Jurisdiction:	Title of Plan:	Date of Plan:
Union County	Union County MJ Multi-hazard Mitigation Plan	**May 9, 2013**
Local Point of Contact: **Jeremy Rounds**	**Address:** **101 E. Montgomery St. Creston, Iowa 50801**	
Title: Regional Planner		
Agency: **Southern Iowa Council of Governments**		
Phone Number: 641.782.8491	**E-Mail:** rounds@sicog.com	
Funding Source: HMGP/State/Local		
State Reviewer:	**Title:**	**Date:**
FEMA Reviewer: Steve Greene Michelle Wolfe	**Title:** HM Community Planner HM Community Planner	**Date:** July 15, 2013 July 23, 2013
Date Received in FEMA Region VII	May 24, 2013	
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved	July 23, 2013	

Jurisdiction:	NFIP Status*	
	Y	NP
1. Union County		✓
2. City of Afton		✓
3. City of Arispe		✓
4. City of Creston	✓	
5. City of Cromwell	✓	
6. City of Lorimor		✓
7. City of Shannon City	✓	
8. City of Thayer		✓
9. Creston Community School District		✓
10. East Union Community School District		✓
11. Southwestern Community College		✓
12. Greater Regional Medical Center		✓

*** Notes: Y = Participating NP = Not Participating in NFIP S- Sanctioned R-Rescinded**

SECTION 1: REGULATION CHECKLIST

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Chapter 1, Pages 1.5-1.11	✓	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Chapter 1, Page 1.6-1.8, Appendix B (meeting agendas, notices, and minutes)	✓	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Chapter 1, Page 1.6-1.8, Appendix B (meeting agendas, notices, and minutes)	✓	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Chapter 2, jurisdictional profile bullet lists	✓	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 10, Page 10.3-10.5	✓	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Chapter 10, Page 10.3-10.5	✓	
ELEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Chapter 4, Page 4.4-4.43, tables for each hazard	✓	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Chapter 4, Page 4.4-4.43, tables for each hazard	✓	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Chapter 4, Page 4.81-88, Chapter 5 entirely	✓	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Chapter 4, Page 4:24-25	✓	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Chapter 2, jurisdictional profile Pages 2:25-79	✓	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Chapter 9, in various tables by jurisdiction as appropriate	✓	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Chapter 7, Page 7.8-9	✓	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Chapter 8, in various tables by jurisdiction	✓	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Chapter 8, Page 8.24-45, Chapter 9, Page 9.3-18, Appendix E	✓	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Chapter 10, Page 10.4-5	✓	
ELEMENT C: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Page 1.10-11, demographics and infrastructure, Page	✓	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Chapter 2, individual jurisdiction profiles, Page 2.25-78	✓	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Chapter 9, mitigation measures by jurisdiction	✓	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Appendix A	✓	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Appendix A	✓	

ELEMENT E: REQUIRED REVISIONS

Written proof that all jurisdictions' governing bodies have formally adopted the plan (usually a resolution) must be submitted to FEMA. *See Local Multi-Hazard Mitigation Planning Guidance (July 2008) pages 17-18.*

Note: If the plan is not adopted by a participating jurisdiction, that jurisdiction would not be eligible for project grants under the following hazard mitigation assistance programs: HMGP, PDM, FMA, and SRL.

SECTION 2: PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Plan Strengths

- The plan author does an outstanding job discussing the plan development process especially highlighting the planning team's meetings, recoding each jurisdiction's participation and the coordination of government and non-governmental organizations.

- The plan provides excellent level of detail for each community's profile and risk assessment. The maps created, as well as the tables throughout the plan, clearly convey how the identified hazards truly impact the participating jurisdictions.

Opportunities for Improvement

- While the plan provides a sound description for what each score represents, it is unclear how a score was determined for each factor that was measured. A couple of examples:
  - Historical Occurrences - a community with 4-7 occurrences could be awarded a 4 or 5. What is unclear is how the planning committee determines if a community is awarded a 4 or 5.
  - Probability - A community with a probability of 51%-75% chance of a hazard occurring is awarded either a 6 or 7. Again, it is unclear how the planning committee determines if a community is awarded a 6 or 7.

  A couple of options to consider could be to either provide an explanation of how the planning team determines what number a measurable factor is awarded or to eliminate the option to choose from two numbers with the same definition (e.g. instead of awarding either a or five for a community with 4-7 historical occurrences of a hazard, just award the community with a 4 and eliminate 5 as an option.

B. Resources for Implementing Your Approved Plan

A variety of mitigation resources are available to communities. The Iowa Homeland Security & Emergency Management website: http://www.iowahomelandsecurity.org/disasters/hazard_mitigation.html provides planning and project related information as well as details on how major FEMA mitigation programs are implemented in the State.

HSEMD's training website provides information on upcoming training opportunities within the State: http://homelandsecurity.iowa.gov/training/.

Various funding programs are available from several state and federal agencies to assist local jurisdictions in accomplishing their mitigation activities and goals. A detailed listing of programs, information on each program, and contact information is also available from the 2010 State Hazard Mitigation Plan.

Review of the FEMA HMA guidance (FY11 is the most current) is also encouraged as guidance provides information about application and eligibility requirements. This guidance is available from http://www.iowahomelandsecurity.org/grants/HMA.html or through FEMA's grant applicant resources page at http://www.fema.gov/government/grant/hma/grant_resources.shtm.

- The FEMA Hazard mitigation planning site http://www.fema.gov/plan/mitplanning/index.shtm contains the official guidance to meet the requirements of the Stafford Act, as well as other resources and procedures for developing and updating hazard mitigation plans.
- FEMA offers a Mitigation Best Practices Portfolio where communities can learn from others' successes, share their own successes, use the FEMA library, find detailed information and maps on hazards, read case studies, and find other resources for becoming a more resilient community: http://www.fema.gov/plan/prevent/bestpractices/index.shtm

The Department of Homeland Security's Federal Emergency Management Agency (FEMA) recently launched the new FEMA.gov. Please be informed that many of the most popular Hazard Mitigation Assistance web links have changed:

- Where can I get information on Hazard Mitigation Assistance? https://www.fema.gov/hazard-mitigation-assistance
- Hazard Mitigation Grant Program: https://www.fema.gov/hazard-mitigation-grant-program
- Pre-Disaster Mitigation Program: https://www.fema.gov/pre-disaster-mitigation-grant-program
- Flood Mitigation Assistance Program: https://www.fema.gov/flood-mitigation-assistance-program
- **Fiscal Year 2011 Unified Guidance (with updated links)**: http://www.fema.gov/library/viewRecord.do?id=4225
  The Hazard Mitigation Assistance Unified Guidance dated June 1, 2010 applies to HMGP for disasters declared on or after June 1, 2010.
- Grant Applicant Resources : https://www.fema.gov/site-page/grant-applicant-resources
- Application Process: https://www.fema.gov/site-page/application-development-and-process
- Environmental and Historic Preservation (EHP) At-A-Glance: http://www.fema.gov/library/viewRecord.do?id=5904 This document provides provides information on how to incorporate environmental and historic preservation considerations into your Hazard Mitigation Assistance application and project.
- Version 4.8 of the Benefit Cost Analysis Software is now available. The updated toolkit and updated training materials are available on the Benefit Cost Analysis website at http://www.fema.gov/benefit-cost-analysis.

If you need additional information contact the Hazard Mitigation Assistance Helpline at (866) 222-3580 or email hmagrantshelpline@fema.dhs.gov. Please allow up to 5 business days for a response.

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Chapter 1: Introduction and Planning Process

1.1: Executive Summary

The Union County Multi-Jurisdictional Hazard Mitigation Plan is a plan update developed using the methodology set forth in FEMA's *Multi-Hazard Mitigation Planning Guidance (2008),* FEMA Planning How-To Guides, and Iowa Homeland Security and Emergency Management Division's (HSEMD) Planning Guidance.

Union County and its jurisdictions were active in the planning document and did a good job providing the data necessary to complete the successful project. The project took many months to complete but the planning team as a whole met eight times, and individual jurisdictions hosted the consultant, who facilitated discussion about hazard mitigation and mitigation projects. The final plan includes ten chapters organized after the planning process required by the DMA 2000. Appendices include some of the maps, charts, and data that support the plan as well as approval information, adoption resolutions, and documentation of public involvement.

Using FEMA guidelines, the planning team selected minimum standards for participation, including attendance at two or more of the planning meetings, completion of worksheets, involvement in selection and evaluation of mitigation actions, prioritization of mitigation actions, and adoption of the plan. The following jurisdictions met participation requirements:

- Union County
- City of Afton
- City of Arispe
- City of Creston
- City of Cromwell
- City of Lorimor
- City of Shannon City
- City of Thayer
- Creston Community School District
- East Union Community School District
- Southwestern Community College
- Greater Regional Medical Center

Adoption resolutions for the participating jurisdictions are found in *Appendix A*.

Additionally, other organizations participated in the process as partners with one or more of the above jurisdictions. Such groups included the Union County Conservation Board, Iowa DNR, Alliant Energy, SIRWA, Union County Soil and Water Conservation District.

The jurisdictions were directly involved in selecting the hazards to profile, in the profile itself, in the data collection about critical assets, in identifying the capabilities, in selecting goals and objectives, in analyzing mitigation actions, and in prioritizing those actions selected for implementation. Planning team involvement and input permeates this plan. Local governments have adopted this plan and intend to implement the plan over the next five years.

Each jurisdiction has adopted several mitigation actions. The actions include administrative projects, educational efforts, structural projects, and other efforts. Local officials are well aware that the plan ensures eligibility for federal funds and that they are not obligated to implement the plan exactly as presented, since issues, hazard risks, and funding availability change over time.

The plan also details the related update information, including details about the status of projects listed in the previous plan for each jurisdiction.

In 2015, the county should seek HMGP or PDM funds to begin formally updating the plan. In the meantime, the plan should be consulted and considered as projects are programmed and budgeted each year in each jurisdiction.

1.2: Disclaimer

This mitigation plan is the best representation of the needs, concerns, and ideas of the active members of the mitigation planning team and the consultant. The ideas presented in this plan are not meant to be legally binding or represent the final authority on hazard mitigation issues. Local, state, and federal officials shall make final

decisions as to what projects are undertaken or how funds are used. This plan provides recommendations only.

1.3: Background

FEMA defines mitigation as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability. Thus, for the purposes of this plan, mitigation discussions focus on specific actions that can be taken to reduce loss of life and property from natural hazards by modifying the built environment to reduce the risk and potential consequences of these hazards.

Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5165 as amended by the Disaster Mitigation Act of 2000 (DMA) (Public Law 106-390), provides for states, tribes, and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning. FEMA implemented the hazard mitigation planning provisions through regulations in 44 CFR Part 201.

This plan was prepared in accordance with the regulations governing the mitigation planning requirements for local mitigation plans as published under 44 CFR §201.6. Under 44 CFR §201.6, local governments must have a FEMA-approved local hazard mitigation plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

Union County was awarded a Hazard Mitigation Grant Program (HMGP) grant from the Federal Emergency Management Agency (FEMA) and the Iowa Homeland Security and Emergency Management Division (IHSEMD) in 2010 for the development of a comprehensive multi-jurisdictional multi-hazard mitigation plan. The plan was completed and approved by FEMA in 2013. The County hired the Southern Iowa Council of Governments (SICOG) to assist in the planning process and the writing of the mitigation plan.

This plan is an update to the previously approved Union County plan that expired in October 2011. Most of the jurisdictions, with the exception of Greater Regional Medical Center and Southwestern Community College, participated in the initial plan or were added as amendments to that plan since its adoption in 2006.

1.4: Purpose of the Document

Building a disaster resistant community is a noble goal that challenges Union County to undertake actions that protect families, businesses, and public facilities by reducing the effects of natural and other key disasters. Reducing the effects of these disasters makes economic sense, and it is good public policy because it protects the citizens and the future of the community.

This multi-jurisdictional multi-hazard mitigation plan (plan) has been prepared in order to:

- Comply with both, Federal and State disaster mitigation planning requirements;
- Provide a comprehensive hazard analysis/risk assessment that best defines the hazards most likely to impact Union County, Iowa, and the various jurisdictions, including cities and schools, within the county;
- Identify hazard mitigation activities that would lessen or eliminate the effects of the hazards identified; and
- Outline a strategy for the implementation of hazard mitigation projects.

This plan was developed based on the input of elected local officials and staff, community leaders, business leaders, educators, interested public, public health professionals, utility managers, local fire departments, the County's Sheriff's department, local economic development staff, educators, county engineering staff, volunteers, news media, School officials, other City and County officials, and the Union County Emergency Management Agency (EMA).

The Disaster Mitigation Act of 2000 requires that all jurisdictions wishing to receive mitigation funds after November 2004 would have to complete a multi-hazard mitigation plan meeting certain planning processes and requirements. All jurisdictions are required to participate in the planning process and adopt the completed plan.

1.5: Key Definitions and Acronyms

Key mitigation planning terms and definitions include:

- **Community Rating System (CRS):** program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of the policyholders in those communities are reduced.
- **Exposure:** the part of the asset base in the path of or exposed to a given hazard.
- **Extent:** The size of an area affected by a hazard or hazard event (often in terms of percentage of total jurisdictional area)
- **Flood Hazard Area:** The area shown to be inundated by a flood of a given magnitude on a map.
- **Flood Insurance Rate Map (FIRM):** Map of a community, prepared by FEMA, shows both the special flood hazard areas and the risk premium zones applicable to the community under the National Flood Insurance Program.
- **Flood Zone:** A geographical area shown on a FIRM that reflects the severity or type of flooding in the area.
- **Floodplain:** Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
- **Hazard:** A source of potential danger or adverse condition.
- **Hazard event:** A specific occurrence of a particular type of hazard.
- **Hazard Mitigation:** any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects.
- **Magnitude:** A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
- **Mitigate:** To cause something to become less harsh or hostile, to make less severe or painful.
- **Planning:** The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.
- **Preparedness:** Actions that strengthen the capability of government, citizens, and communities to respond to disasters.
- **Probability:** A statistical measure of the likelihood that a hazard event will occur.
- **Recovery:** The actions taken by an individual or community after a catastrophic event to restore order and lifelines in a community.
- **Risk:** The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
- **Vulnerability or susceptibility:** Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, since many businesses depend on uninterrupted electrical power, if an electric substation is flooded it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
- **Vulnerability (or risk) assessment:** The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

The following acronyms and abbreviations are found throughout this document:

- Committee or Team: The Union County Hazard Mitigation Planning Committee or Team, the group of appointed and volunteer officials that directed the creation of this mitigation plan
- CRS: Community Rating System
- DMA 2000: Disaster Mitigation Act of 2000

- EMA: Emergency Management Agency
- EMC: Union County Emergency Management Commission or Coordinator, depending on use/context
- EMS: Emergency Medical Services, such as ambulance and rescue teams
- EPA: United States Environmental Protection Agency
- FEMA: The Federal Emergency Management Agency
- HARA: hazard analysis and risk assessment (a step in the planning process)
- HAZMAT: Hazardous Materials, generally as defined by the EPA
- IHSEMD: Iowa Homeland Security and Emergency Management Division
- NCDC: National Climactic Data Center
- NFIP: National Flood Insurance Program
- NIMS: National Incident Management System
- PH: Union County Public Health
- SICOG: Southern Iowa Council of Governments
- SIRWA: Southern Iowa Rural Water Association
- USDA: United States Department of Agriculture

1.6: Planning Context

Hazard mitigation planning in rural counties in Iowa is often in the purview of the County Emergency Management Agency (EMA). The EMA may be the obvious choice but it is not necessarily the first choice. While the Coordinator may be skilled in the area and is a champion when it comes to the issues, many hazard mitigation actions will not be lead or implemented by the EMA. Rather, the EMA and its hired Coordinator, and other staff, if any, should be highly involved in planning; the role of the EMA is overarching, often focusing on other elements of the emergency management process.

Emergency management has four phases that often have gray areas when it comes to the process and the tasks and actions undertaken. The following figure illustrates the natural or normal flow of this process.

Figure 1 – 1: Planning Context

Because of the intricate nature of the emergency management effort, some mitigation actions in this plan could also fall into the categories of preparedness, response, and recovery. Further, hazard mitigation tasks make preparation, response, and recovery easier.

1.7: Hazard Mitigation Planning Process

The Plan was developed by the Union County Hazard Mitigation Planning Team (planning team), which included representatives from the county, incorporated cities, state agencies, and local businesses and organization and local residents. Participants in the planning process and measures taken to solicit and encourage public participation are identified in the Planning Process section. Union County contracted with the local council of governments to facilitate the planning process and produce a draft and final plan document.

44 CFR 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.

The Union County Board of Supervisors, upon receiving the HMGP grant, authorized the Emergency Management Coordinator (EMC) Jo Anne Duckworth to begin the planning process. The County contracted with the Southern Iowa Council of Governments (SICOG) to assist the County in preparation of the plan. The Union County EMA took a leadership role in collaboration with SICOG planning staff to develop the planning process and coordinate the planning team meetings. The contractor produced the draft and final plans and coordinated the review with the State of Iowa and FEMA.

The contractor and Union County EMA established the framework and process using FEMA's *Local Multi-Hazard Mitigation Planning Guidance (2008),* FEMA Planning How-To Guides, and HSEMD Planning Guidance. The plan is organized around the four-phase process identified in these planning documents.

- Organize Resources
- Assess risks
- Develop the mitigation plan
- Implement the plan

The table below shows how the mitigation plan requirements and the Community Rating Service (CRS) planning steps relate to the four phases of the mitigation planning process and the How-To Guides. The CRS is a voluntary program for NFIP-participating communities that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) Reduce flood losses; (2) Facilitate accurate insurance rating; and (3) Promote the awareness of flood insurance.

Figure 1 – 2: DMA 2000 and CRS Planning Requirements Comparison

Mitigation Plan Requirements - 44 CFR §201.6	CRS Planning Steps	How-To Guides
Organize resources		*Getting Organized (FEMA 386-1)*
201.6(c)(1)	1. Organize	
201.6(b)(1)	2. Involve the public	
201.6(b)(2) and (3)	3. Coordinate	
Assess Risks		*Understanding Your Risks (FEMA 386-2)*
201.6(c)(2)(i)	4. Assess the hazard	
201.6(c)(2)(ii) and (iii)	5. Assess the problem	
Develop the Mitigation Plan (Mitigation Strategy)		*Developing a Mitigation Plan (FEMA 386-3)*
201.6(c)(3)(i)	6. Set goals	
201.6(c)(3)(ii)	7. Review possible activities	
201.6(c)(3)(iii)	8. Draft an action plan	
Implement and monitor progress		*Bringing the Plan to Life (FEMA 386-4)*
201.6(c)(5)	9. Adopt plan	
201.6(c)(4)	10. Implement, evaluate, revise	

Phase 1: Organize Resources

Step 1: Organize the Planning Effort

The Union County EMC led the charge in creating a planning team and set up a kick-off meeting in Creston, the county's largest town and county seat. This meeting officially began the planning process. The planning process continued with several other meetings over the next year or more. The table on the next page lists the planning team members that attended at least one of the planning team meetings.

Figure 1 – 3: Union County Hazard Mitigation Planning Team

Name	Position(s), as Applicable	Jurisdiction(s) Representing
Steve Akes	Engineer	Union County
Bob Brown *	Supervisor	Union County
Dennis Brown	Supervisor	Union County
Alan Carr	Park Manager	Green Valley State Park/IDNR
Randi Cass	City Clerk	City of Arispe
John Coulter	Chief	Afton Police Department
Brian Damewood		Greater Regional Medical Center
Jo Duckworth	Emergency Management Coordinator	Union County
Karla Focht	Conservationist	Union County USDA/NRCS office
Micheal Fry	Mayor	City of Arispe
Tim Foglesong		East Union School District
Doug Jones	Director	Union County Conservation Board
Ellen Gerharz	Director	Creston Chamber of Commerce
Terry Gilbert	Council member	City of Shannon City
Paul Goldsmith *	Conservationist	Union County USDA/NRCS office
Jim Hagen		Greater Regional Medical Center
Gene Haner	Assessor	Union County
Matt Higgins	Manager	Alliant Energy
Tim J. Hood *	Superintendent	Creston Community School District
Amanda Husband	Environmental Health	Union County
Sandy Hysell	Auditor	Union County
Todd Jackson	Chief	Creston Fire Department
Bob Janson *	Supervisor	Union County
Jamie Kinyon		Southern Iowa Regional Housing Authority
Jim Krantz	Chief	Afton Fire Department
Kevin Kruse	Building Official	City of Creston
Toni Landers	City Clerk	City of Afton
Tom Lesan	Education/Economic Development	Southwestern Community College
Sandra Lauer	City clerk	City of Cromwell
Joe Mayhew		Union County Conservation Board
Dan McIntosh	Manager	Southern Iowa Rural Water Association
Wayne Pantini	Executive Director	Union County Development Association
Rick Piel	Sheriff	Union County
Ron Riley	Supervisor	Union County
Wayde Ross	Conservationist	Union County USDA/NRCS office
Amy Schultes	Director	Prairie Solid Waste Agency
Mary Seales	City Clerk	Cities of Lorimor and Thayer
Chuck Scott	Interim Superintendent	Creston Community School District
Robin Sevier, RN	Outreach	Greater Regional Medical Center
Roy Strouel	Administrator	Creston Community School District
Daniel Stull	Park Officer	Green Valley State Park/IDNR
Mike Taylor	City Administrator	City of Creston
Paul Ver Meer	Chief	Creston Police Department
Pam Vogel	Superintendent	East Union Community Schools
Larry Wagner	Council member	City of Creston
Mark Weis		East Union School District
Warren Woods	Mayor	City of Creston
Tom Zacharias	Plant Manager	Farley's and Sather's/Ferrara Candy Co.

