelter locations	Severe Winter Storm, Extreme Heat, Tornado	City Council	On-Going	Minimal	Local
M	Encourage lead based paint and asbestos removal	HAZMAT	City Council	On-Going	Minimal	Local
M	Encourage and maintain enrollment in emergency notification system	Thunderstorm/Lightning, Windstorm, Tornado, Communication Failure	City Council, Fire Department	On-going	Minimal	Local
M	Encourage home owners to keep emergency kits	Windstorm, Tornado	Bremer County EMA	On-Going	Minimal	Local
M	Encourage residents to keep smoke detectors, sprinkler systems and fire extinguishers maintained in their homes	Fire	City Council	On-Going	Minimal	Local
M	Educate the public on maintaining their sump pumps	Flash Flood	Fire Department, Public Works	On-Going	Minimal	Local
M	Encourage the public to receive vaccinations	Disease	City Council	On-Going	Minimal	Local
M	Educate city personnel to handle a sinkhole situation	Sinkholes	City Council	On-Going	Minimal	Local
Emergency Services						
H	Maintain and acquire materials and equipment for fire departments, law enforcement agencies and ambulance crew personnel	All	City Council	On-Going	Minimal	Local
H	Provide emergency shelters for evacuees	All	Bremer County EMA	On-Going	Minimal	Local
H	Maintain storm spotter training for local fire departments/deputies and EMS crews	Thunderstorm/Lightning, Windstorm, Tornado,	Bremer County EMA, City Council	On-Going	Minimal	Local

		Hailstorm				
H	Enhance Standard Operating Procedures for dissemination of information/press releases in the event of a disaster	Communications Failure	City Council, EMA	On-Going	Minimal	Local
H	Continue training and promotion of the Incident Command System	Communications Failure	City Council	On-Going	Minimal	Local
H	Maintain list of county emergency contacts	Communications Failure	All City Departments	On-Going	Minimal to Low	Local
H	Provide fans and/or cooling shelter	Extreme Heat	City Council	On-Going	Minimal	Local
H	Develop and maintain staging area for dumping during cleanup	River Flood	City Council, Fire Department	On-Going	Minimal	Local
H	Set a designated number of people to be trained in post-disaster record keeping/damage assessments	Emergency Management	City Council, Staff	On-Going	Minimal	Local
H	Maintain lists of personnel and equipment available to use with response plans	Emergency Management	City Council, Fire Department	On-Going	Minimal	Local
M	Make available a cleanup crew for after a storm	Thunderstorm/Lightning	City Council, EMA	On-Going	Minimal to Low	Local
M	Maintain automatic TTY TDD machines for emergency personnel and city/county employees	Communications Failure	City Council, EMA	On-Going	Minimal	Local
M	Complete continuity of government plan	Communications Failure	City Council	On-Going	Minimal	Local
M	Keep supply of backup radios and cellphones	Communications Failure	City Council	On-Going	Minimal	Local
L	Maintain list of potential translators to be called upon in case of an emergency	Communications Failure	Bremer County EMA, City Council	On-Going	Minimal	Local
L	Maintain or install GPS units in all emergency service and city/county vehicles	Communications Failure	City Council	On-Going	Minimal	Local
Prevention						
H	Maintain mutual aid agreements	All	City Council	On-Going	Minimal	Local
H	Purchase and maintain backup generators	Severe Winter Storm, Thunderstorm/Lightning, Tornado, Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain public works equipment	Severe Winter Storm	City Council	On-Going	Minimal	Local
H	Backup all digital data	Thunderstorm/Lightning	Bremer County EMA, City Council	On-Going	Minimal	Local, State
H	Maintain mutual aid agreements with the Northeast Iowa response Group	HAZMAT	City Council	On-Going	Minimal	Local
H	Keep HAZMAT manuals/information current and easily accessible	HAZMAT	All City personnel	On-Going	Minimal	Local
H	Maintain, test, and replace warning sirens	Windstorm, Tornado, Hailstorm, Thunderstorm/Lightning, Communications Failure	EMA	On-Going	Minimal to Low	Local
H	Identify areas throughout the county that would substantially benefit from outdoor warning sirens	Windstorm, Tornado	City Council	On-Going	Moderate	Local, State
H	Regularly review and amend fire and medical HAZMAT response standard operating procedures	Communications Failure	City Staff	On-Going	Minimal	Local
H	Improve standard operating procedures for schools	Communications Failure	City Council, Staff	On-Going	Minimal	Local
H	Seek to improve communications with other agencies	Communications Failure,	Bremer County EMA, City	On-Going	Minimal	Local