** No longer in this office or position at time of plan adoption*

The Union County planning team contributed to the process by:

- Providing facilities for meetings
- Attending and participating in meetings
- Collecting data
- Promoting the plan to elected officials and other relevant organizations
- Making decisions on planning processes and content
- Assisting with the evaluation of goals, objectives, and alternative actions
- Submitting worksheets (examples in appendices) as assigned by the contractor
- Reviewing drafts
- Assisted in setting up discussions with elected officials to adopt the plan

Outside agencies and organizations also participated in the planning process by providing examples and technical assistance, including FEMA Region 7, IHSEMD, other Iowa COGs, and the Iowa DNR floodplain section.

The planning team communicated throughout the planning process through face-to-face meetings, email, and phone conversations, as well as the official meetings and survey worksheets. The following table shows the flow of meetings for this hazard mitigation plan update. Each meeting involved a morning and evening session with the same agenda in order to attract the best turnout. *Appendix B* to this plan includes the public notices, agendas, Powerpoint presentations, sign-in sheets, and minutes for the official planning meetings.

Figure 1 – 4: Schedule of Planning Team Meetings

Official Meeting	Main Topics	Date
1	Kick-off: overview of the planning process and purpose for the plan; distribution of initial planning worksheets; discussion of benefits of planning and project grants	August 30, 2011
2	Work on hazard identification; review of work to date; turn in surveys; describe future steps	November 7, 2011
3	Work on hazard profile; review of work to date; turn in surveys; describe future steps	December 15, 2011
4	Work on critical asset list; develop data on critical assets; update data from previous plan on the assets; review of work to date; turn in surveys; describe future steps and other information needs	January 16, 2012
5	Develop problem statements by jurisdiction; develop goals and objectives for the plan; review of work to date; turn in surveys; describe future steps	March 20, 2012
6	Continued work on past surveys; complete the STAPLE-E process; describe how STAPLE-E builds the plan's mitigation actions by jurisdiction	October 8, 2012
7	Discussed mitigation plan approval process; reviewed and modified list of mitigation actions by jurisdiction	March 7, 2013
8	Discussed mitigation plan approval process, implementation process, and recorded public comments on draft plan	May 20, 2013

Step 2: Involve the Public

44 CFR 201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to planning approval.

The planning team and met eight times between August 30, 2011 through May 20, 2013 (see above table). All meetings complied with the Iowa Open Meetings Law. Iowa's Open Meetings Law "Seeks to assure, through a

requirement of open meetings of governmental bodies, that the basis and rationale of governmental decisions, as well as those decisions themselves, are easily accessible to the people. All actions and discussions at meetings of governmental bodies, whether formal or informal, including work sessions, must be conducted in open session unless exceptions or exemptions are specifically provided by law. Open session means a meeting to which all members of the public have access."

Additionally, as the plan was nearing completion, a significant media blitz involving all three local newspapers covering all jurisdictions and the local radio station was initiated. The draft plan was provided online at www.sicog.com and as a hard copy at the EMA office and at the Creston Public Library, where the public could view the plan and make comments. The public comments could be made by phone, fax, email, or in person directly to the planning consultant or at the final planning team meeting. This meeting, held on May 20, 2013, was designed primarily to take public comment. A full draft of the plan with appendices and maps was presented.

Finally, in accordance with State of Iowa Law, public meetings were held prior to the jurisdictions adopting the Plan.

Step 3: Coordinate with Other Departments and Agencies
44 CFR 201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: ....(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, an agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Union County Emergency Management invited other local, state, and federal departments and agencies, local businesses, academia, private and non-profit agencies, and surrounding counties to attend the HMPC meetings, provide input prior to the meetings, and review and comment on draft sections of the plan. Those that were part of the planning team and attended meetings are listed in the *Figure 1 – 3*. Those that provided other key input are listed as part of the sources information in *Appendix C*. Certainly, some people and organizations that provided input may be missing or not listed accidentally.

Other sources of information and planning documents are referenced throughout the plan and in *Appendix C*.

An effort was gained to solicit comments from surrounding counties. The planning consultant, SICOG, has worked with all the surrounding EMAs and has written most of the plans in the surrounding counties. That insight and those contacts were used in the planning process for the Union County plan update. Further, as part of the review and public comment period, SICOG notified the organization's members via email and monthly newsletter of the availability of the plan for comment on the SICOG website, www.sicog.com.

Phase 2: Assess Risk

Step 4: Assess the Hazards
This step involved identifying and profiling the hazards.

Step 4a: Identify the Hazards
During the second planning team meeting, the planning team worked on hazard identification. Because not all members attended the meeting and some members wanted more time to contemplate the hazard list, the survey process continued several weeks after the meeting. The Powerpoint discussion showing hazard definitions from the State of Iowa HMP and the survey for this purpose are found in *Appendix B*. *Chapter 3* of this plan details the hazard identification and results. At the third planning meeting, the results were discussed and corrections made as needed.

Step 4b: Profile the Hazards
During the third planning team meeting, the planning team worked on hazard profiling, which covered only those hazards that were identified as having occurred in the jurisdictions and that could occur but are not yet reported. Because not all members attended the meeting and some members wanted more time to contemplate the profile, the survey process continued several weeks after the meeting. The scoring system and survey for this purpose are found in *Appendix D*. *Chapter 4* of this plan details the hazard profile and results. At the fourth planning meeting, the results were discussed and corrections made as needed.

Step 5: Assess the Problem
This step includes the determination of assets at risk and the estimation of losses.

Step 5a: Identify Assets at Risk
In order to link the kinds of hazards that can occur with the impact they have on humans and property, the risk assessment must identify the assets at risk. The vulnerability assessment on which the planning team worked during the fourth planning team meeting helped create a full assessment of properties and populations that are vulnerable to various hazards. Worksheets from *Understanding Your Risk* were used to create a risk assessment. Local asset data, such as valuation data from the County Assessor's Office, were also used. The forms used can be found in *Appendix D*. *Chapter 5* of the plan details the assets at risk.

Further, as part of the risk assessment, the planning team developed a capability assessment. The relationship between risk and capabilities is notable. Strong capabilities should reduce the risk to lives and property. The capability assessment was incorporated into the community profile in *Chapter 2* and the discussion of the mitigation problem statements and overall vulnerability assessment in *Chapter 7*. Worksheets used in this process are found in *Appendix E*.

Step 5b: Estimate Losses
All natural hazards were evaluated for annualized losses that may occur, based on current values of properties. Worksheets from *Understanding Your Risk*, which are found in *Appendix D*, were used to create a loss estimation. The methodology used and the estimation itself are found in *Chapter 6*.

Phase 3: Develop the Mitigation Plan

Step 6: Set Goals and Objectives
While the goals of the original plan are noble and useful, the planning team thought that new goals and objectives should be considered. During the fifth planning team meeting, the planning team considered the hazard profile, vulnerability assessment, loss estimation, original goals and objectives, capability assessment, and a list of problem statements to determine relevant goals. Forms used in this process are found in *Appendix B*. The goals and objectives were determined in large part by a vote of members attending that meeting, in order to create the wording that made the most sense for the leaders of the jurisdictions in the county. This information is presented in *Chapter 7*.

Step 7: Review Possible Activities
The previous plan adopted in 2006 had very elementary mitigation projects. The previous plan was one of the first ones written by the planning consultant working on this current plan. Further, the State of Iowa has adopted many other mitigation actions for implementation. Using experience, the State ideas, and *Understanding Your Risks*, the planning team created a multi-page worksheet with over one hundred possible mitigation actions, found in *Appendix E*. This worksheet was distributed to planning team members and other key organizations and department heads in the county in order to learn of the status of mitigation actions. Additionally, other mitigation actions were added for jurisdictions during the planning team discussions and as part of reviews of surveys and worksheets. Mitigation actions that are already in place, underway, or complete were listed in *Chapter 2*. Relevant mitigation actions that are not already in place, underway, or complete were listed in *Chapter 8*. As part of the evaluation, each jurisdiction was to update its list of mitigation actions from the previous plan in order to document what has been completed, what is still in consideration, and what is no longer relevant.

During the sixth planning team meeting, the results of this process were brought together and projects were discussed. Jurisdictions that have not completed the worksheets were able to work on them during the meeting. During this meeting, the team began work on a full list of mitigation actions to include in the plan, which would be evaluated more fully using the STAPLE-E evaluation worksheets, copies for each jurisdiction of which are found in *Appendix E*. Members were asked to turn in a single STAPLE-E worksheet for each jurisdiction. This process is detailed in *Chapter 8*. As requested, the contractor met with individual jurisdictions to evaluate, select, and prioritize mitigation measures.

After the STAPLE-E review, each jurisdiction was given at the seventh planning team meeting a draft mitigation strategy with total evaluation scores. The planning team selected projects from the list with consideration of scores and capabilities and prioritized those that were deemed relevant for the next five years. The planning team created for each jurisdiction a list of projects along with the timeframe for implementation and the assessment of responsibility. The worksheets used for this are found in *Appendix E*. The process and results are found as the full mitigation strategy in *Chapter 9*.

Step 8: Draft the Plan
The draft of the hazard mitigation plan was completed in May 2013. At that time, the previously mentioned public comment period was completed and the draft plan was edited to consider public comments. At the eighth (final) planning team meeting, the draft was presented to consider further comments. The draft plan, once the planning team approved it, was submitted for approval and adoption by the local jurisdictions, the IHSEMD, and FEMA.

Phase 4: Implement the Mitigation Plan

Step 9: Adopt the Plan
Adoption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and strategies outlined in the plan. In addition, adoption legitimizes the plan and authorizes responsible agencies to execute their responsibilities. Copies of the resolution adopting the plan are located in *Appendix A*.

Step 10: Implement, Evaluate, and (if needed) Revise the Plan
During the final planning meeting, the consultant described the prescribed FEMA and State process for the plan implementation, evaluation, and revisions. The final chapter of the plan, *Chapter 10*, details these processes and assigns responsibilities. Further, the chapter inserts current State and FEMA language about the topics. It was determined, based on minimal reviews and edits to the old plan, that a simple review method would be necessary.

Plan Update
44 CFR 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in the development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project funding.

In all phases of the planning process described above, the planning team reviewed the existing sections of the plan and provided comments on necessary changes. Being the consultant's first multi-jurisdictional plan, the original Union County plan lacked many of the items included in this plan. Many limitations were found in the review of the planning process used at that time, and FEMA and made some of planning requirements more stringent since its approval of that plan.

Because this is a plan update, the remaining chapters provide descriptions of the changes in the definitions, scoring criteria, evaluation criteria, processes, requirements, and results since the previous plan was prepared and approved.

The following table lists the main items that were modified as part of the new plan when compared to the plan adopted in 2006.

Figure 1 – 5: Summary of Updates to the Union County HMP

Chapter/Section/Topic	Description of Updates	Where Found in New Plan
Participation/prerequisites	More jurisdictions participating up-front: schools, hospital, college, County and State Parks and Recreation	Throughout plan; Appendix A (adoptions)
Planning process	Updated with new language; expanded planning process descriptions; sited some FEMA regulation statements; expanded executive summary; expanded public participation items and meeting information; combined two chapters into one	Chapter 1
Community profile	Updated with 2010 Census data and Census estimates; removed data that did not have a direct mitigation value; expanded information on other plans in the community; provided more community specific information; updated valuation information; moved and improved capability assessment data to and within the profile chapter; updated NFIP and repetitive loss information	Chapter 2
Risk assessment	Updated the list of possible hazards based on 2007 and 2010 State plan; updated hazard definitions; updated profiles based on new information in State plan, other websites and experts, and local planning team data; updated flood, dam failure, and levee failure data and modified hazard classifications; updated FEMA declaration list; updated statutory language; modified scoring system; modified the data in appendices; updated risk maps; updated the critical asset lists and the data about those assets; improved loss estimation	Chapters 3-6, Appendices D-F
Mitigation strategies	Full review of past mitigation strategies; updated list of possible strategies; improved capability assessment processes and data; updated goals and objectives; improved STAPLE-E processes and documentation of results; updated implementation table information with better process for prioritization; more realistic number of mitigation actions so better chance they will be undertaken; updated statutory language; separate or notated information for NFIP and repetitive loss related data on which FEMA focuses.	Chapters 2, 7-9, Appendices G-H
Plan maintenance, review, evaluation	Updated statutory languages; expanded process for annual reviews; better example checklist(s); improved funding matrix and grant options list; clarified responsibilities for each jurisdiction for the annual and long-term maintenance, review, and evaluation.	Chapter 10; Appendix I
Appendices	Updated and streamlined to shorten plan and take out non-useful data and maps; added approval letter and full crosswalk using new FEMA form	Appendices, including Appendix J

Summary and Timeline of the Planning Process

The following chart outlines the timeframe of the preparation of the mitigation plan.

Figure 1 – 6: Union County Hazard Mitigation Plan Timeline

	2010		2011				2012				2013	
Task/Month	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6
HMGP Grant Award												
Contracts Signed												
Team Creation												
Background Study												
Hazard ID and Vulnerability Assessment												
Capability Assessment												
Goals, Objectives, Alternative Mitigation Measures												
Implementation Strategy												
Draft Mitigation Plan												
Final Mitigation Plan												
Planning Team Meetings												
Final Adoption and Submittal to FEMA												
Make Changes per State/FEMA Comments												
Grant Closeout												

1.8: Record of Participation

Using FEMA 386-8 as a guide, the following table shows the level of participation by each jurisdiction. In order for the community to be considered a "participating jurisdiction," in this plan, the jurisdiction must comply with a majority of the following.

Figure 1 - 7: Jurisdiction Participation Record

Jurisdiction	Union County	City of Afton	City of Arispe	City of Creston	City of Cromwell	City of Lorimor	City of Shannon City	City of Thayer	Creston CSD	East Union CSD	Southwestern Community College	Greater Regional Medical Center
Attended at least 2 meetings or work sessions	X	X	X	X	X	X	X	X		X	X	X
Submitted inventory and summary of reports and plans relevant to hazard mitigation	X	X		X								
Submitted list of hazards that affect jurisdiction	X	X	X	X	X	X	X	X	X	X	X	X
Submitted description of what is at risk (local critical facilities and infrastructure at risk)	X	X	X	X	X	X	X		X	X	X	X
Submitted a description or map of local land use patterns (current and future)		X		X		X					X	
Developed mitigation goals for the community	X	X	X	X	X	X	X			X	X	X
Developed mitigation actions/participated in analysis	X	X	X	X	X	X	X	X	X	X	X	X
Prioritized actions	X	X		X	X		X		X	X	X	X
Completed questionnaires	X	X	X	X	X	X	X		X	X	X	X
Reviewed information from the previous plan as part of plan update	X	X	X	X							*	*
Reviewed and commented on draft plan	X											
Hosted opportunities for public involvement	X											

** Did not adopt original plan, so not applicable*

1.9:Acknowledgements and Special Thanks

Numerous county and city officials provided valuable data and information throughout the planning process. We wish to give special thanks to the following:

- The HMGP program
- All the planning team members
- Union County Emergency Management Agency and Coordinator Jo Anne Duckworth
- Local governments who participated and adopted the plan
- State and FEMA plan review staff

1.10: Assurance to Compliance with FEMA Requirements

This multi-jurisdictional mitigation plan complies with Iowa Homeland Security and Emergency Management Division's and FEMA's planning guidance; FEMA regulations, rules, guidelines, and checklists; Code of Federal Regulations; existing Federal and State laws; and such other reasonable criterion as the President/Governor, Federal/State legislatures and IHLSEM/FEMA may establish in consultation with local governments while the plan is being developed. This plan also helps with the minimum planning requirements for all FEMA mitigation programs, such as the Flood Mitigation Assistance (FMA) Program, the Pre-Disaster Mitigation (PDM) Program, and the Hazard Mitigation Grant Program (HMGP), and where appropriate, other FEMA mitigation related programs such as the National Earthquake Hazards Reduction Program (NEHRP), the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).

NOTE: The contract for this plan indicates it is a multi-jurisdiction plan according to terms in Section 201.6(c)(5) and, therefore, all area agencies were asked to approve and adopt this plan, as found in Appendix A.

Chapter 2: Community Profile

This chapter describes the planning area's main characteristics and provides a description of each participating jurisdiction and their existing mitigation capabilities.

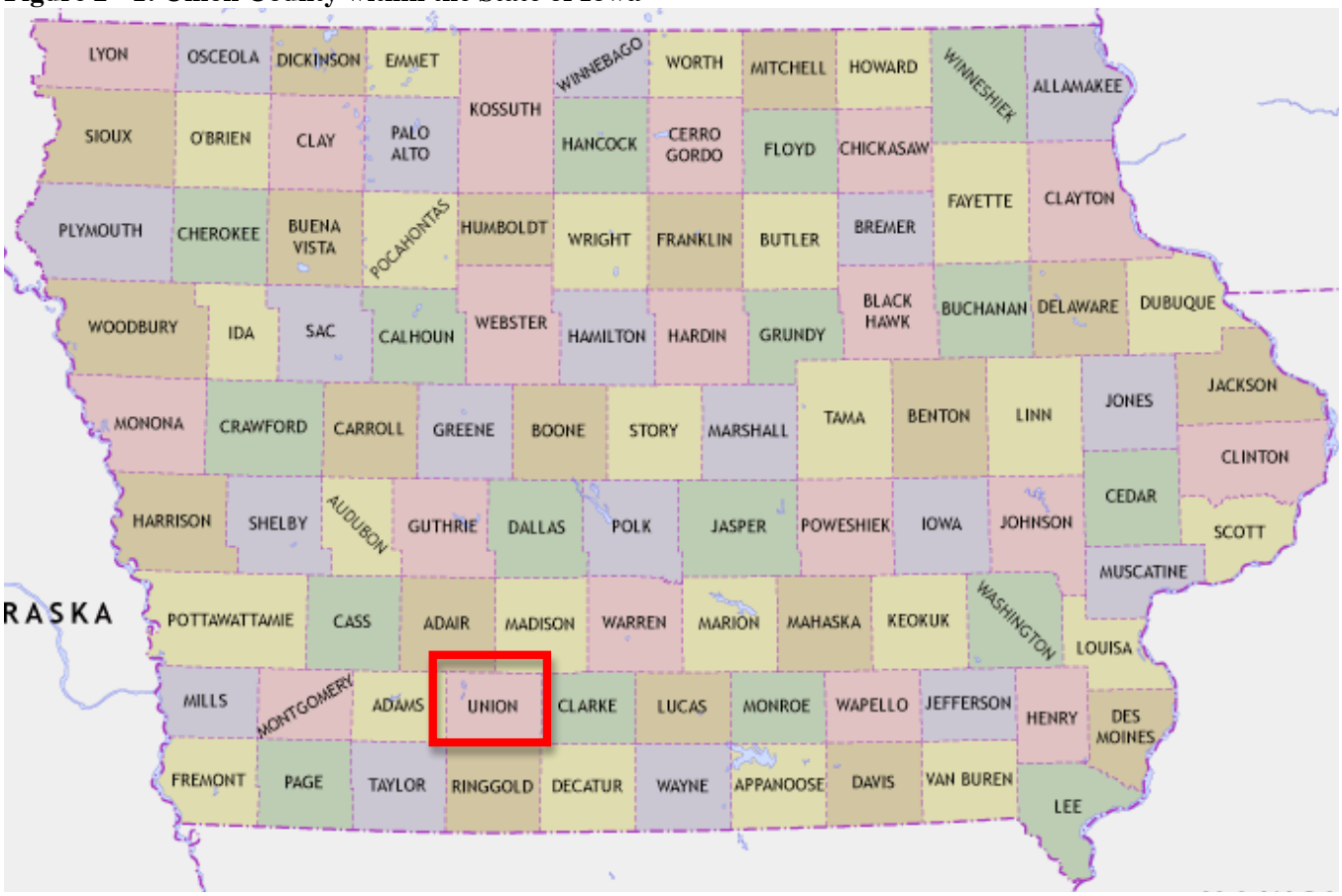
2.1: Participating Jurisdictions' Planning Area Profile

This section details the main characteristics of the planning area: Union County. *Figure 2 - 1* shows the county's location within the State of Iowa.

Location

Union County is located in south central/southwest Iowa and is in the second tier of counties in the state. Creston, the county seat, is located in the western part of the county, about 70 miles south and west of Des Moines. The county is bordered by Adams County to the west, Clarke County to the east, Adair and Madison Counties to the north, and Ringgold County to the south. The dimensions of the county are approximately 24X18 miles, with a total area of 432 sq. miles.

Figure 2 - 1: Union County within the State of Iowa

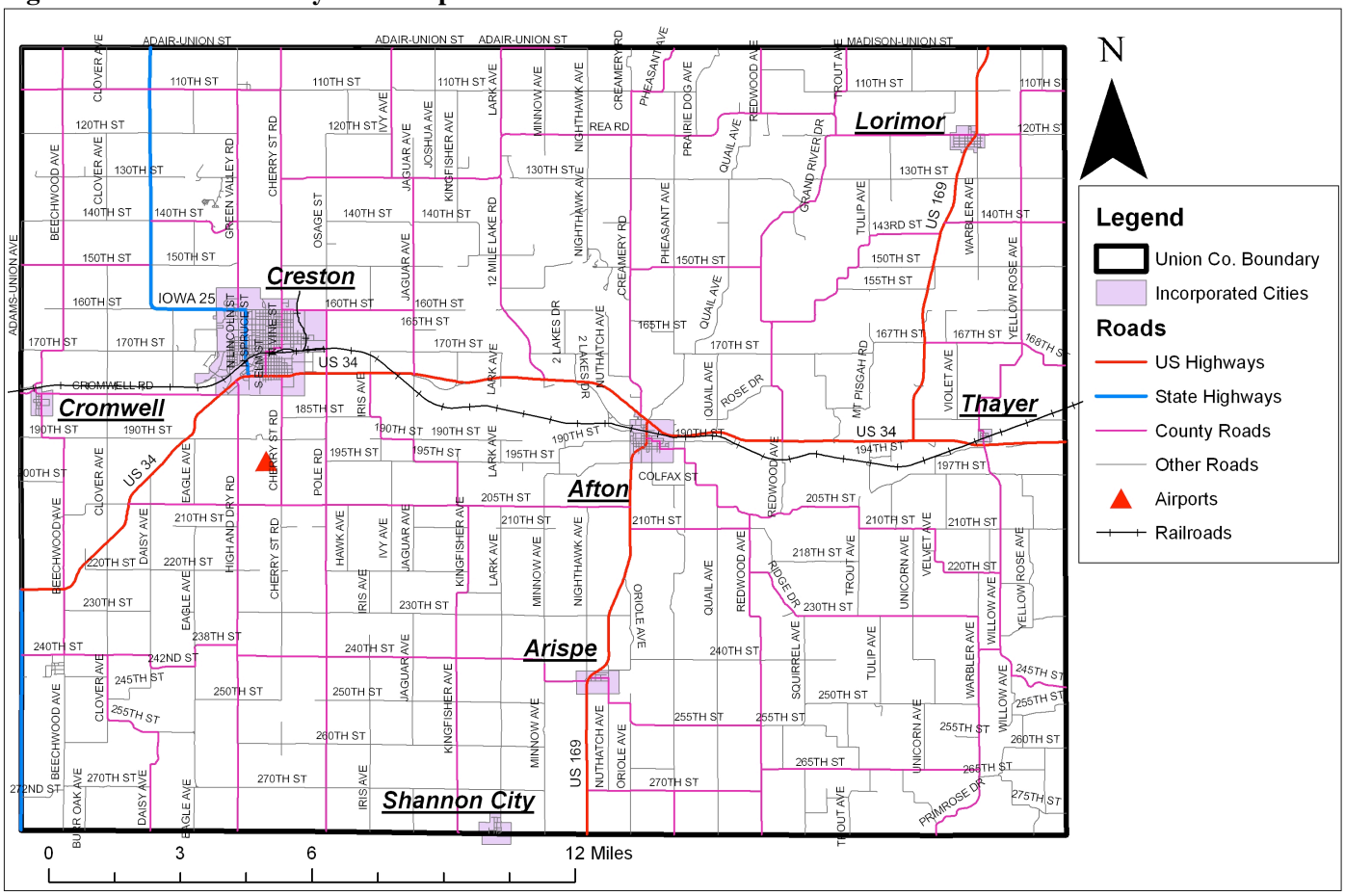


Source: World Sites Atlas, www.worldsites.org

A base map of Union County is included on the following page. There are 7 incorporated cities or towns in the county and approximately 420 square miles of unincorporated rural area. This county is divided into 13 township governments. The county is very rural and towns are spread throughout.

The following page contains a base map of the entire planning area.

Figure 2 - 2: Union County Base Map with Political Boundaries



The base map shows the incorporated jurisdictions and the road network within the planning area. Additional maps in the following pages show other data in the planning area as well as maps of specific jurisdictions that are participating in the plan.

Brief History of Development

Union County has always been a very rural county, from its original settling around 1855 and as the county grew over the years. The first settlers were small farmers and entrepreneurs who built small cities along the railroads, which were built from the 1860s to 1880s. At one time, the county was home to several railroad lines. Most of the towns were incorporated from 1875 to 1900, and at one time the county had many more small incorporated and unincorporated villages. After the decline of the railroads, changes to the agricultural industry, increased mobility, and greater costs of living, the population shifted to larger communities inside and outside the county. Now, over half the county's population lives in Creston, a stark change from the early years. In 1870, the county had 3,974 persons; Creston had 411. In 1900, the county peaked at 17,916 and Creston had 7,752, the fourth highest ever for the county seat. Over our history, Union County has been primarily a farming and small business community. Only a few larger employers existed. Today, the community is more diverse economically and socially, despite a smaller population. Union County has become a regional shopping, service, health, manufacturing, and education center, serving smaller counties in all directions. The community boasts excellent tourism potential, good recreation, strong business, a college, quiet living, and many worthwhile local and state assets that should be protected.

Geography and Geology

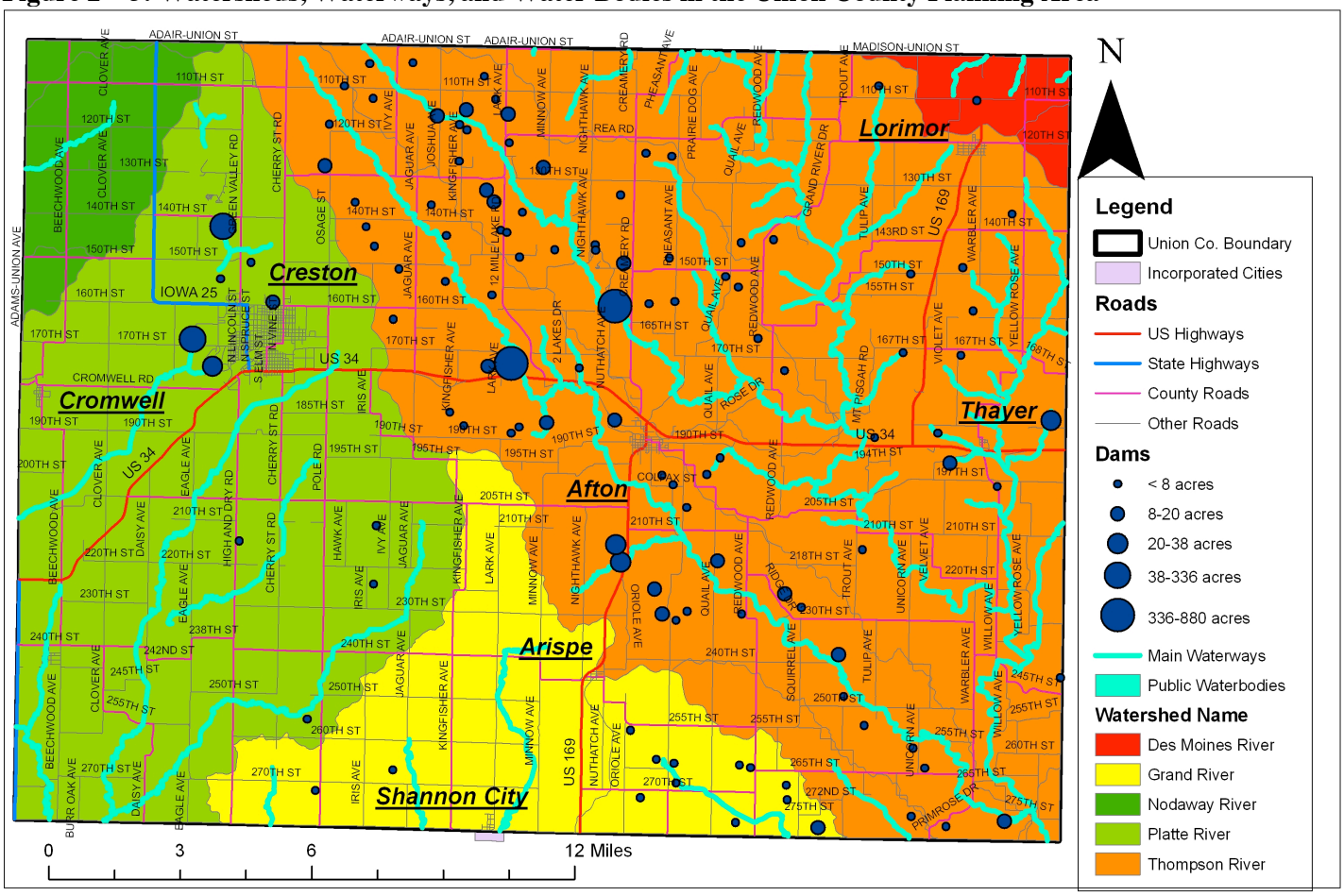
Understanding the surface water systems and topography of the region is vital for the projection of possible hazard events and determination of methods to protect assets of the community.

Geology. Union County and the cities in the county are located in the Southern Iowa Drift Plain. Approximately 85% of the county's groundwater is obtained from a Drift Groundwater Source. The other 15% is obtained from alluvial aquifers. This area includes rolling hills and valleys with up to 150 feet elevation changes. The area averages at 1250 feet above sea level, generally sloping downhill to the south.

Surface Water Systems. The county is well drained by rivers and streams that begin in the northern part of the county. There are no major rivers, lakes, or mountains in the county. The county is dissected by the Iowa (Mississippi-Missouri Rivers) Divide. The ridge of this divide is at about 1,350 above sea level. However, the complex stream systems and small ponds cover almost all the sections in all the county's townships. A map of streams and recognized watersheds follows. There are many potential floodplain areas in the county, although none are mapped at this time. Key streams include the Platte River (East, Middle, West Forks) in the western quarter of the county, the West Fork Grand River flowing from the center of the county to the south, the Middle Fork Grand River flowing along the eastern third of the county, Twelve Mile Creek in the middle of the county, and Three Mile Creek in the northern third of the county.

There are 8 major watersheds in Union County, as found in the following map. These include the South River, Thompson River, Upper South River, Twelve Mile Creek, East Fork Grand River, Grand River, Platte River, and East Nodaway River.

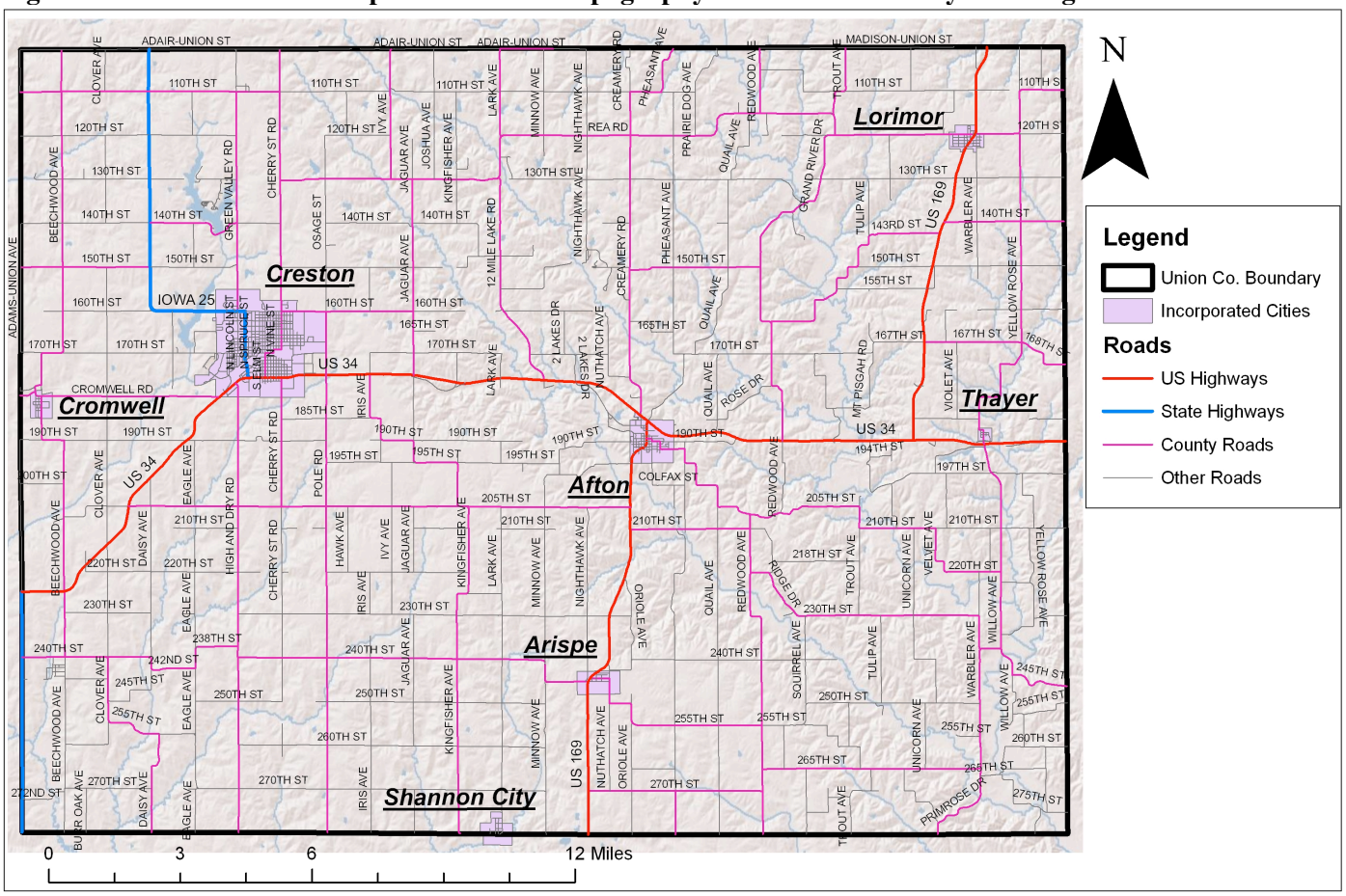
Figure 2 – 3: Watersheds, Waterways, and Water Bodies in the Union County Planning Area



Topography. The county lacks unique, fragile, or hazardous landforms or landform regions. Very little of the county has rugged terrain, and most areas of such terrain are in the southeastern parts of the county, where there are few productive farms. The county does not have significant outcroppings, limestone bluffs, or erosion areas. No

known hazards are found resulting from terrain or topography. The following map shows the general topographic relief of the county.

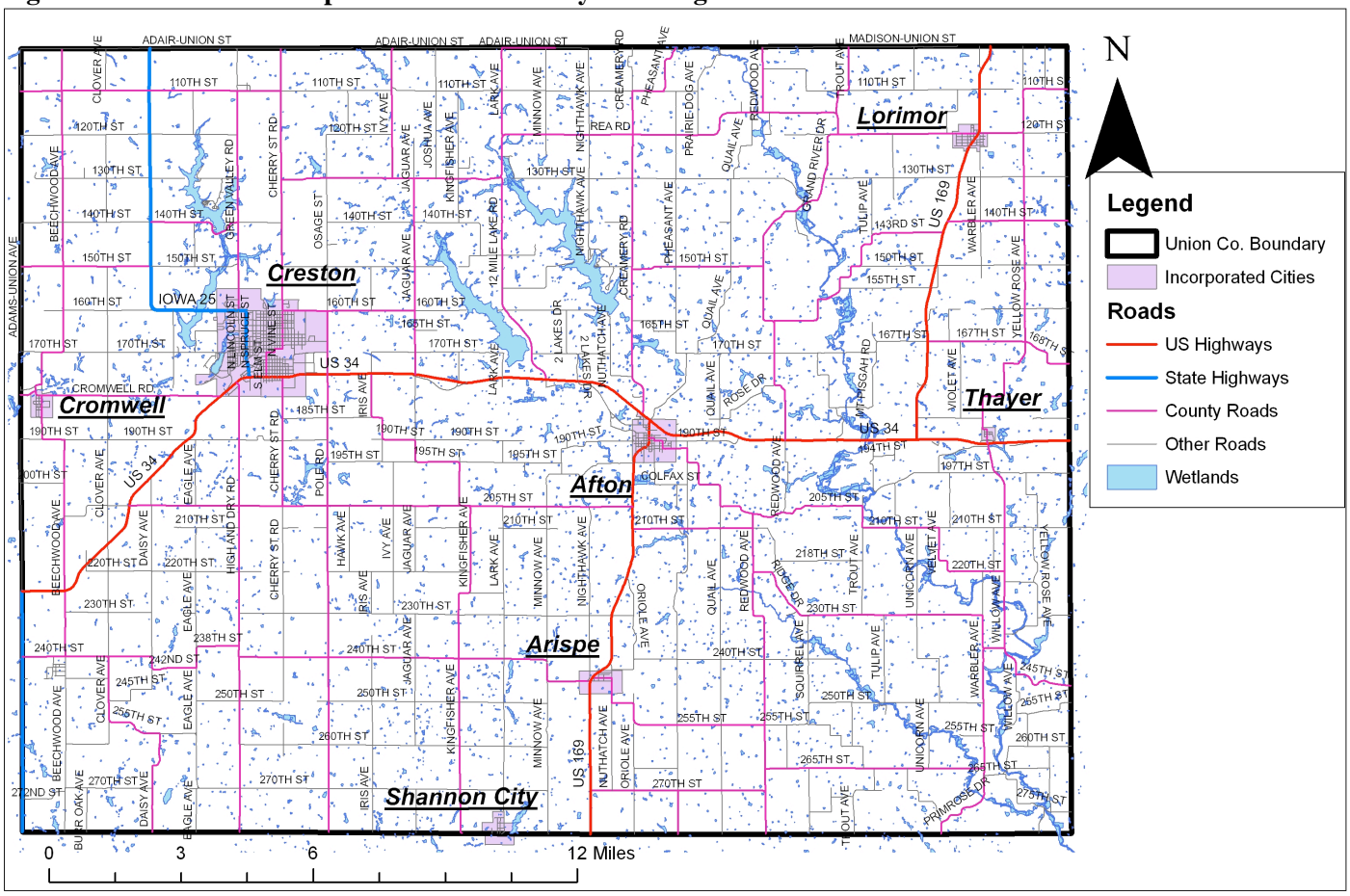
Figure 2 – 4: Shaded Relief Representation of Topography in the Union County Planning Area



Soils. The major soil associations in the Union County area include: 1) Macksburg-Winterset, 2) Gara-Ladoga, 3) Nodaway-Colo-Wabash, 4) Gara-Pershing, 5) Sharpsburg-Shelby-Nira, 6) Grundy-Haig, and 7) Shelby-Pershing Associations. Almost 50% of the county's area is composed of Sharpsburg-Shelby-Nira soils. This type is characterized by gently sloping to moderately steep, moderately well drained and well drained upland soils that have a silty clay loam or clay loam surface layer and formed in glacial till or loess. This soil occupies a bulk of the western half and northern half of the county. Most of the well-populated areas and cities of the county are located in the Sharpsburg-Shelby-Nira Association (Shannon City, most of Creston, most of Cromwell, and most of Afton); Macksburg-Winterset Association (Lorimor, part of Creston, and part of Afton); Grundy-Haig Association (most of Arispe); and Gara-Ladoga Association (Thayer). These soils are generally upland types with gentle to moderate slopes and decent to good drainage. No community is located entirely within an alluvial or wetland soil type. The Macksburg-Winterset and Sharpsburg-Shelby-Nira Associations are probably the best type for row-crop production. While Iowa is heavily agricultural, over 30% of the county's land, primarily the southeastern 30%, is ill suited for perennial row crop production.

Wetlands. Small wetlands occupy various areas of the county. The US Army Corps of Engineers evaluates proposed construction activities in wetlands and issues Section 404 permits when necessary to protect wetland areas. Most wetlands areas are currently used for agricultural purposes and are not developed for any human use, although some are in developed areas and pose modest hazards during extreme wet weather to roadways and buildings. The following map includes the wetlands of Union County.

Figure 2 – 5: Wetlands Map of the Union County Planning Area



Floodplains. Only a small part of the county is recognized as a floodplain. The county has not yet been mapped in the updated floodplain mapping processes (either by FEMA or by the IDNR). Traditional floodplain NFIP maps are only available for the following communities:

- City of Creston
- City of Cromwell
- City of Shannon City (partly in Union County and partly in Ringgold County)

The following pages contain profiles of these cities with copies of FIRM maps.

Transportation

Highway access. The county seat is located at the junction of US Highway 34 and Iowa Highway 25 just 31 miles west of Interstate 35, a major HAZMAT route. All highways in the county are two-lane routes. About 28 miles of US Highway 34, 26 miles of US 169, and 16 miles of Iowa Highway 25 are in the county. All other roads, a total of 900 miles in length, are county paved and other roads, of which 80% are gravel, dirt, or blacktop. All cities in the county are accessible by Level 1 gravel or paved roads at the minimum. As can be seen on the base map, the roads in the county are primarily on a gridular pattern.

Streets and Roads. The seven towns in the county have streets and roads to all developed areas. In Creston, the largest city and county seat, 75% of the roads and streets are paved, with the remaining being seal coated. The other cities in the county contain primarily gravel roads, with some seal coated roads. Rescue vehicles can access all developed parts of any town.