		Terrorism				
H	Continue cooperation between county roads department and local fire departments during snow emergencies	Severe Winter Storm	City Council, Staff	On-Going	Minimal to Low	Local
H	Continue fire prevention program	Fire	City Council, Staff	On-Going	Minimal	Local
H	Maintain membership in the NFIP	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Maintain and keep storm drains clear of debris	Flash Flood	City Council	On-Going	Minimal	Local
H	Stockpile sand and sandbags	Flash Flood, River Flood	Fire Department	On-Going	Minimal to Low	Local
H	Purchase additional trash pumps	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or as needed	Grass/Wildfire, Drought	Fire Department	On-Going	Minimal	Local
H	Establish alternative transportation routes should a road need to be closed	Transportation	City Council	On-Going	Moderate	Local
H	Identify fallout shelter locations	Radiological/Nuclear Event	City Council, Staff	On-Going	Minimal	Local
H	Maintain and update anti-virus software	Terrorism	City Council, Fire Department	On-Going	Minimal	Local
H	Secure vulnerable targets, as identified by the LEPC and County EMA with alarms, security cameras and fences	Terrorism	City Council, Public Works	On-Going	Low	Local
H	Review and update fire codes as necessary	Fire, Explosion	City Council, Police	On-Going	Moderate	Local
H	Continue to cooperate with pipeline owners and operators to ensure locations are marked	Fire, Explosion	Public Works	On-Going	Minimal	Local
H	Maintain air conditioner(s) in community buildings	Extreme Heat	Public Works	On-Going	Minimal to Low	Local
H	Keep a supply of drinking water to distribute	Extreme Heat	City Council	On-Going	Minimal	Local
H	Monitor disease outbreak news from the CDC and Iowa Department of Public Health	Disease	Fire Department	On-Going	Minimal	Local
H	Initiate and enforce burn ban in times of drought or as needed	Drought	City Council, Fire Department	On-Going	Low to Moderate	Local
H	Secure the area (around a sinkhole)	Sinkholes	City Council, Fire Department	On-Going	Minimal	Local
H	Inspect any utility lines that are near a sinkhole	Sinkholes	City Council, Public Works	On-Going	Minimal	Local
H	Update flood maps/flood studies for areas throughout the county	River Flood	All City Departments	On-Going	Minimal	Local
H	Establish transportation evacuation routes and protocols	River Flood	City Council, Fire Department	On-Going	Minimal	Local
H	Continue cooperation with county in developing flood mitigation efforts	Flash Flood, River Flood	City Council, Staff	On-Going	Minimal	Local
H	Continue working with the Bremer County Recovery Coalition	Flash Flood, River Flood	City Council	On-Going	Minimal	Local
H	Maintain and update emergency response plans	Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain communication with county contacts	Emergency Management	City Council	On-Going	Minimal	Local
H	Maintain NIMS compliance	Emergency Management	City Council	On-Going	Minimal	Local
M	Determine locations for potential heating shelters and volunteer organization	Severe Winter Storm	Bremer County EMA, City Council	On-Going	Minimal	Local
M	Enforce sidewalk clearance ordinance	Severe Winter Storm	City Council	On-Going	Minimal	Local
M	Maintain law enforcement monitoring of large storage supplies	HAZMAT	City Council, Fire Department	On-Going	Minimal	Local

M	Acquire necessary response and detection equipment for city/county employees	HAZMAT	City Staff	On-Going	Minimal	Local
M	Provide a local hazardous waste dropoff site	HAZMAT	City Council, Fire Department	On-Going	Minimal to Low	Local, State
M	Upgrade radio communications equipment as needed	Communications Failure	City Staff	On-Going	Minimal	Local
M	Enforce no parking designations at special events	Transportation	City Council, Sheriff	On-Going	Minimal	Local
M	Develop rationing procedures	Drought	City Council	On-Going	Minimal	Local
M	Enforce a curfew	Riot/Violent Demonstration	Sheriff	On-Going	Minimal	Local
M	Identify and inventory potential sinkhole sites	Sinkholes	City Council, Staff	On-Going	Minimal	Local
M	Enforce the local zoning ordinances	Landslides/Mudflows	City Council, Staff	On-Going	Minimal	Local
L	Purchase NOAA weather radios	Thunderstorm/Lightning, Windstorm, Tornado, Radiological/Nuclear Event	City Council, Zoning Administrator	On-Going	Minimal	Local
L	Place alarms on storage facilities containing hazardous materials	Hazardous Materials (HAZMAT)	City Council	On-Going	Minimal	Local
Property Protection						
H	Continue enforcement of city sump pump discharge ordinance	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
H	Maintain, enforce and update floodplain ordinance	Flash Flood, River Flood	City Staff	On-Going	Minimal	Local
H	Develop sandbagging procedures for the community	River Flood	City Council, Fire Department	On-Going	Minimal	Local
H	Maintain pump station	River Flood	City Council, Staff	On-Going	Minimal	Local
M	Use surge protectors to prevent electrical damage to critical and sensitive equipment	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
M	Enforce and update building codes, as needed	Thunderstorm/Lightning, Windstorm, Tornado, Hailstorm, Expansive Soils, Earthquake	Bremer County EMA	On-Going	Minimal	Local
M	Identify, purchase and remove structures from flood hazard areas	Flash Flood, River Flood	City Council, Staff	On-Going	Moderate	Local, Federal
L	Install a snow fence around the wastewater treatment facility	Severe Winter Storm	City Council	On-Going	Minimal	Local
L	Maintain use of snow fences in the city/county	Severe Winter Storm	County Staff	On-Going	Minimal	Local
L	Placement of lighting arrestors on power lines	Thunderstorm/Lightning	City Council	On-Going	Minimal	Local
Structural Projects						
H	Construct or designate a safe room or storm shelter	Windstorm, Tornado, Hailstorm	City Staff	On-Going	High	Local, State, Federal
H	Encourage backup power generation for local telephone systems and cellular operations	Communications Failure	Bremer County EMA	On-Going	Minimal	Local
H	Pursue partnership with rural water as the system expands	Fire, Explosion	City Council, Fire Department	On-Going	Minimal	Local
H	Improve water system to enhance firefighting capacity/ability	Fire	City Staff	On-Going	Minimal	Local
H	Acquire more water pumps	Flash Flood, River Flood, Dam Failure, Levee Failure	City Council	On-Going	Minimal	Local