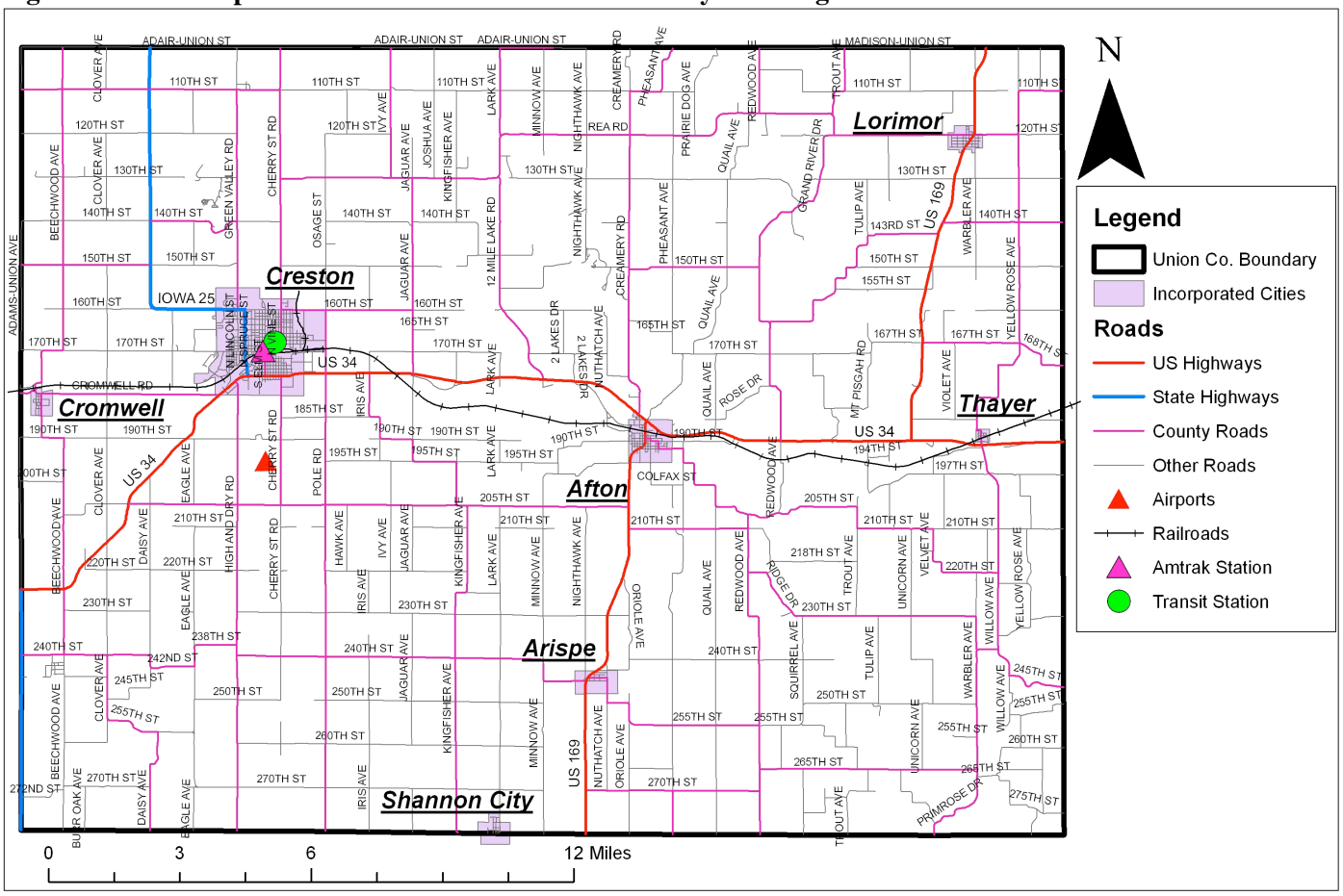
Railroads. The BNSF mainline from Chicago to San Francisco travels 28 miles through the county. The double track hosts almost 70 trains each day plus a major switching yard in Creston. Spurs are also located in Creston and

Afton. Major local intermodal users of the railroad access include several grain handlers. The railroad also handles large volumes of coal, chemicals, durable and nondurable goods, and toxic gasses. The traffic on this mainline has increased since 2000, after many years of decline. No new lines are likely and no additional abandonment is likely. Amtrak's California Zephyr also uses this line for one train each direction, with a stop in Creston daily.

Airports. Union County contains one official airport, located 1 mile south of Creston. This airport is a Class II enhanced service facility suitable for minor to midsized commuter and cargo plans. The asphalt runway is 4,910 feet long and 75 feet wide; the grass runway is1,675 feet by 100 feet. The facility has limited services related to air traffic control or transport of HAZMAT or other substances. The nearest commercial airport is 70 miles northeast of the county in Des Moines.

The following map shows the key transportation facilities in Union County.

Figure 2 – 6: Transportation Facilities in the Union County Planning Area



Climatology

Union County lies in the humid continental zone, which covers all of Iowa. With a mean temperature of 73.3 degrees in the summer and 24.7 degrees in the winter, Union County is slightly warmer on average than the state as a whole. Any season can fluctuate from very wet to very dry, and springs and autumns are typified by wide ranges of temperatures and wind patterns. Annual rainfall in the area is approximately 34.1 inches, and snowfall is 28.0 inches. The frost-free season is 161 days on average.

Figure 2 – 7: Annual Climate Trends

Month	Avg. High	Avg. Low	Mean	Avg. Precip.	Est. Record High	Est. Record Low
January	27 F	8 F	17 F	1.20 "	63 F	-34 F
February	33 F	13 F	23 F	1.28 "	74 F	-35 F
March	46 F	24 F	35 F	2.40 "	90 F	-17 F
April	59 F	34 F	47 F	3.58 "	92 F	1 F
May	70 F	45 F	58 F	4.31 "	98 F	22 F
June	80 F	56 F	68 F	4.64 "	102 F	35 F
July	84 F	61 F	73 F	4.09 "	106 F	29 F
August	82 F	58 F	70 F	4.41 "	107 F	36 F
September	75 F	49 F	62 F	3.55 "	101 F	21 F
October	63 F	37 F	50 F	2.73 "	95 F	2 F
November	46 F	25 F	36 F	2.41 "	82 F	-15 F
December	32 F	14 F	23 F	1.47 "	69 F	-32 F

Source: Weather Channel

Land Use Patterns

There are approximately 276,480 acres or 432 square miles in the county. Clearly, a great majority of the county is composed of agricultural uses, primarily rowcrop farming, grazing and livestock farming, and non-rowcrop farming. Data from the 2002 Census of Agriculture indicates 236,211 total farm acres, or 369.1 square miles (85.4%). The county is composed of many other land uses, however, such as incorporated communities (2.2%, 6,000 acres), dense forests (2.2%, 6,000 acres), public lands and recreation areas including lakes (3.0%, 8,300 acres), natural waterways (0.5%, 1,180 acres), utilities (0.5%, 1,180 acres), mined and excavated lands (0.1%, 300 acres), rural industrial/commercial/residential (0.3%, 829 acres), transportation (5%, 13,825 acres), and other or multiple uses (1%, 2,655 acres). Note that the county has no state or federal lands, with one exception: the Green Valley State Park, a 1,000-acre park two miles north of Creston.

Union County's rural area and the cities of Creston, Afton, and Lorimor have land use maps. The maps provide information on the current uses and the planned future uses of land. Note the following table for the jurisdictions in the county.

Figure 2 – 8: Land Use in Union County Jurisdictions

Jurisdiction	Est. Area	Residential	Comm./Ind.	Public/Rec.	Trans.	Agriculture/Open
Rural County	270,248 acres	500 acres	329 acres	8,300 acres	13,825 acres	253,500 acres
Afton	700 acres	300 acres	20 acres	100 acres	30 acres	250 acres
Arispe	392 acres	50 acres	2 acres	3 acres	5 acres	332 acres
Creston	4,330 acres	1,350 acres	500 acres	550 acres	500 acres	1,100 acres
Cromwell	200 acres	75 acres	2 acres	2 acres	5 acres	116 acres
Lorimor	356 acres	120 acres	10 acres	10 acres	15 acres	201 acres
Shannon City	160 acres	50 acres	1 acre	1 acre	5 acres	103 acres
Thayer	60 acres	30 acres	1 acre	1 acre	4 acres	24 acres

Sources: land use maps of county and some cities; consultant studies and surveys

The agriculture and open spaces in the chart above include any and all farmland and farmsteads within the county, forest lands, open spaces not set aside for public recreation, and other land uses, including floodplains and streams. The bulk of the land in the county and all cities in this category is farmed land.

Historic Places/Districts/Archaeological Sites

Union County has 4 sites listed on the National Register of Historic Places. The sites are as follows:

- CB&Q Railroad Depot, 116 West Adams, Creston
- Grand River Bridge at 230th Street over Grand River, rural Arispe
- Jefferson Elementary School, 501 North Cherry, Creston
- U.S. Post Office Building, 200 block North Maple Street, Creston
- Iowana Hotel, 203 W. Montgomery St., Creston

A historic site is the Mormon cemetery five miles southwest of Lorimor. These sites and other potential sites include buildings and bridges that should be protected from hazards, such as tornados and floods. To date, no historic districts have been established. There are no known major archaeological sites in the county that would need protection from certain hazards.

Planning Area Population Characteristics

Union County is a rural county in the southwestern part of the state, just southwest of the Des Moines metropolitan area. According to the 2010 Census, Union County had a population of 12,534, which is actually modest growth since 2000, unlike most of the surrounding counties and other rural counties in Iowa. Because Creston is a regional center with many services and new housing opportunities for specific populations, it is attracting populations from even smaller surrounding counties. Future growth is possible on a modest scale but declines are also very possible as more people move to urban areas and warmer climates. Growth indicators provided by the Office of Social and Economic Trend Analysis suggests that Union County will never again reach 13,000 persons unless major economic shifts occur.

Figure 2 – 9: Population Trends of Rural and Incorporated Jurisdictions

	2000	2010	Change	Percent Change	% of 2010 Total
County	12,309	12,534	+225	+1.8%	100.0%
City of Afton	917	845	-72	-7.9%	6.7%
City of Arispe	89	100	+11	+12.4%	0.8%
City of Creston	7,597	7,834	+237	+3.1%	62.5%
City of Cromwell	120	107	-13	-10.8%	0.9%
City of Lorimor	427	360	-67	-15.7%	2.9%
City of Shannon City *	70	66	-4	-5.7%	0.5%
City of Thayer	66	59	-7	-10.6%	0.5%
Places Total	9,348	9,471	+123	+1.3%	75.6%
Balance of County	2,969	3,063	+94	+3.2%	24.4%

Source: U.S. Census Bureau
** Note: A small, mostly unpopulated portion of Shannon City is in Ringgold County.*

The county has 13 townships, 8 of them being square with 36 sections of 1 square mile each, 4 of them with approximately 34 to 35 sections each, and the City of Creston as a township. The below townships include the populations of incorporated cities within each.

Figure 2 – 10: 2010 Population by Township

	Population	% of Total		Population	% of Total
Creston Twp	7,834	61.7%	New Hope Twp	623	5.4%
Dodge Twp	209	1.5%	Platte Twp	254	2.1%
Douglas Twp	654	5.4%	Pleasant Twp	110	1.0%
Grant Twp	265	2.1%	Sand Creek Twp	243	1.7%
Highland Twp	284	2.3%	Spaulding Twp	236	1.9%
Jones Twp	262	2.4%	Union Twp	1,224	10.2%
Lincoln Twp	336	2.4%			

Source: U.S. Census Bureau

The following 2010 Census and American Community Survey five-year estimate data is useful:

- Population by gender: male – 6,106 (48.7%); female – 6,428 (51.3%)
- Median age: 40.9 years
- Population aged 0-17: 2,936 (23.4%)
- Population aged 17-64: 7,331 (58.5%)
- Population aged 65 and older: 2,267 (18.1%)
- Race of population: White – 12,144 (96.9%); Black or African American – 89 (0.7%); American Indian – 39 (0.3%); Asian – 60 (0.5%); Native Hawaiian and other Pacific Islander – 3 (0.0%); Some other race – 74 (0.6%); two or more races – 125 (1.0%)
- Hispanic or Latino origin of any race: 225 (1.8%)

- Population composition: in households – 12,182 (97.2%); in group quarters – 352 (2.8%)
- Households: 5,271; average size: 2.31
- Family households: 3,328; average size 2.88

Planning Area Housing Characteristics

The total number of housing units in 2011 was 5,937, compared to 5,657 in 2000, a growth of 4.9%. The number of occupied units in 2010 was 5,271 (88.8%) and the number of vacant units was 666. Of the 5,271 occupied units, 3,736 (70.9%) were owner-occupied and 1,535 (29.1%) were renter occupied. Notice the following data for the entire county.

Figure 2 – 11: Local Housing Structural Characteristics in 2010

	Total Units	Occupied	Owner **	Renter **	Owner Avg. Value	Vacant for Occasional Use
County	5,937	5,271	3,736	1,535	$88,100	77
Afton	400	355	262	104	$73,500	3
Arispe	49	42	44	1	$42,000	0
Creston	3,773	3,378	2,216	1,099	$80,600	0
Cromwell	48	42	22	3	$61,300	0
Lorimor	211	160	111	28	$38,500	28
Shannon City *	38	32	34	3	$32,300	5
Thayer	29	24	20	11	$30,000	0
Rural Areas	1,362	1,217	1,027	286	Unable to determine	41

Source: U.S. Census Bureau, 2010 Census; 2010 Census five-year estimates
** Note: A small, mostly unpopulated portion of Shannon City is in Ringgold County.*
*** Owner and renter data is based on Census estimates, not final counts, so they may not total the occupied count.*

Because housing age, value, and condition are the key characteristics we must assess in terms of vulnerability and losses in the event of disasters, value and age data is provided in this section. Housing values in Union County are far below the statewide average values for similar sized homes.

Figure 2 – 12: Planning Area Housing Age Characteristics in 2010

Ranges of Year Built	Number	Percent
2000 or newer	386	6.6%
1990-1999	364	6.2%
1980-1989	340	5.8%
1970-1979	917	15.5%
1960-1969	524	8.9%
1950-1959	566	9.6%
1940-1949	406	6.9%
Pre-1940	2,405	40.7%
Median Year Built	1953	X

Source: U.S. Census Bureau, 2010 Census five-year estimates

The median year built in 2010, according to the ACS estimate, was actually four years older (57 years) than in 2000, when the median year built was 1947 (or 53 years). Older homes simply are more likely to be deteriorating and are not likely to have modern electrical wiring and plumbing systems. Such structures are more likely to be damage in hazard events.

In some areas, housing construction continues to occur. Growth areas of the county include infill housing in each of the larger cities, development of new housing on the west edge of Creston, and development of small subdivisions (such as Timber Lake in Lincoln Twp and Spring Valley in Jones Twp) in rural parts of the county. Minor growth is occurring in other rural townships and smaller towns. Some 30 single-family and multi-family homes are built annually in the county. The median value and median rent in the county is increasing and will likely continue to do so. Most homes built since 2000 are selling from $120,000 to $250,000. Virtually all the homes in the county have adequate heating systems and kitchen facilities. Most homes are connected to public water and sewer, except in rural areas and in Shannon City, where many homes are connected to individual septic tanks, although Shannon City's septic tanks are managed professionally to ensure compliance.

Educational Facilities and Attainment

Educational levels of the county are vital in terms of understanding relative community assets and ability to best serve the community after a disaster. Union County is the home of the Creston Community Schools and East Union Community Schools, and portions of other districts with buildings outside our county. Approximately 2,400 students are enrolled in the school districts in the county. The county is also home to the main campus of Southwestern Community College. This campus in Creston serves approximately 1,400 part-time and full-time students, many living in the county and are part of the county's population. Two small private or parochial schools are located in the county. A small cosmetology school is located in Creston. The school profiles in this chapter detail current enrollment levels.

Two parochial schools, Mayflower Heritage Christian School (57 students) and St. Malachy Catholic School (100 students), both in Creston, were invited to participate in the HMP but did not do so. Both schools have recently completed building projects and are not likely to be undertaking building projects in the coming five years.

Of the 8,345 residents aged 25 or older, at least 89% have attained a high school graduation or equivalency and 15.6% have at least a bachelor's degree. Certain parts of the county have widely ranging levels of education, but overall the county has a typically educated workforce, at least as far as disaster mitigation is concerned.

Figure 2- 13: Educational attainment of all persons 25 and over

Maximum Level Attained	Number	Percent
Population 25 years and older	8,345	100.0%
Less than 9th grade	218	2.6%
9th to 12th grade, no diploma	669	8.0%
High school graduate (incl. equivalency)	3,489	41.8%
Some college, no degree	1,887	22.6%
Associate Degree	785	9.4%
Bachelor's Degree	836	10.0%
Graduate or Professional Degree	461	5.5%

Source: U.S. Census Bureau, 2010 Census five-year estimates

Economic Characteristics

Though the information provided below is gathered at only the County level, the indication it provides is that many of the once agriculture-related jobs have been specialized or been replaced with jobs located in Creston, surrounding counties (mainly Clarke County), and larger metro areas, such as Des Moines, and Omaha.

Figure 2 – 14: Planning Area Employment Industry Categories

	Number	Percent
Non-Farm Employment	6,273	100.0%
Agriculture, Forestry, Fishing, Hunting, Mining	394	6.3%
Construction	403	6.4%
Manufacturing	1,462	23.3%
Wholesale Trade	162	2.6%
Retail Trade	781	12.5%
Transportation and warehousing and utilities	270	4.3%
Information	90	1.4%
Finance and insurance, and real estate and rental and leasing	271	4.3%
Professional, scientific, management, administrative, and waste management services	333	5.3%
Educational, health care, and social assistance	1,374	21.9%
Arts, entertainment, recreation, accommodation, and food services	315	5.0%
Other services, except public administration	239	3.8%
Public administration	179	2.9%

Source: U.S. Census Bureau, 2010 Census five-year estimates

Overall, Union County has a pretty stable economy with diverse industry sectors represented. Few large employers have closed or new ones have opened that have changed the economy significantly. This characteristic makes it somewhat easier to implement mitigation actions. While the national unemployment rates have fluctuated significantly in the past five years, Iowa and Union County have been more stable. Note the following.

Figure 2 – 15: Planning Area Employment Information

Data Set	Number	Percent
Population aged 16 and over	9,785	100%
In labor force	6,632	67.8%
Civilian labor force	6,632	100% of total labor force
Employed	6,273	94.6%
Unemployed	359	5.4%
Females aged 16 and over	5,086	52.0% of all persons 16+
In labor force	3,215	63.2%
Civilian labor force	3,215	100% of female labor force
Employed	3,078	95.7%
Unemployed	127	4.3%
Worked at home	269	4.3%
Mean travel time to work for those not working at home (minutes)	13.7	--
Occupation—Employed civilian population 16+	6,273	100.0%
Management, business, science, and arts occupations	1,508	24.0%
Service occupations	1,008	16.1%
Sales and office occupations	1,415	22.6%
Natural resources, construction, and maintenance occupations	521	8.3%
Production, transportation, and material moving occupations	1,821	29.0%

Source: U.S. Census Bureau, 2010 Census five-year estimates

In March 2012, the county unemployment rate was 5.6%, which was slightly higher than average for the entire state of Iowa (5.2%) but much lower than the national rate of 8.2%.

Most people that live in Union County also work in Union County. However, many work in Clarke, Adair, Taylor, and Polk Counties, and thus they commute 25 minutes to over an hour each way to work.

Union County has some notable major employers. The following is the estimated employment in early 2012.

Figure 2 – 16: Planning Area Major Employers and Key Industries

Company	Location	Product/service	Estimated Employment
East Union Schools	East edge of Afton	Education	200
Bunn-O-Matic Corp	NE edge of Creston	Coffee Maker Mfg	600
Fansteel Wellman Dynamics	Creston Industrial Park	Metal Casting Mfg	425
Ferrara Candy Company	Creston Industrial Park	Food Gummy Mfg	351
Gits Manufacturing	Creston Industrial Park	Lubrication Devise Mfg	130
BNSF Railroad	Uptown Creston	Railroad Transportation	90
DeBruce Grain complex	East Creston	Grain handling	27
Southwestern CC	Northwest Creston	Education	165
Greater Regional MC	Northwest Creston	Health Care	299
Wal-mart	US 34 Retail Corridor	Retail	200
Creston Schools	Creston	Education	400
Farmer's Cooperative	Central Afton, east Creston	Agri-processing	128
Precision Optical Group	South Creston	Precision Mfg	100
Vanmark Equipment	Creston Industrial Park	Vegetable Process Equip Mfg	25
Green Valley Chemical	3 miles north of Creston	Chemical Products Mfg	35
CHS, Inc.	East Creston	Agri-processing	30
Advanced Ag, LLC	East edge of Creston	Agri-processing	15
Southwest Distributing	Creston Industrial Park	Beverage Distribution	20
Creston Publishing Company	Uptown Creston	Publishing/Newspaper	33

Source: Union County Development Association (with a few exceptions)

The local construction industry is stable and a strong part of the economy. If a disaster does occur, this could be mobilized to repair homes, streets, and businesses damaged. Union County has a decent supply of hardware and lumber selection. Major markets for food and materials can be accessed via Interstate 35, which is only 15 miles from the eastern border of the county.

Income Characteristics

Local income characteristics tell us very much about the ability of the community to support the costs of hazard mitigation. In this section, we summarize the household income data for the planning area.

Figure 2 – 17: Planning Area Income Characteristics

Characteristic	Number	Percent
Households	5,326	100.0%
Less than $10,000	479	9.0%
$10,000 to $24,999	1,297	24.3%
$25,000 to $49,999	1,442	27.1%
$50,000 to $74,999	1,009	18.9%
$75,000 to $99,999	633	11.9%
$100,000 or higher	466	8.8%
Median household income	$40,879	X
Mean household income	$48,268	X
Median family income	$50,546	X
Mean family income	$58,740	X
Per capita income	$20,435	X
Median earnings for workers	$22,275	X
Poverty status—Persons below poverty level	2,151	17.8% of persons
Under 18 years of age	779	27.1%
Age 65 or over	247	11.5%
Families	360	10.4%
Families with female householder, no husband present	141	26.0%
Individuals with incomes below 50% of poverty level	1,007	8.3%

Source: U.S. Census Bureau, 2010 Census five-year estimates

Since 2000, the county has seen modest increases in incomes and earnings, consistent with rural southern Iowa. However, the county remains far below Iowa in terms of income and earnings. Poverty rates have also increased in all categories. This has resulted in a general decline in ability of the people in the county to afford home repairs, growing insurance premiums, and other investments to make the population less vulnerable to hazards.

The populations of individual cities and townships in the county have widely varying income and poverty status statistics. People of some townships and very small cities have particularly low income levels.

Agricultural Trends

Being a rural county in Iowa, it is important to consider economic, land use, and valuation levels of the local agricultural base. Select applicable planning data is included for the county, which includes all jurisdictions of the multi-jurisdictional plan.

Figure 2 – 18: Planning Area Agricultural and Farm Data

Characteristic	1997	2000	Change	Characteristic	1997	2002	Change
Total Farms	726	698	-28	Total Acres	236,211	238,034	+1,823
Average Acres/Farm	325	341	+16	Est. Sq. Miles	369.1	371.9	+2.8
Farms with Hogs/Pigs	63	33	-15	Cropland Acres	111,685	116,889	+5,204
Number of Hogs/Pigs	56,082	87,635	+31,553	Pasture Acres	41,652	36,831	-4,821
Farms with Cattle	402	351	-51	Woodland Ac.	9,379	10,567	+1,188
Number of Cattle	37,889	43,761	+5,872	Farms w/ Govt Pmts	533	491	-42
Farms w/ Dairy Cattle	5	7	+2	Total Pmts ($000)	$3,330	$3,563	+233
Number Dairy Cattle	0	261	+261	Avg Pmt/Farm	$6,247	$7,256	+1,009

Sources: Regional Economic & Community Analysis Program, Iowa State University, www.recap.iastate.edu/atlas/farms/

Note that while average farm size has increased, the number of farms continues to decline. From 1982-1997, the livestock herds declined, only to rebound somewhat in the past five years. Fewer farms are producing more on slightly more acres. The hog trend is due to the growth of a few confinement feeding operations in this county, which have tens of thousands of head in one or more buildings on a site. These large confinements have become a special fire and waste management risk in our area. The county had 238,034 acres of farmed land in 2002,

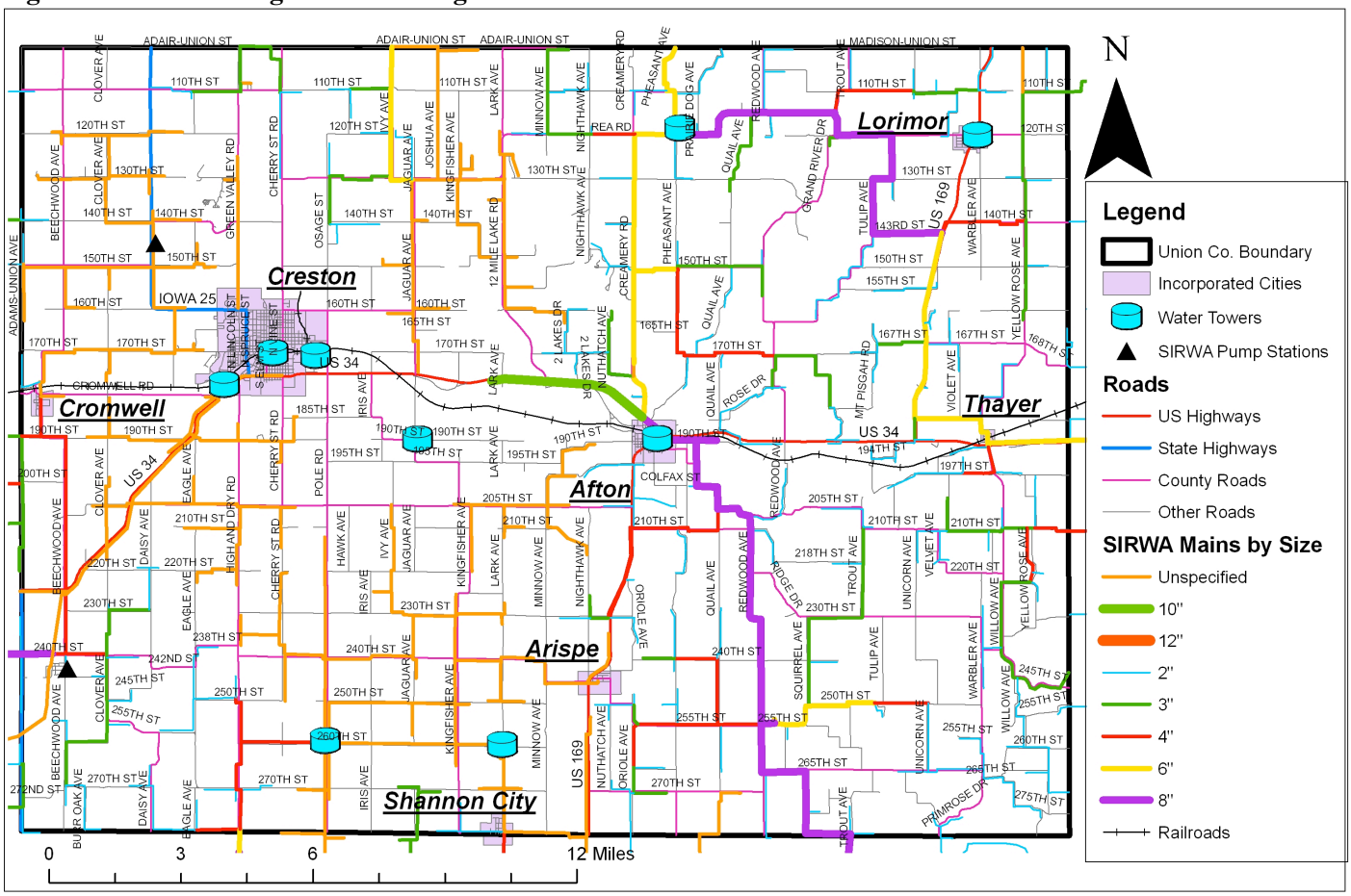
according to the 2002 US Agricultural Census. The farmed land in 2002 included 49.1% cropland, 15.5% pasture, 4.4% woodland, and 31.0% other uses (buildings, roads, etc). In 2007, there were 681 farms with an average farm size of 341 acres. In 2010, the average land value was $3,147 per acre, but land values since early 2010 have risen very rapidly all over Iowa. Farm payments continue to heavily impact area farming, and most farmers are not able to support their families merely on farm production sales, due to high production costs.

Union County produces a large variety of many different farm commodities, and is average in most categories among counties in Iowa. Iowa is the largest hog and corn producing state and is near the top in cattle and soybean production. Agriculture is a very important part of the local economy, and while the area is not solely dependent on the agriculture sector, it is relevant and vital that the planning team consider hazard impact on local crop and livestock production, even though crop and livestock insurance is in place in this area.

Potable Drinking Water Systems and Facilities

Union County is fully served by a potable water system, with at least 95% of occupied or occupiable property having water connections from a public or non-profit source. The remaining properties are primarily rural properties still drinking from private wells. A vast majority of the county is served by the Creston Waterworks production plant at Twelve Mile Lake. This plant draws and purifies water from both Twelve Mile and Three Mile Lakes in the center of the county. The water from this plant serves the city of Creston, with the remaining water going to the Southern Iowa Rural Water Association (SIRWA) via a purchase agreement. SIRWA, a nonprofit group governed by public officials in eight counties, sells the water in portions of nine counties, including all of Union County outside Creston.

Figure 2 – 19: Planning Area Drinking Water Facilities



Three Mile Lake contains 900 acres of surface water held by a 2,000-foot dam on the south end of the lake. Twelve Mile Lake contains 700 acres held by a similar dam on the south end. Moderate droughts and extended seasonal

dry spells in the past ten years have not had a major impact on the local water supply capacity for the county. However, SIRWA is implementing a large-scale grid system that will include two to four more lakes in the region to address future droughts and meet growing water demand. These lakes will not be located in Union County.

Water towers, hydrants, and pump stations are located strategically in the county. Pertinent water assets are found on the map on the following page.

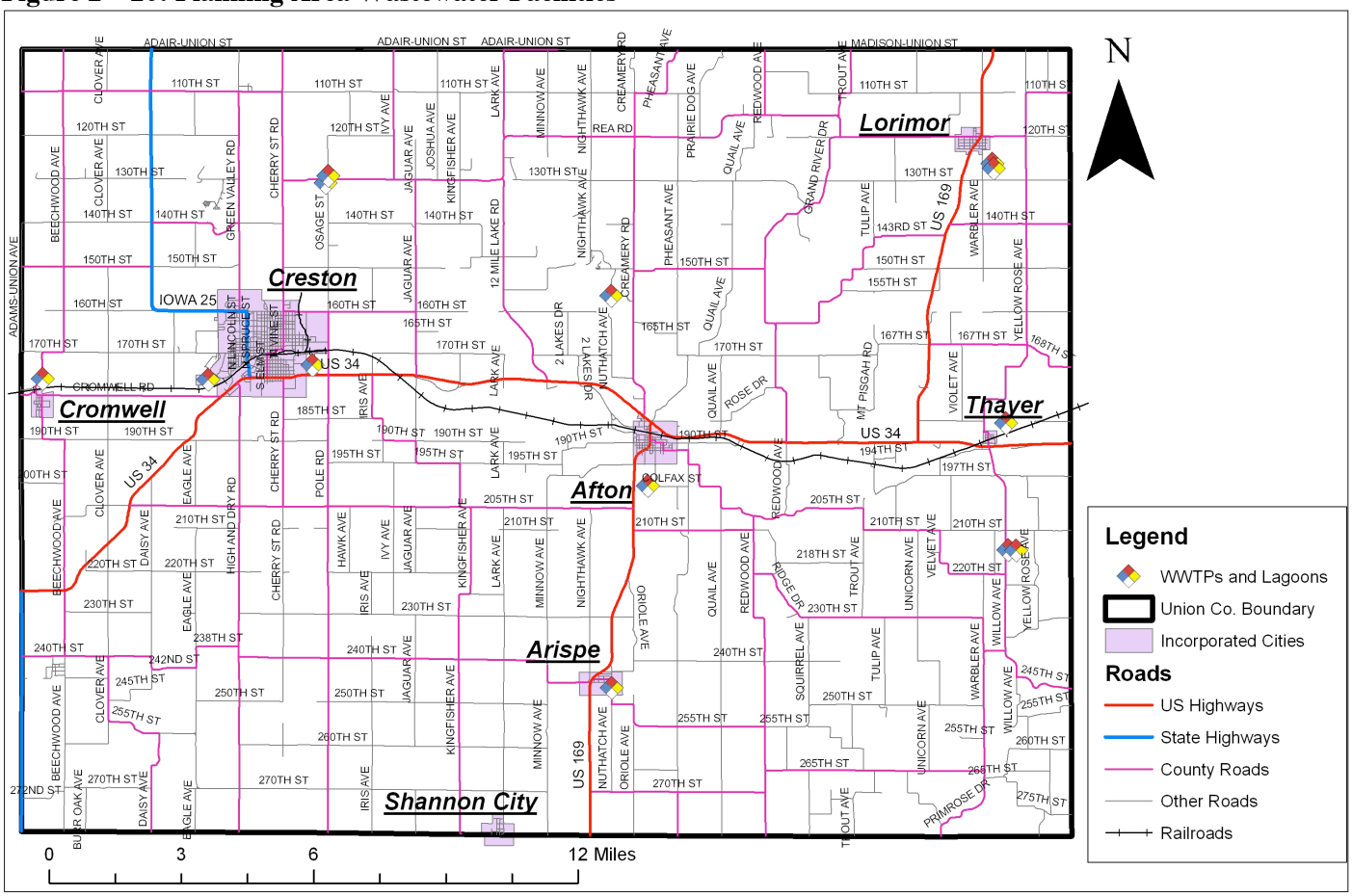
Weaknesses exist in that water sources are exposed to possible intentional or unintentionally contamination. Lightning has caused water facility damage. Some areas lack interconnects with major trunk lines. Water pressure varies in hilly areas and when fires tax the system. Many areas must rely on dry hydrants to fight fires.

Resources: Creston Water Works: 641.782.5817; SIRWA: 641.782.5744.

Sanitary Sewer Systems and Facilities

Approximately 3% of the county's area containing 70% of the population is served by central or other publicly owned sewers. The following cities have municipal sewer systems covering at least 90% of the jurisdictions: Creston, Afton, and Lorimor. Cities with SIRWA-owned systems, via a franchise with each city, include Shannon City, Cromwell, Arispe, and Thayer. Shannon City's residences are served by on-site systems. The area formerly incorporated as Kent is subject to wastewater violations and the County is enforcing septic system upgrades. Union County Environmental Health is in charge of this process. Unfortunately, most of rural parts of the county outside these cities are not centrally served. While Environmental Health is required to enforce laws related to on-site pollution, the county has limited resources and capacity for adequate enforcement. Therefore, it is possible that many of the nearly 2,000 rural residences and other occupied structures have noncompliant on-site systems.

Figure 2 – 20: Planning Area Wastewater Facilities



SIRWA has a back-up pump and generation system it can take to help with sewer failures that require such intervention.

Creston has the largest sewer system in the county. Its lagoons and treatment plant are located on the western edge of the city, just southwest of McKinley Lake, dumping effluent into a small branch stream of the Platte River. The Ferrara candy factory also has a small lagoon for pre-treatment of its wastes. This is located in the Creston Industrial Park just outside the city. Afton's sewer treatment uses lagoons only. The lagoons are located south of the city, dumping effluent into Twelve Mile Creek. Lorimor's treatment facility is a small lagoon system one-half mile southeast of the city, with effluent dumping into a small tributary of the Grand River. Each of these cities has local ownership of the systems via municipal utilities. Thayer and Cromwell have small lagoon systems, each owned by SIRWA, as previously described.

Weaknesses exist in local sewer facilities. The main problem impacting hazard mitigation is that almost all the systems are older and have excessive inflow and infiltration of storm water and groundwater. These issues tax the local sewer systems, inflate operation costs, and cause backups into homes and businesses during and after heavy rain.

Resources: Creston Water Works: 641.782.5817; Afton City Hall: 641.347.5224; Lorimor City Hall: 641.763.2297; SIRWA: 641.782.5744.

Energy Facilities and Pipelines (heating and cooking fuel)

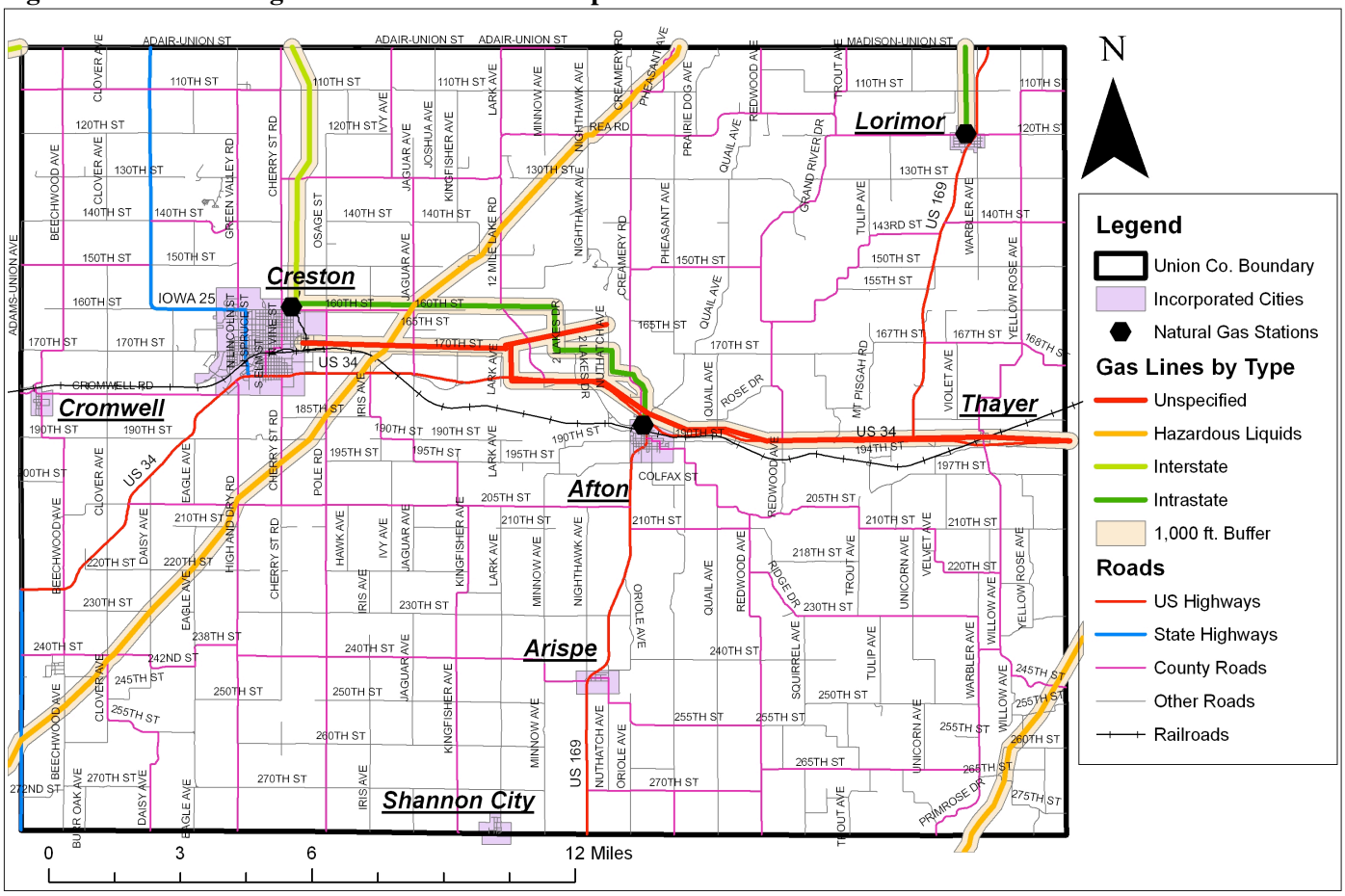
The Iowa Utilities Board oversees and regulates the location and provision of energy services. The county is served by Alliant Energy, MidAmerican Energy, Central Iowa Power Cooperative (CIPCO), and subsidiary rural power cooperatives of the TouchStone Energy system (Southwest Iowa Service Cooperative, Clarke Electric Coop and Farmers Electric Coop). Each of these providers handles gas and electricity, but MidAmerican provides only gas in this county, and this service is to the city of Afton. Lorimor is the only city in the county to offer a municipal gas utility. Creston's gas utility is supplied by Alliant Energy.

Creston is fed by two high pressure gas lines owned by Pipeline of America (one is 3" and one is 4"). Afton is supplied by this line, but Northern Natural Gas starts at Creston and goes to Afton. Afton's utility has a meter system. Some 99% of the area in these cities is served by the gas from the line coming south from Adair County to Creston and then east to Afton. Lorimor is served by a separate line coming from Madison County into the city. This line is also owned by the Northern Natural Gas Company. Bottled or liquefied petroleum is also available in Union County through private sources and is used by most rural residents and residents in all cities other than Afton and Creston. Many homes, especially older homes, are heated by wood, corn, or other sources.

The local Alliant representative provides great insight into natural gas issues in the county. At the north end of Creston is Alliant's natural gas border station, which must remain in function if gas is to be used in Creston, Afton, and some surrounding areas. Many of the hazards dealing with natural gas related to odorization, whereas the public panics due to fear of gas leaks and the danger to life that it causes. Hence, major pipeline issues cause a notable strain on the business and residential communities. The representative noted, however, that most O&M costs are borne by the company, and customers are in rare danger. It is not uncommon for a large part of the pipeline supply system to be damaged by excavator digging and hitting a line. Extreme conditions (usually heat and cold) also affect adequate supplies. Other than the actual loss of the border station, the second largest concern is an event that occurred in the winter and forced the relight of all homes in Creston. At best, this would take about a week, even though plans are in place for such events and critical customers would be first. Alliant has an emergency plan in place that details how the company responds to specific hazards that cause pipeline incidents.

The map on the next page shows the existing main trunk lines and facilities.

Figure 2 – 21: Planning Area Natural Gas and Pipeline Facilities



The main weaknesses in the natural gas systems are the lack of service in rural area, the lack of redundancy, and growing international demand.
Resources: Alliant Energy: 515.284.0199; MidAmerican Energy: 800.329.6291; Countryside Products (propane): 641.782.7152; Williams Pipeline Company: 641.342.2580; and Natural Gas Pipeline: 641.765.4242.

Virtually no local fuel energy production sources are available in this county. The only possible future sources are from renewable fuels, as the county has no reserve coal, natural gas, or other "fossil" fuel sources.

Electrical Facilities and Services

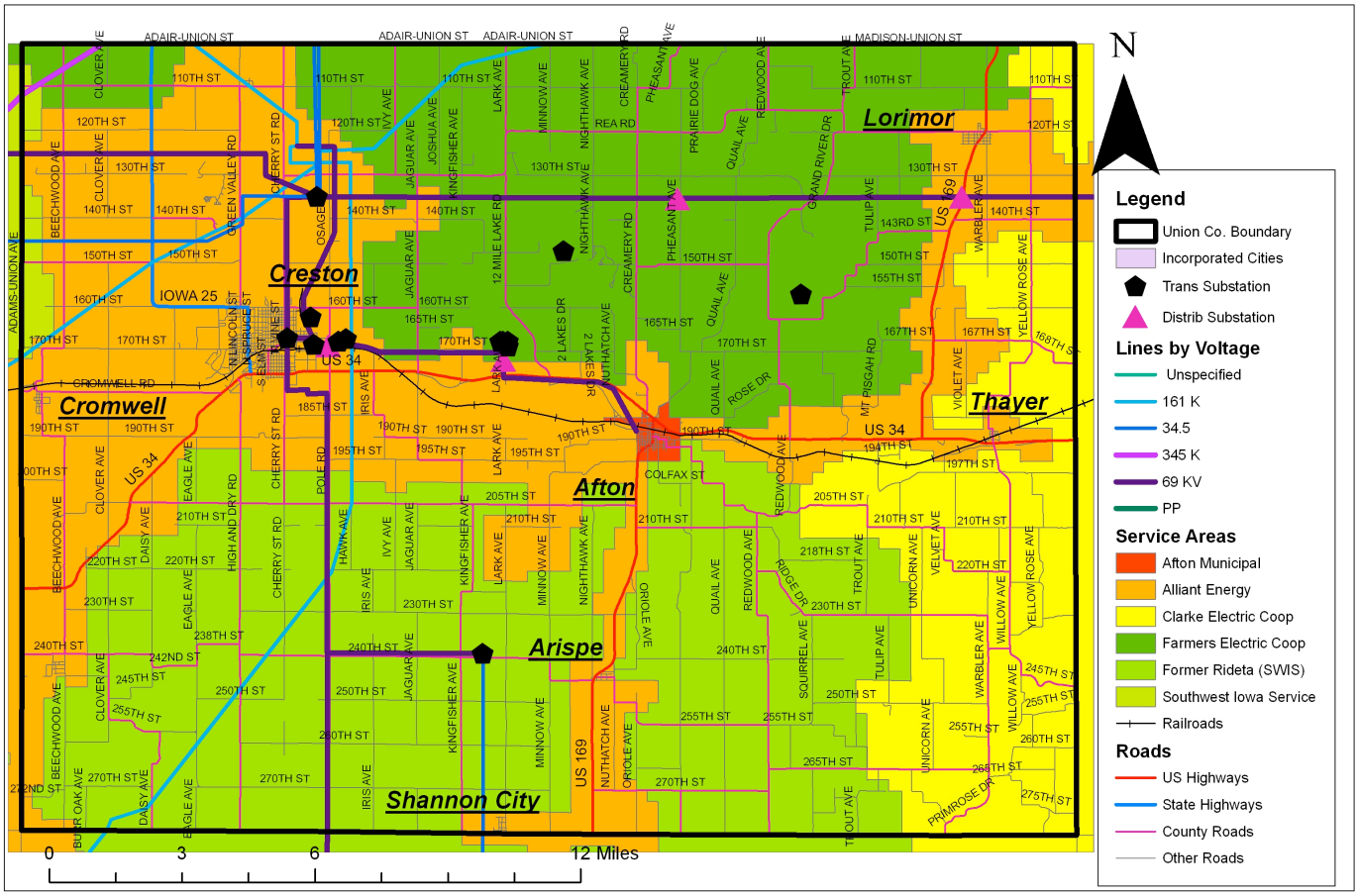
The Iowa Utilities Board oversees and regulates the location and provision of electricity services. The county is served by Alliant Energy, Central Iowa Power Cooperative (CIPCO), and subsidiary rural power cooperatives (RECs) of the TouchStone Energy system (Southwest Iowa Service Cooperative, Clarke Electric Coop and Farmers Electric Coop). Alliant serves all cities in the county, except Afton, and some rural areas. Most of the rural area is served by the RECs. Unlike gas services, the entire county (some 99% of residences) is served by off-site public or private power sources. The county's only onsite capacity is the CIPCO peaking plant three miles north of Creston. The power supply for this station comes from the American Transmission Station via Alliant Energy.

Afton is the only city in the county to offer a municipal electric utility; Alliant wholesales to the City.

Alliant Energy has provided more detailed information about power supplies in the county. Current upgrades completed in recent years resulted in improved reliability at the two subs in Creston and associated "T" lines. These projects allow alternative load flows in and out of town and the surrounding areas. Alliant studies trends in damages to utility systems and then develops work plans that focus specifically on problem areas. The Alliant representative indicates the transmission system is sound, but it is often compromised by excessive heat events and

ice storms. Tornados and straight-line winds also have caused significant line and pole damage. Other issues are trees and animals. Alliant's engineering group plans for single contingency failure and recognizes those possibilities, developing infrastructure accordingly to support these failures and annual community load growth. Further, Alliant works closely with the American Transmission Company to monitor system loading conditions and planned line work and rebuilds. During the summer, loads are watched more closely.

Figure 2 – 22: Planning Area Electric Facilities



Generally, in normal conditions, the rural co-ops have good redundancy in supply means and would not have a problem unless a major national shortage was to occur. CIPCO has staff to upgrade and restore the plant and lines after a failure. Besides the modest capacity of the CIPCO plant north of Creston, there is no local production capacity in place, and few assets have backup power supplies. Substations are located in Creston, Afton, and several rural locations, as shown in the map on the next page. When not damaged by weather or manmade events, the existing system meets basic needs but does not have much excess capacity.

Weaknesses in the systems and services have been addressed following repeated tornadoes, high wind events, heavy snows, and ice storms in the past five years that have damaged high-voltage and low-voltage power lines, substations, and poles. The lack of redundancy remains an issue in some areas. Very few power facilities are buried; the cost of burial is very high. Human resources to repair damaged lines can only be obtained by drawing on resources from many surrounding counties. The cost of continual tree maintenance around lines is high.

Resources: CIPCO: 641.782.2158; Clarke Electric: 641.342.2173; SWIREC: 888.220.4869; Alliant Energy: 515.284.0199; and MidAmerican Energy: 800.329.6291

Storm Water Control Systems
Storm water removal is a public facility function, often connected with flash flooding. In Iowa, storm water is treated differently than wastewater, and should be kept separate from drinking water and wastewater. Generally, complete storm water control is very limited. In rural areas, most storm water is left to flow naturally. Along roads and key assets, storm water is controlled with ditches, retention basins, bridges, and culverts. Formal storm water controls are found only in cities, where some streets have curb and gutter with underground culverts and pipes. More densely developed areas and large parking areas have full systems and retention basins for water. The City of Creston recently constructed a retention basin to address water runoff from an upland farm field into the streets and residential areas of northeast Creston.

Many weaknesses exist. One has to do with the lack of investment in the facilities. Many are very old or are inadequate (they do not address the water flow problem in a way to prevent downhill flooding). No maps are available. Systems are not inspected regularly.

Emergency Transportation Access
Especially in dealing with multi-jurisdictional efforts, transportation access is vital to success of emergency management programs. A large portion of the Union County budget goes to secondary roadwork, including road surfacing, shoulders, bridges, culverts, and overpasses. The county has approximately 750 miles of rural roads and a similar length of streets in the incorporated cities. The county has an estimated 174 rural bridges. With a railroad in the county, some areas are cut off from service due to the inability to get vehicles to the scene if a train is blocking the road crossing. An area just east of Creston includes two homes that are only accessible this way, and a secondary way must be made so fire and ambulance vehicles can access. Access to Thayer from Creston, Afton, and Murray (in Clarke County) is slowed because trains can block the main entry route. Creston's fire vehicles cannot get to the south side of Creston via the Cedar Street underpass due to height restrictions.

Fire departments and others cannot get large heavy vehicles to all areas of the county due to road conditions and bridge weight limits. This has necessitated all fire and EMS departments receiving a map of limited bridges and from that developing a route plan for any given incident. CIPCO's power restoration vehicles cannot get to all areas due to bridge tonnage limits, as 18 tons is needed. Access to power lines after disasters is often compromised. The problems have resulted in a concerted effort to improve the situation, but due to the funding limitations, the county must solve the direst issues first. Cooperation with the county engineer is continuing in this regard.

Union County is fortunate enough to be the home of the regional transit authority, the Southern Iowa Trolley. An agreement is in place where the Trolley will help with evacuations at schools, nursing homes, the hospital, etc. Public Health has access to public transportation for a dispensing site for emergency public medications and other items needed in emergencies.

With the E-911 systems in place, the county is well positioned to respond quickly and accurately. However, it is noted that some confusion with road names in surrounding counties is a problem. All first response agencies have updated color E-911 maps. Road name confusion has been solved by digital 911 mapping for dispatch (Phase II).

Resources: City halls; Iowa DOT: 641.782.4417; Union County Engineer: 641.782.7417.

Communications Facilities and Systems
Both emergency service communications and personal communications are vital for the safety of the community. For instance, if land phone or cell service is down, hazard and other victims cannot call for assistance or rescue.

Emergency communications are vital to hazard mitigation, response, and recovery. The county's communications center is the dispatcher's office at the courthouse/law enforcement center (LEC) in uptown Creston. This site includes all the technology, equipment, and a tower necessary to coordinate multi-agency communications. The county is working on a communications plan update, which has identified some problem areas. The UCEMA has a moderately equipped mobile communications/dispatch unit. It is a refurbished school bus that caries generated power and can operate indefinitely on site of an incident or disaster. Further, the county has access to a mobile

trailer as needed by Windstream, a major telecom provider in the state, that can prove temporarily a dozen positions with high-speed Internet and phone service.

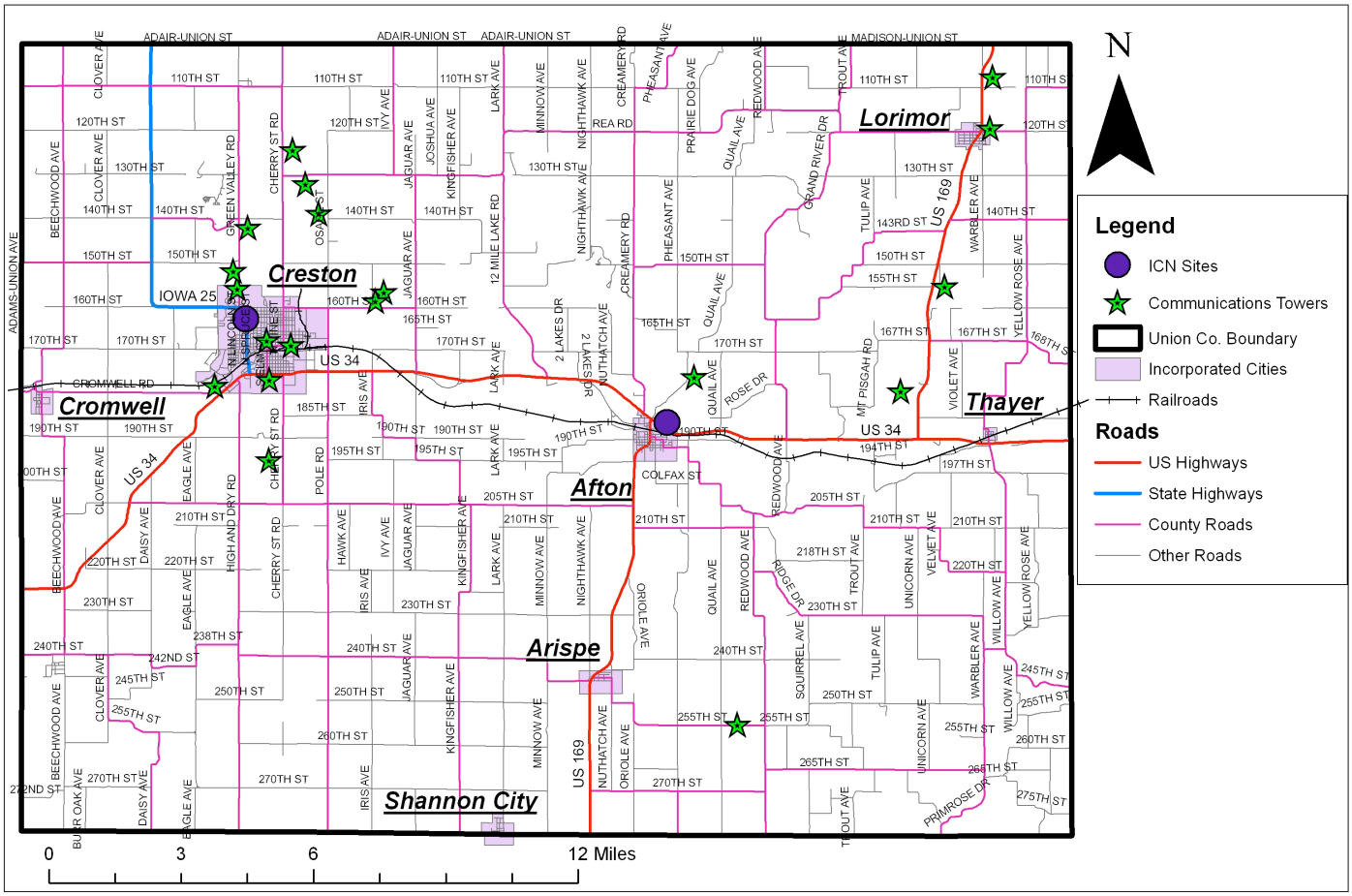
The county has good to excellent communications in key areas, but other areas, especially extreme south, east, and north areas of the county, have limited communications ability for first responders. Repeaters are needed to reach the dispatcher at the county communication center in many of theses areas. Our county lacks much of the communications equipment, such as simulcast towers and repeaters, necessary for all vehicles and responders.

The county participates in a 7-county regional E-911 program to provide and maintain all facets of rapid response equipment. The entire county is fully addressed and signage is clear as to where emergency vehicles are to go. The response agencies are also participating in a countywide communications plan that will allow for equipment that consistently will be able to communicate with one another. County dispatchers are all professionally trained to follow efficient protocols.

The local telephone service is offered through Windstream, South Central Communications, Grand River Mutual Telephone, and other local carriers. The entire county is served via wired landline telephone that meets needs in normal conditions. Cellular services are adequate in populated areas; most areas are served from at least one local tower. There are numerous towers in the county, located at high elevations near population centers. See the communications map on the next page to see the distribution of key communications assets.

Additionally, several cellular companies have hubs on local water towers and other "radio" towers in the Creston area that are not taxed to cellular companies. The county sheriff's office is in charge of surveillance of the towers, per contract with the providers.

Figure 2 – 23: Planning Area Communications Facilities



Internet service is available in almost all parts of the county and in all incorporated cities by a variety of providers. Most cities have access to high-speed or wireless Internet. Approximately 1,023 people in the county do not have access to broadband Internet.

Broadband communications are vital and necessary for modern communications. To meet this need in-house, UCEMA is working on an MOA with Mediacom to provide the Emergency Operations Center (EOC) Internet access with backup generators. Other communications assets have backup batteries. The Health Alert program, operating out of the hospital, requires broadband technologies. EM and public health agencies in the county rely on 800 MHz specialized radio system to communicate locally and statewide directly. 800 MHz base radios are installed at GRMC, EMS, and Public Health. With grant funds, The UCEMA and LEC are next in line to be outfitted.

Finally, Union County is connected to a statewide fiber optic communications network. The ICN, as it is called, allows for real-time videoconferencing-like services to several sites in Creston and one site in Afton. The facilities are useful for information exchange, statewide and nationwide training, networking, and seminars, for both the general public and for emergency response personnel.

Alert Media Coverage

Union County lies within the Des Moines Emergency Alert System (EAS) operational area. The primary EAS radio station for the county is KSIB 101.3 FM and AM in Creston, 641.782.2155. KSIB has connections with the Creston fire station and other storm spotter dispatch points. Radio stations in Osceola and Des Moines, Iowa, also provide coverage in the county. Key television stations serving the county include KCCI Channel 8 (CBS), Des Moines, 515.247.8888; WHO-TV Channel 13 (NBC), Des Moines, 515.242.3500; Fox 17 (KDSM), Des Moines, 515.287.1717. Cable television service is provided to most of the county by Mediacom, 1.800.332.0245. The county does not have local service and has no direct means of cable override to alert the public via cable. The official newspaper for Creston, Cromwell, and Union County is the *Creston News Advertiser*, 641.782.2141. The communities of Afton, Arispe, Shannon City, and Thayer call upon the *Afton Star Enterprise*, 641.347.8721. Lorimor's paper is the *New Lorimorian*, 641.763.2209.

Radio and television weather bulletins include both observation and radar methods of determining severe weather and other hazards. Union County has an active spotter program and has access to the weather forecasters and alert staff at the stations and the National Weather Service. A map showing the warning spotter locations and routes is continually updated at the county EMC office and at Incident Command posts at the fire stations.

We should note that the county is currently working to establish a public information officer position that will be a permanent liaison between the EM community and the media. The county is working to develop a program at SWCC and finding an instructor for this purpose.

Emergency Services – Incident Command

The EMC has a converted school bus that is used as a mobile command unit. Adding to that is a trailer for medical decontamination and one for HAZMAT/SCBA equipment. These are available and at the disposal of the EMC. No new trailer or other incident command equipment is needed in the short-term future.

Emergency Services – Law Enforcement

The County is protected by the Union County Sheriff's Department. Creston and Afton also have police departments. The Sheriff and Creston Police share office space in the Law Enforcement Center (LEC) in uptown Creston, which holds the dispatcher and jail also. The law enforcement agencies of the county are active in drug enforcement and municipal infraction enforcement. The sheriff's office is working to improve service to the east end of the county. The organizations operate a joint 28-E agreement for dispatching services, including EMS, HAZMAT, law enforcement, and fire. A modern communications tower is located at the LEC.

Methamphetamines pose unique problems due to local production of this drug, often using stolen hazardous and combustible materials. The passage of stronger anti-methamphetamine laws has improved the situation in this county by making it more difficult to manufacture meth.

The agencies in the county work hard to address local needs with limited resources. Street patrol activities can mitigate some hazards by discouraging crime. Funding for the necessary human resources to patrol areas and to respond rapidly to incidents would be the best method of mitigation at this time.

Resources: Union County Sheriff: 641.782.8402; Creston Police: 641.782.8402; Afton City Hall: 641.347.5224.

Emergency Services – Fire Protection

Union County's fire departments are equipped and staffed better than those in most surrounding counties. The county's fire districts and facilities are shown in the following map. The Creston Fire Department is the only combination volunteer/career department in the region; all others are volunteer departments. As such, Creston's fire service provides many services on a regional level, including training, certifications, enforcement, prevention programs, and inspections. Many of these services are provided on contract with the State Fire Marshal's office. Afton and Lorimor have large fire service areas also, both with fully volunteer staffs. Murray Fire Department also provides some service to portions of Jones and Pleasant Townships.

All incorporated cities have active fire hydrants. Many of them are located on water lines not adequately sized for modern needs and standards. Twenty-two (22) rural dry fire hydrants are also located strategically in the county. More hydrants are desired and will be added as funding is available.

The communications equipment of the departments is sound; departments are now finishing compliance with the FCC narrow banding requirements.

Resources: City halls; Creston Fire Department: 641.782.5610.

Emergency Services – EMS and Ambulance Service

Union County is served by the Greater Regional Medical Center (GRMC) Ambulance Department, housed at the GRMC, which is dispatched by the county's communications center by dialing 911 or by call to the hospital. The county and all cities are entirely connected to Phase II E-911 services. The Union County EMS Association's 8-member board oversees the operations of the EMS service. The ambulance service covers the entire county, and has 2 part-time and 10 full-time paramedic level staff. While local organizations provide expertise and volunteers to this effort, much of the training and equipment costs are sought outside the county due to the lack of funds. County fire department EMS certifications include 20 in Afton, 15 in Creston, 5 in Lorimor, and 3 in Murray. While certifications vary, several of these are instructors, nurses, and other specialists. Several have Paramedic certification. (EMS certification in Iowa is a licensed certification per state tests and continuing education requirements through the IDPH.)

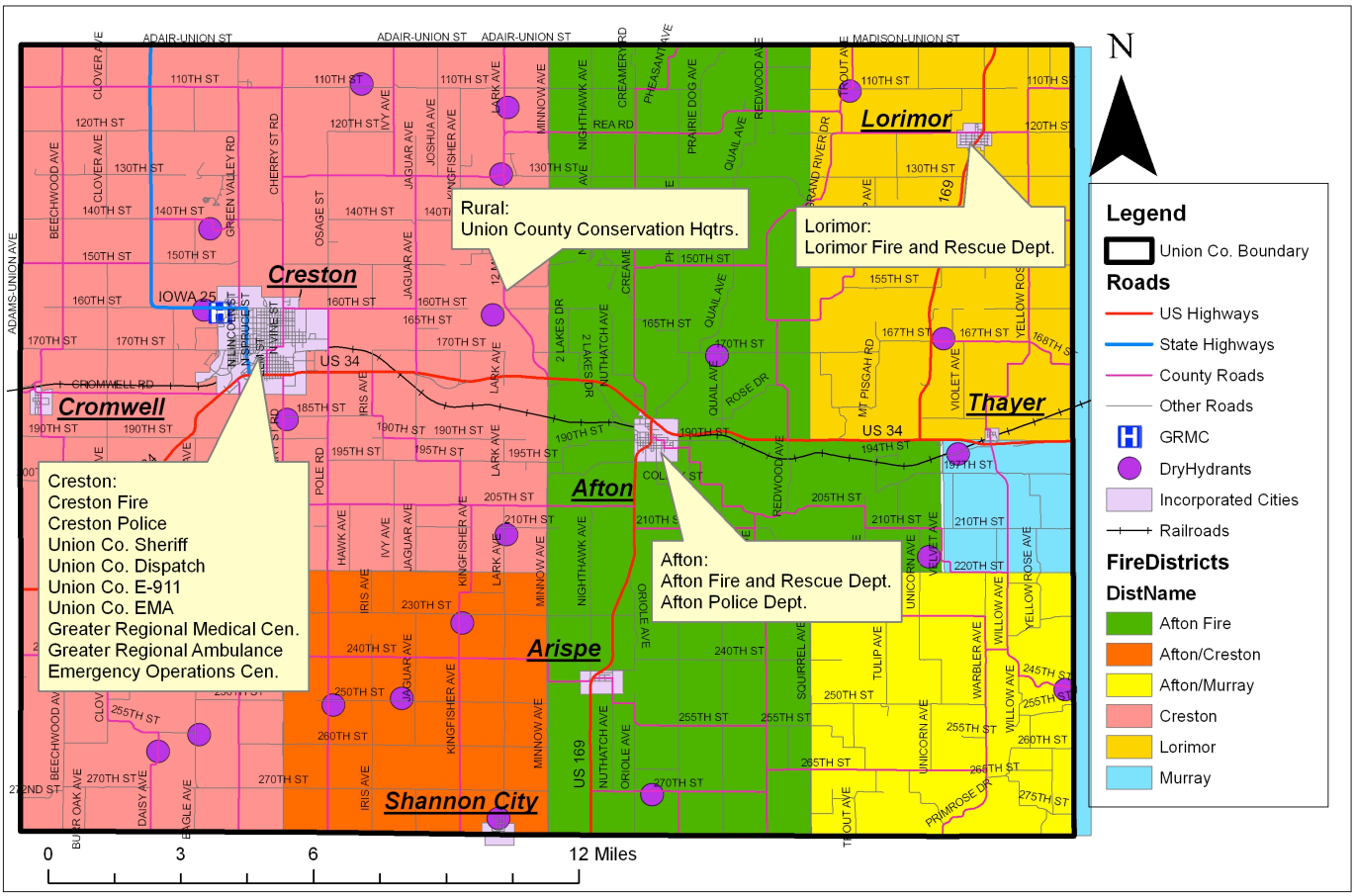
Southwestern Community College in Creston offers training opportunities for EMT certification and other EMS related programs.

In terms of area certifications, GRMC Ambulance Department is certified to the Paramedic level. The hospital is the main transport service to the county. The Creston and Lorimor Fire Departments are certified to EMT-B, and the Afton Fire Department is certified to EMT-I. At the fire department level, most of the EMTs are volunteers. EMTs in the fire service provide assistance to stabilize patients until the Ambulance arrives. The GRMC Ambulance Department has 2 fully-equipped transport vehicles.

The current EMS services are adequate in most parts of the county, but some people in the eastern half of the county are concerned about the response time for the ambulance services, due to Creston's location on the western portion of the county. Response of the ambulance to the Lorimor area can be as long as 30 minutes, so many times the ambulance in Winterset (14 miles) in Madison County is sought. It should be noted, however, that Lorimor's

recent purchase of a new ambulance has improved this situation. Lorimor's EMS is also dispatched by Madison County.

Figure 2 – 24: Planning Area Fire Districts and Emergency Services/Facilities



Life Flight medical helicopter is available and dispatched from Des Moines and can go to any part of the county and to major hospitals as needed. During the times of multiple events, Mercy Air One is used, and a helicopter from Omaha can be called when a third is needed.

Resources: Greater Regional Medical Center: 641.782.7091 and all fire and EMS departments; http://unioncountyems.com.

Emergency Services – Hazardous Materials Response

In terms of HAZMAT and other specialized issues requiring rescues, the county has contacts only with Council Bluffs Fire Department providers for Level A service, but such cannot access the scenes in Union County within 1.5 hours, which in the case of a HAZMAT incident causing severe injury, could put the injured and the rescuers at severe risk when immediate intervention is required. So far Union County has been unable to access Level A service from Des Moines, Council Bluffs, or Ottumwa due to cost and distance. This can change if the local leaders increase funding for this priority. The State of Iowa does not provide HAZMAT services, other than an Iowa Dept. of Natural Resources (IDNR) advisor that provides contact resources and identification assistance to local teams but does not physically handle the material. The IDNR response is typically from Atlantic, about one hour away. Their purpose is cleanup enforcement.

Local fire departments have several trained HAZMAT individuals. Afton has 8 Technicians and 2 Operations level certifications. Creston has 4 Technicians and 14 Operations level certifications. Only Tech level persons can actually contact the materials.

It is reported that 30 persons are needed for a regional HAZMAT team. All of them must be technicians. In this way, the local team effort does not meet OSHA and baseline standards. Union County has a trailer and equipment but has only Level B suits, so is limited Level B response. The Creston FD has decontamination capabilities on scene and the hospital provides onsite decontamination capabilities; GRMC has six certified persons in the hospital to treat certain HAZMAT victims.

Resources: Greater Regional Medical Center: 641.782.7091 and UCEMA: 641.782.1622.

Emergency Services – Intensive Health and Medical Care

The county's hospital, the Greater Regional Medical Center, is located in the northwest corner of Creston, at the corner of Iowa Highway 25 (Townline Road) and Cottonwood Street. This facility is a 68-bed facility providing standard medical care. Additionally, the facility has a functional emergency room, specialty clinics, Life Flight, EMS services, mental health services, drug and alcohol rehab programs, and quarantine areas. The community is home to two other general medical clinics and at least 11 other specialty services. Currently, there are 4 MDs, 4 DOs, 3 DCs, 5 dentists, and 3 optometrists. The community is home to an increasing array of outpatient services and care for seniors. Included are several housing options for those with chronic care issues, age-related issues, and physical limitations. Additionally, the Des Moines metro area provides more acute care close to Union County and the local hospital has contracts for visiting specialty doctors.

The county Board of Health addresses infectious disease incidents and pandemics. With concerns growing of the flu, bird flu, mad cow disease, anthrax, pertussis, and West Nile virus, among any number of growing threats from terrorist organizations, the county needs additional assistance in this area, especially in light of an outbreak at the same time as a major natural event, such as an ice storm in the winter leaving many seniors and others of poor health in the cold and susceptible to illness.

The EMS services and the county Public Health Department continue to work together to study the impacts and needs related to disease control. One thing that is underway is continuity plans for businesses if a large bulk of the workers get ill. From that we are able to estimate 30% of labor force could be impacted. Plans are underway to deal with such a tragedy in our county, knowing we cannot rely solely on outside resources. Public Health started a pandemic flu plan to help the county meet new state requirements. In this plan, schools and businesses will be included as a means to cut the spread of disease. Each school and business will have a sub-plan. The county also has mass vaccination and antibiotic distribution plans. Public Health notes that livestock disease is a major local issue. Cooperation in such issues with area and state veterinarians has been secured. Union County makes it a practice to stay out front of emerging trends with exercises and drills involving multiple disciplines.

Public Health leaders have also studied the need for ID systems and have IDOT and hospital photo ID cards to date for all critical personnel. However, our research and experience indicates that more improvements could be warranted. Photo ID cards with a list of what each person does and what certifications are held will greatly enhance service.

Morgue capacities in the county are very limited. Emergency plans have been written to bring in temporary morgue facilities.

Resources: Greater Regional Medical Center: 641.782.7091; UC Public Health: 641.782.3545.

Sheltering and Human Protection

While most people, even in rural Iowa, have decent homes with basements, some 30% of homes in Union County meet one of the following susceptibility criteria: manufactured home, no basement, or severe home deterioration. Manufactured home parks and many poorly built homes offer no protection from severe weather. For the persons impacted, storm shelters are vital. Safe places for human life during a severe storm or other disaster. Storm shelters are vital for only a few but often devastating types of events: tornados, windstorms, hailstorms, winter storms, and thunderstorms/lightning. (Shelters can also provide a safe place for longer-term housing during other events, such as flooding.) Often, the above events occur simultaneously during one severe storm.

Union County has several recognized shelters, most of which are used for long-term sheltering. Several private shelters exist also, but EMC officials cannot disclose locations for these private shelters. Many shelters in use in the county are not known as to wind speed capabilities. Union County has several dual use buildings that are suitable for storm shelters. These include schools, the hospital, several churches, and the UCEMA building. Several manufactured home parks, at least two in Creston, have on-site concrete storm shelters. These structures do not offer near absolute projection. Only four structures, two completed, and two under construction, are designated as Tornado Safe Rooms, and are FEMA rated to withstand a 3-second 250 MPH wind gust. They are asterisked in the table on the next page.

Figure 2 – 25: Shelters and Estimated Capacity

Location or facility	Estimated capacity	Location or facility	Estimated capacity
Afton community center	75	YMCA-Creston	320
Creston schools * (2 sites)	2,000	Three-Mile Lodge	150
East Union schools *	500	Mobile home parks-Creston	25
Alliant Building shelter	10	Hospital	100
Courthouse	20	All viable churches	1,000
Creston's McKinley Park restroom *	120	Lorimor community center	100

* FEMA Tornado Safe Room

Due to the fact that over 250 persons stay at both Green Valley State Park and Three Mile Lake Recreation Area campgrounds each weekend from Memorial Day to Labor Day, sheltering this population remains essential. Right now, users of these facilities must go to the YMCA in Creston or the Three Mile Lodge, both of which require a few miles of driving.

Emergency Alert Systems/Outdoor Warning

Fortunately, the EMC has a list of all formal sirens in the county, including the year installed for many, a history, and activation comments. The county's outdoor warning sirens are located in each city (Creston, 11; Afton, 4; Lorimor, 1; Cromwell, 1; Thayer, 1; and Arispe, 1) except Shannon City. Recently, sirens were added at rural campgrounds. The systems are tested occasionally and are found to be adequate in terms of reliability and decibel levels with some exceptions.

Emergency Alert Systems/Indoor Warning

The County EMC has a limited weather/all hazards radio program to date. With the installation of the NOAA weather radio transmitter on the Lenox and Van Wert towers in 2001, the county has good coverage. However, many persons do not yet see the value of the weather/all hazards radio, despite the new all hazard and Amber Alert components. The local Radio Shack store in Creston provides radios at a subsidized rate, and advertisements of the radios are ongoing. Approximately 10% of the county's population, not including first-responders and public buildings, has them in their homes and businesses. The EMC has authorized the submission of grant applications for a weather radio program to provide affordable radios to key volunteers and others in the county that highly desire them. The goal is to get radios into all schools, large businesses, city and county buildings, major offices, key hospital locations, nursing homes, senior living homes, and other applicable locations.

The EMA has installed 2 scanners in public facilities of the county, and all first responders have pagers and access to scanners. Several institutions do not yet have them. Union County has an indoor warning radio system that broadcasts directly from the LEC Dispatcher.

Union County currently participates in a Code Red reverse E-911 alert system, where residents and others can enroll to receive phone alert messages to all kinds of hazard threats.

2.2: Participating Jurisdictions' Profiles

This plan's jurisdiction profile includes an overview of the noted jurisdictions and their organizational structure; a description of staff, fiscal and technical resources, and information regarding existing hazard mitigation capabilities such as adopted plan policies and regulations, if any. The descriptions and capabilities assessments are based on

available and applicable data, including information provided by the jurisdictions collected during the planning process.

The Union County Emergency Management Agency (EMA) is responsible for county emergency response policies and for preparing local emergency personnel for emergency response. This duty includes cooperation with the county board of supervisors, who are responsible for approving appropriate countywide efforts. The countywide leadership by the EMA and the hired Coordinator has advanced the county in terms of mitigation planning and activities. The emergency management commission includes representatives from each city, a county Supervisor, and the county Sheriff's office. The seven city governments, two school districts, hospital, and Southwestern Community College approve local mitigation efforts in their respective jurisdictions.

Officials from the jurisdictions were specifically invited and encouraged to participate in the multi-jurisdictional planning process, including the selection and appointment of the planning team. Jurisdictions provided available data for infrastructure details, prior planning efforts, previously completed and/or ongoing mitigation actions, et al. via phone, email, and/or during the public hazard mitigation planning meetings. Community members represented their various entities, including local fire departments and emergency response personnel, elected officials, school officials, conservation board personnel and others. In their respective capacities they functioned as planners to advise and guide the plans risk assessment analysis and mitigation action selection.

Due to current data limitations as described in this plan, only accurate and identifiable data and details is/are included within the plan.

All participating jurisdictions assisted in the listing of and description of current mitigation actions and capabilities to implement other actions. Using the State's example list of alternative mitigation actions as a guide, and eliminating those that only pertain to hazards that can occur in each jurisdiction, local officials have identified which mitigation measures are being implemented in each jurisdiction from among over 100 potential actions. In this section, the planning team used various data sources at the local, regional, and state levels to provide a summary of mitigation efforts in each jurisdiction.

As noted, the following jurisdictions participated during the planning process and adopted the countywide plan. With their adoption of the countywide plan, each jurisdiction individually verified that the hazards identified in the plan impact their jurisdiction, and that they verify concurrence to the list of goals and mitigation action items.

Union County

This section of the plan addresses the following two entities: a) the rural part of the county not included in incorporated areas (cities and towns), and b) County-owned assets located in any jurisdiction.

The County is run and managed by a board of supervisors composed of three elected members and approximately 15 department heads that cover numerous County functions. Several of the department heads, such as Sheriff, Auditor, Treasurer, and Recorder, are elected. Others are appointed, including such departments as Engineer/Secondary Roads, Public Health, E911, Assessor, and the Emergency Management Coordinator. The EM Coordinator is the lead on hazard mitigation planning in the county and coordinates with other County officials and the various other jurisdictions, including schools, hospitals, Cities, townships, and fire/EMS departments. Many of the departments serve under both the Board of Supervisors and separate elected or appointed commissions or committees.

Townships and other rural jurisdictions fall under the participation requirements and planning status of the county for the purposes of this plan.

Additionally, there are several unincorporated towns in the county that fall under the Union County plan. These include Spaulding, Kent, and others. Other jurisdictions that fall into the County section of the plan include County parks (Twelve-Mile, Three-Mile, Cedar Park, Thayer Lake, and others) and a State park (Green Valley).

Union County Historical Context

The County was created in 1853 from Clarke County. It is a gently rolling land, which originally was covered with prairie and an occasional grove of trees. It originally was to be named Mason but at the last minute the name was changed to Union because of the arising differences between the north and the south. In 1846 Mormons established a way station named Mt. Pisgah on the eastern side of the county. This was the temporary home of thousands of Mormons as they traveled west. The last Mormon left in 1852. In 1849, the first permanent settlers came into the county and this site was the location of the first post office in Union County. The first settlers located along the Grand and Platte Rivers in Union County. The first village, Petersville, was established near the Grand River in 1853. Farmland drew settlers from the eastern states. The railroad came to Afton in 1868. Creston was established by the railroad as a division point in 1869 and continues to be a railroad town to this date. Most towns in the County began as the railroad pushed west, north, and south. Union County became a melting pot of many ethnic groups. The railroad brought in settlers from the eastern states and many European countries such as Sweden, Germany, England, Ireland, Bohemia, Czechoslovakia and others. Many of these early settlers came as either employees of the railroad or at the urging of the railroad's land agent. Presently the income of many of the county's residents is dependent on agriculture and a number of service and manufacturing industries in the county. *(Source: Union County, IA GenWeb Page)*

Union County Physical Profile

Union County is located in the southwest part of Iowa and occupies 432 square miles. The vast majority of the county is rural land used for farming and open areas (forests and unused land). Much of the county is also used for rural transportation and recreational facilities. Approximately 2% of the county's land area is occupied by incorporated cities, of which 75% of the county's population can be found. Topography is mostly rolling hills with a mean elevation of approximately 1,250 feet. Small rivers are found in the county.

The Union County base map is located as *Figure 2 – 2* on Page 2.2.

Union County Infrastructure, Services, and Resources

Potable water is provided by several municipal suppliers adjacent to some of the cities and by Southern Iowa Rural Water Association in other areas. These utilities treat water from surface sources (lakes within the county). Water treatment plants, water pumps, and water towers are found throughout the county.

Most of the rural part of the county, with the exception of some of the populated areas adjacent to cities, are not served by public central sewer systems. Individual landowners have septic systems and lateral fields. The County Environmental Health and IDNR administer these systems and enforce environmental laws related to them. These organizations have a more direct role in a non-compliant area of the former town of Kent.

Rural electric systems are provided by regulated utilities and rural electric cooperatives, which provide power in all parts of the county. Several major power lines and substations are found in the rural part of the county. Farmer's Cooperative covers much of the north and northeast half of the county. Southwest Iowa Cooperative provides power to the southern and western parts of the county. The Central Iowa Power Cooperative facility three miles north of Creston provides some power generation for the rural systems. A few landowners own their own generators and wind turbines, but most production is done outside of the county. Several rural substations exist, such as at the Creston industrial park, south of Lorimor, and near the CIPCO plant.

Natural gas services provide energy to a few areas where pipelines travel. The major pipelines travel southwest-northeast through the central and northern part of the county. There are branch lines going to various cities in the county (Creston, Afton, and Lorimor). Most rural homes, businesses, and farms are served by private individual LP services. Individual tanks are located above ground in yards.

The County Engineer (Secondary Roads Department) is responsible for construction and maintenance of the secondary road system in Union County. Union County's rural road system has approximately 500 miles of roadway. Over 100 rural bridges and the roads are maintained via several county storage facilities and offices. The Secondary Roads Department has had annual budgets ranging from $4.6 million to $12.1 million in recent years;

the budget includes property tax proceeds, road use tax proceeds, local option taxes, and disaster aid ($2.5 million total over four years). Budget expenditures include administration and engineering, roadway maintenance and improvement costs (including bridges, culverts, and snow/ice control), and various equipment and supplies costs.

Fire and EMS is provided by area fire departments that are housed in cities of the county and surrounding counties. Several rural fire hydrants and dry hydrants are found in strategic locations around the county. Most roads and bridges can accommodate fire trucks and rescue vehicles. All departments have small off-road grass and wildland fire vehicles.

The Union County Sheriff's Office, with the assistance of the Iowa Highway Patrol and county/state conservation law enforcement, serve the needs of the rural area of the county and – under contract - the other jurisdictions. The Law Center and communications system are located in Creston.

The Fiscal Year 2012 100% valuations for rural Union County were $363 million total, which includes approximately $100 million in residential, $160 million in agricultural, $16 million in agricultural buildings, $20 million in commercial, $20 million in industrial, and $40 million in other property. Union County levied a tax rate of $16.43055 for regular property; the extended tax rate was much greater. General funds are used for hazard mitigation efforts.

The rural part of the county is served by numerous school districts, churches, civic groups, volunteer organizations, and key businesses. Some retail and convenience options are found in rural areas. However, many rural residents and property owners must go to area towns to access community shelters, government services, lodging, banks, grocers, and medical care. In 2008 a few warning sirens were installed in rural populated areas, at the beach at Green Valley Lake and at Three-Mile Lake campground. Those in other areas would have to rely upon weather radio, phone alerts (such as reverse E911), and wireless Internet to be alerted to hazard event warnings. The County has a contract with the Red Cross to administer facilities during and after disaster events.

Few rural assets have fixed backup generators. Some organizations have portable standby generators, such as fire departments, SIRWA, and the Secondary Roads Department. No facilities in the rural area of the county are designated as tornado safe rooms capable of withstanding 250 MPH winds. The YMCA in Creston is used as a shelter for campers and users of Green Valley Lake to complement a stronger restroom building on the campground. Campers and users at Three Mile Lake can visit Three Mile Lodge's basement, which is a sturdy building but is not a designated safe room.

Public service providers for rural Union County are as follows:

- Water: Various rural water providers, private wells on individual farms, adjacent municipal utilities
- Sewer: adjacent municipal utilities, individual private septic tanks
- Electric: MidAmercian Energy, Alliant Energy, Clarke Electric Cooperative, Southwest Iowa Rural Electric Cooperative
- Natural Gas: MidAmercian Energy, Alliant Energy, individual LP tanks supplied by local LP dealers
- Internet and Phone: Windstream, Mediacom, Grand River Mutual, and wireless in some locations
- Law enforcement: Union County Sheriff
- Fire: Creston, Afton, Lorimor, and Murray Fire Departments; other via mutual aid
- Ambulance: Greater Regional Medical Center, limited Lorimor Fire, surrounding counties
- Public notifications: *Creston News Advertiser*, *Afton Star Enterprise*, *The New Lorimorian*, Creston Radio KSIB 101.3 FM
- Sanitation: Waste Management, private haulers
- Civic organizations: FFA, 4-H, veterans groups, chambers of commerce, conservation and wildlife groups

The County's official website, which includes extensive local information along with official County business is www.unioncountyiowa.org.

Union County Conservation indicates it invests $20,000 or $25,000 per year on various hazard mitigation activities. Union County Secondary Roads/Engineer, along with other county agencies to a lesser degree, indicates it invests $750,000 per year. Green Valley State Park indicates it does not invest any funds directly to mitigation activities.

Union County NFIP Participation

While river flooding occurs in low-lying areas of Union County, FEMA has not mapped the rural part of the county, and no Special Flood Hazard Areas exist. For that reason, no flood hazard map is available at this time. The Iowa DNR is currently working on modern GIS-based flood mapping using the new LIDAR technology. It is unclear at this time if or how FEMA will recognize or use the new maps. The county is also participating in the Risk MAP process, sponsored by FEMA, to analyze flood risks by watershed.

Union County Planning Status and Capabilities

Union County has a paid county emergency management coordinator, who is in charge of countywide programs and operations. Other offices address hazard mitigation issues mainly as they pertain to emergency response. The County EM commission calls, at a minimum, quarterly meetings where issues are discussed and business is undertaken. Several jurisdictions participate by sending representatives to the voting board. Regular exercises and trainings are undertaken. The county coordinator acts as the contact between state and federal agencies and the local public and governments in the event of a disaster and has a key role in hazard mitigation planning. This office is in charge of mitigation, preparedness, response, and recovery. Once this plan is in place, and greater resources are provided to the county emergency management office, the capacity of the county to undertake mitigation actions should increase. Implementing the NIMS process, where local elected officials are educated about these issues, should increase interest and likely funding.

The Union County Emergency Management Coordinator states that the Agency offers several services for all natural disasters, including but not limited to: a) handling incident cleanup, b) requests for State declaration and equipment c) formal report submission when required by FEMA for a Presidential Declaration, and d) capturing photos and completing basic paperwork.

The website for the coordinator and the agency is:
www.unioncountyiowa.org/index.php?option=com_content&view=article&id=52&Itemid=58.

Mary mitigation activities and some mitigation planning topics, such as hazard identification, are addressed in the countywide emergency operations plan. Per the State of Iowa, each county EMA must adopt and maintain a plan, and the EMA assists various cities to adopt local EOPs. These EOPs are being revised throughout the State of Iowa at this time to a new format. Yet, the basic functions of the EOP remain the same: to address the needs of emergency management and response. Some parts must be updated and submitted to the State of Iowa annually and other parts must be submitted periodically. Several topics in the EOP relate to hazard mitigation. One of them is the "mitigation plan" which is really a mini HARA with a hazard scoring system. A new Emergency Services Format (ESF) is being used. Topics addressed include: a) command and control, b) communications and warning, c) damage assessment, d) emergency public information, e) evacuation, f) fire and EMS services, g) health and medical, h) law enforcement, i) mass care, j) sheltering, k) public works and utilities, l) radiological incidents, m) resource management, n) human resources, o) search and rescue, p) hazardous materials, and q) terrorism. The EOP helps tie the various resources at the local, county, state, and federal level as to how they collaborate in the emergency management efforts.

The EOP was reviewed briefly as part of this HMP, but both plans are stand-alone documents and details from one plan are not necessarily translated into other plans. Many of the planning and emergency response capabilities are addressed adequately in the EOP plan and its implementation by the EMA and local officials in individual jurisdictions. Responsibilities and provider descriptions were sufficient for initial mitigation planning purposes. There appears to be sufficient division of duties and elected official oversight. Each section has preparedness and response checklists that can be used before, during, and after an incident and an incident command flow chart. The EOP is current and compliant with the State of Iowa.

The County's EOP and individual jurisdiction EOPs address the capabilities in each jurisdiction well. Through many trainings, exercises, and workshops, local officials have a good idea of what resources are available within and to the county to address local needs. Recent tornado response in Creston in April 2012 demonstrated the system is working.

The county addresses several hazards on a multi-jurisdictional level. For example, communications are addressed by a communications plans and by an E-911 board. The Local Emergency Planning Committee (LEPC) addresses hazardous materials. Local fire departments monitor and inspect individual HAZMAT sites. State officials lead many hazard mitigation efforts and regulate facilities, such as the Iowa DOT handling transportation incidents, the Iowa DNR and Utilities Board handling pipelines and HAZMAT sites, and Iowa Dept. of Public Health handling disease incidents.

These other plans address the capabilities to implement the hazard mitigation plan, but they alone do not mitigate hazards in the absence of a mitigation plan designed to address the prevention of hazards and reduction of losses. The EOP and other local plans are still necessary because not all hazards can be prevented, and response, recovery, and preparation are still needed.

Other planning and training efforts include:

- Other plans in place include comprehensive plan adopted in the 1970s, a five-year transportation plan adopted in June 2011 and a transportation improvement plan adopted in July 2011 (Secondary Roads), land use plan, watershed plan (NRCS/Union County SWCD in some areas), economic development plan, strategic plan, and a critical asset list. The County is working on a flood mitigation plan.
- Policies and ordinances include: building ordinance below the Three-Mile Lake dam, floodplain ordinance (below Three-Mile Lake dam), nuisance ordinance (limited), site plan review requirements (limited), wetlands and riparian areas conservation plan (Union County Conservation Board and NRCS), and debris management plan (2009, EMA).
- The EMA is working on the following certification programs: NWS Storm Ready, and Building Code Effectiveness Grading program.
- Programs include: hazard awareness program; full mutual aid agreements for fire, EMS, and law enforcement; economic development program; public education and awareness programs; engineering studies for streams (in collaboration with utilities)
- Studies and reports available include: past HARA, evacuation route map, and critical facilities inventory.
- Staffing and technical programs include: building official/inspector, GIS specialist, engineer, public works official (assistant to the county engineer) EM Coordinator, emergency response team, LEPC, EM Commission, Sanitation Department, and Transportation Department, and related commissions and programs supported by staff from the non-profit and quasi-government sector (economic development, regional planning, historic preservation, and housing).
- Union County is National Incident Management Systems (NIMS) compliant.
- Local storm spotters are trained and dispatched.
- NGOs include: American Red Cross, Salvation Army, veterans groups, utility companies, community groups, and development groups (Union County Development Association).
- Mutual aid agreements are on file for all services.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The County and groups within the rural area participate in a number of mitigation actions. The table on the next page describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 -26: Union County Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Nursing facilities, senior/handicap housing have built-in alerts, Code Red since 2008 fills gaps
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Initial community briefings protocol, PSAP, for information after or during event	Ongoing	Part of the countywide EOP and drills/trainings
Install warning sirens for outdoor warning *	Complete	County installed warning sirens in populated areas in 2009 – still needed at County Conservation sites
Promote/provide tornado safe room design education for builders and developers	Ongoing	With several safe rooms underway and built since 2009, local builders are aware of the programs and technology, could be expanded
Promote NOAA weather radio citizen purchase and use – develop incentives *	Ongoing	Occasional giveaways to key populations; continually sells for $10 discount on retail price locally; working on grants for more giveaways
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, local schools, driver education classes, and law enforcement with bike and traffic safety
Backup jurisdiction files and records – store electronically and in alternative locations	Ongoing	Done regularly by most or all County departments and other key offices
Check and test water wells	Ongoing	County Environmental Health on private property; no SIRWA or public wells
Develop/implement watershed studies and plans for possible flood prone areas	Underway	NRCS/SWCD working extensively in the 3-Mile, 12-Mile and Summit Lake watersheds; will expand to other areas as funds arise and landowners request
Develop electronic directory of local and other resources	Complete	EMA, county website, public service agency websites, regional response/recovery group websites, MATURA, DHS, paper booklets also
Develop/enforce snow removal policies/protocols	Complete	Mostly in incorporated places but also policies in effect for specific developed rural areas and county property
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Ongoing	Bi-annual updates; some county agencies or staff are not aware of this so information sharing may be improved
Formally designate and stock community post-disaster shelters (food and lodging – as needed Red Cross support) *	Ongoing	Very minimal assets permanently in place now but protocols and agreements are in place when there is a need for rural populations
Formulate partnerships to gain legislation	Ongoing	County is part of NACo and ISAC; EMA is part of legislative advocacy groups and regional homeland security group, etc.
Investigate alternative water sources for rural fire suppression	Complete	SIRWA systems available plus a network of dry hydrants strategically placed
Inspect water lines	Ongoing	SIRWA owns and inspects regularly; city lines near towns
Install and update anti-virus software	Ongoing	County departments are managed and IT staff is available
Install speed limit signs	Complete	County installed and sheriff enforces; no major problem areas; Secondary Roads may install more in some locations
Make all public buildings handicap accessible	Complete	Has been complete for many years
Map past chemical contamination sites	Complete	IDNR has maps and data for known sites
Encourage citizen purchase and use of smoke detectors	Ongoing	Local fire departments are active in this but funding is limited; members will install and check and property owner request
Remove underground fuel storage tanks	Ongoing	Most have been mitigated; more will be when no longer used
Repair structurally weak homes/weatherization *	Ongoing	MATURA/SICOG programs are available but funding is limited
Develop soil erosion stabilization projects	Underway	In process with NRCS/SWCD and City/SIRWA/IDNR projects but problems persist in agricultural areas – other non-FEMA grants would fund
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; specific plans for key assets such as Hurley Creek Lake dam and 12-Mile Lake dam.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Create a continuity of operations and succession plan for jurisdiction *	Complete	May need to be updated using new best practices learned around the nation

Develop/implement a recovery plan for power failure *	Complete	Local utilities have plan in place to arrange staffing and equipment to quickly get infrastructure back on-line
Develop and publicize a jurisdictional evacuation plan	Complete, ongoing	Plan is in place to evacuate key rural areas and handle traffic from the towns that are evacuated to rural areas
Emergency guidebooks in all emergency vehicles	Complete	Staff also trained in use of the materials
Establish backup communications center and facilities *	Complete	Command trailer; strategically placed repeaters and towers; Creston Fire Department equipment; new EOC desired
Install GPS units in emergency vehicles	Complete	Complete for EMS services and some fire
Designated public information officer	Complete	Training has been offered to strengthen this process but attendance has been lacking at training efforts
Purchase new fire trucks and ambulances	Ongoing	Creston Fire through AFG; most others are budgeted or vehicles are okay for now
Purchase SCBA (self-contained breathing apparatus) units	Ongoing	Fire departments addressing through grants and donations as needed
Purchase snow trucks, plows, and sanders	Complete	Have several but more or replacement ones are or will be needed
Purchase thermal imaging equipment for fire departments	Complete	Creston Fire has available to all the county via mutual aid; can acquire more via AFG grants
Purchase vehicle extrication equipment	Complete	Creston Fire has available to all the county via mutual aid; can acquire more via AFG grants
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Bury utility lines in new areas of development	Ongoing	Common practice today by utilities; not part of local code
Construct storage facilities for pesticides, insecticides, chemicals	Ongoing	Most or all manufactures and handlers do a good job on this; no problem areas known
Increase bridge capacity	Complete	Done where needed but not a major issue; county engineer states that increasing bridge capacities can move flood problems downstream
Develop reservoirs and lakes	Complete	Major lakes are in place; smaller ponds and retention basins are needed in some locations in county (not for water supplies)
Install pressure tanks/towers for potable water *	Complete	SIRWA has water towers; city water towers help pressure rural pipes also
Retrofit/harden existing overhead power lines	Underway	Alliant and Rural Electric Cooperatives have power line projects underway
Construct or repair dams	Underway	Summit Lake dam repair (funded in part by FEMA) is underway
Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City sites, transfer station, a few county sites
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, gas line operators, roads, bridges
Develop regional water supply plans in concert with SIRWA and Creston Water Works *	Complete	Regional looping study completed; lakes in region planned; Creston large water tower built
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Provide a formal command structure list perpetually in the EMA office and EMA command vehicle *	Complete	Protocols and IC systems in place through NIMS process
Identify locations of accidents and incidents to determine chronic problem areas on highways *	Complete	Much of US Highway 34 resurfaced and rumble strips added; signage added at past incidents as reminder
Maintain involvement in Iowa Homeland Security Team region *	Ongoing	County is active and a leader in the effort; utilizes resources made available from the group
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in rural Union County and/or affecting County assets, either by the County or by partnering agencies, such as, but not limited to, County agencies and boards, the Emergency Management Agency, rural water agencies, rural electric cooperatives, State and Federal landowners, local fire departments, cities in the planning area, utility companies, and others.

Outlook and Future Development

The population of the rural part of the county is likely to continue a slow growth, as has been the case in recent years, or no growth; decline is possible. Most rural development will be residential, but some will be commercial, government, institutional, and recreational. Conversion of farmland on a very modest scale is likely, but development is not likely in possible flood hazard areas. The enthusiasm of the EM Coordinator and other champions is such that implementation of this plan is very likely.

City of Afton

Located in the center of the county, Afton is the second largest town with 845 people. The city is managed by a city council of 5 elected members and an elected mayor. Two city hall staff members administer the city. The City also has a police chief and maintenance/public works personnel.

Afton Historical Context

Afton was incorporated in 1855 and within one year had a population of 156. A school and courthouse was built, and the city became the county seat. Over time the town grew as railroad and agricultural production and use increased. The town once had hotels, a series of banks, law offices, physicians, a creamery, brick manufacturer, and other businesses. In 1890 the county seat was moved to Creston. The town's growth ended but Afton remains one of the most successful towns in Iowa after losing its county seat. The town has shown reasonably steady levels of population over recent history. *(Source: Union County, IA GenWeb Page)*

Afton Physical Profile

Afton is accessed via U.S. Highways 34 and 169 and the BNSF mainline railroad. It occupies 0.98 square miles on an upland ridge just north and east of the Twelve Mile Creek, much of which is residential area, surrounded by agricultural land along the fringes of the city. Approximately 10 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is 1,240 feet. The base map of Afton on the next page shows the town boundaries, street patterns, and key facilities.

Afton Infrastructure, Services, and Resources

The city council meets monthly at a downtown building that contains a council meeting room, offices, and a reception area. The city also owns a city shed and city storage lots near the BNSF railroad, recreational land throughout the town and just out of town, sewer lagoons just south of town, and a cemetery to the northeast.

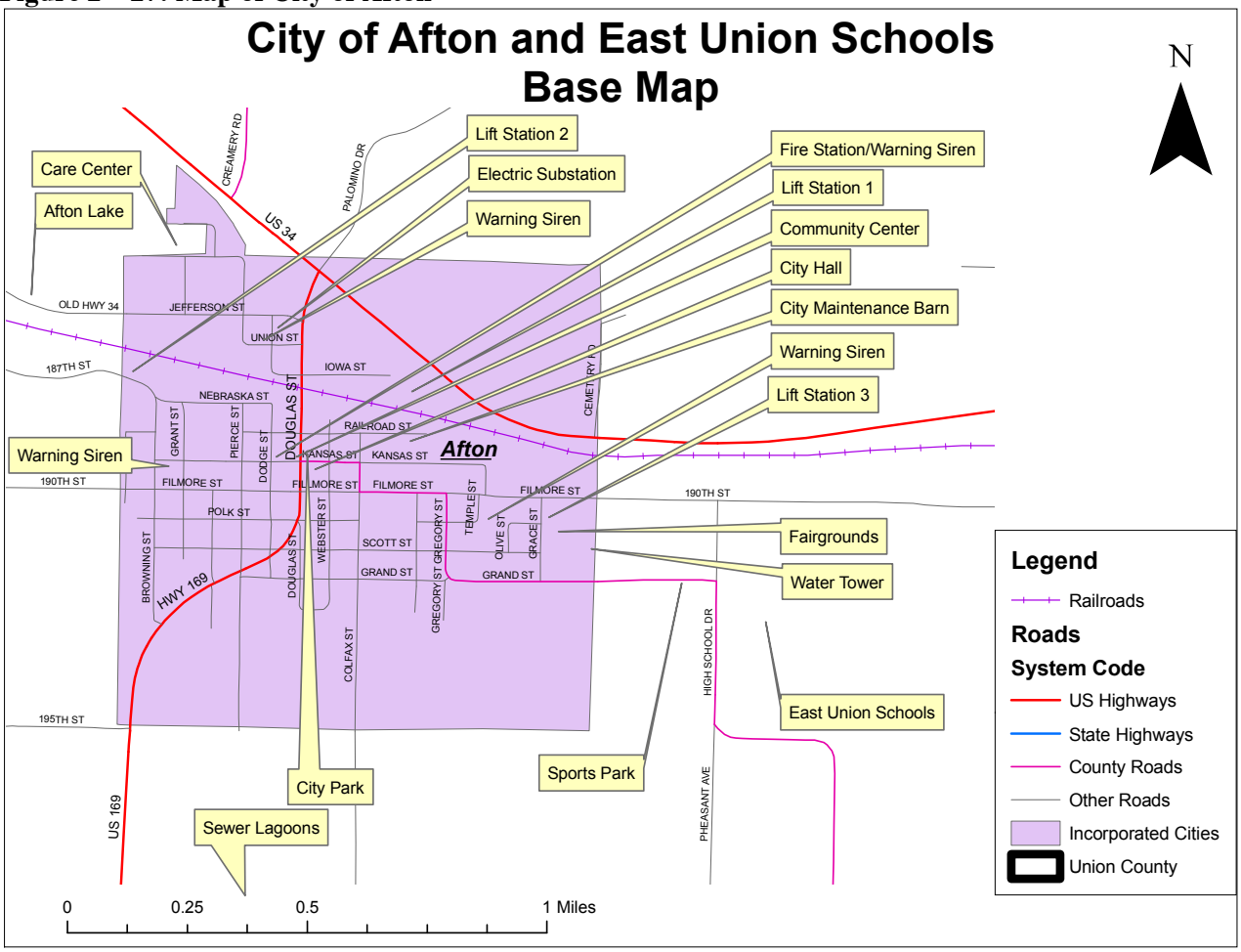
Potable water is provided from the Twelve-Mile Lake water treatment plant four miles west of Afton by SIRWA. A water tower is located near the fairgrounds (the highest point in town) to supply adequate water pressure to the system and meet emergency needs. Water lines are generally in adequate condition to meet existing and likely growth needs at this time.

Virtually all the city is served by a central sewer system with sewer lines and a four-cell lagoon system south of town near Twelve-Mile Creek (2432 S. Colfax St. Extension). The lagoons are in good condition and can handle Afton's potential growth. Sewer lines are of varying condition, whereas the City is working on upgrades as funding is available. There are three sewer lift stations, strategically located throughout the town: south of Iowa Street by the railroad tracks, N. Browning Street between Nebraska and Iowa Streets, and at the Union County Fairgrounds near Grace Street.

Afton has a municipal electric utility through a power purchasing agreement with Alliant Energy. The City acknowledges that system inefficiencies are costly in the old above-ground city power system and street lighting. Alliant owns a substation located along old Highway 34 and Highway 169 in the north part of the town. Alliant is considering a proposal to relocate and replace the substation. There is no local production capacity at this time but

a wind turbine project is being considered. The Afton Care Center at 508 W. Pearl Street contains a fixed power generator.

Figure 2 – 27: Map of City of Afton



MidAmerican Energy provides natural gas from its main pipeline coming from Creston. This line travels under Twelve-Mile Lake. A border station in the north part of Afton (809 N. Pierce) allows for controls to the system. Most residents and businesses use natural gas for heating and other personal energy needs.

The City of Afton manages roads, sidewalks, and trails. Most transportation infrastructure is in fair condition, with the remaining being either poor or good condition. Most streets are gravel or blacktop surface with modest maintenance investment and no curb and gutter.

Storm water control systems are limited in the town. Most water that falls in Afton goes into drainage ditches in residential areas and along streets. Modest underground systems cover the downtown and other key areas along major streets. Culverts are located strategically to move water to streams and other areas outside of the city. Standing water and water flow issues remain in some locations and the town has hilly areas that can offer flash flooding concerns.

The town is served by the Afton Fire Department, which is an all-volunteer force of 25 members based in a sturdy pole building fire station. The fire department also provides EMS/first response services. The department is part of a multi-jurisdictional mutual aid compact. The department owns eight vehicles and has an ISO rating of 7 or 8. The service has non-transport EMS service.

Afton has its own one-person (part time, 20-hour/week) police force and contracts with the Sheriff for assistance as needed. The Union County Sheriff's Office in Creston is the County's E911 dispatch center.

East Union CSD serves the City and surrounding area from a campus about a half-mile east of the Afton on High School Drive.

The Fiscal Year 2010 100% valuations for Afton were $17.5 million for residential properties, $138,000 for agricultural property, $3.0 million for commercial property, $0.5 million for industrial property, $0.4 million for railroad property, and $0.5 million for utilities. Afton levied a tax rate of $12.24533 for regular property; the extended tax rate was $44.83540. The Fiscal Year 2012 budget was $1.7 million. Afton's City Hall and Police Department invest a combined $6,500 in a typical year on hazard mitigation activities.

Afton is home to a convenience store/gas station, a day care facility, a bank, several churches, a nursing home, and several senior and family housing complexes. The new community center is under construction and should be completed by the time the plan is approved.

Afton has four warning sirens that are remotely sounded by Union County upon notification of a warning for Union County. The locations of sirens are at the fire station at 108 W. Kansas, in the alley by 508 W. Kansas, in the alley by 600 North Dodge, and in the alley by 704 E. Scott. The nursing home has the town's only public backup power generator. The nearby C.A.R.E. facility is now installing a power generator, as is East Union Schools as part of the safe room project recently constructed. Local churches, the fire station, the golf and country club, East Union Schools, and the new community center have kitchens that can serve the public during and after disaster events. No facilities in the City are designated as tornado safe rooms capable of withstanding 250 MPH winds; however, East Union Schools just east of town has a safe room built into its addition.

Public service providers for the City of Afton are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: City of Afton
- Electric: City of Afton; Alliant Energy
- Natural Gas: MidAmercian Energy
- Internet and Phone: Windstream, cable and wireless providers
- Law enforcement: Afton Police supported by Union County Sheriff
- Fire: Afton Fire and Rescue
- Ambulance: Greater Regional Medical Center (Creston)
- Public notifications: *Afton Star Enterprise*
- Sanitation: Waste Management
- Civic organizations: park board, church groups, Afton Community Club, Afton Betterment Committee, Afton Development Corporation (just starting), Hometown Hope

City website: www.aftoniowa.com.

NFIP Participation

Afton does not participate in the NFIP Program. The town has not been mapped and there are not FEMA designated SFHAs. City officials and the planning team recognize that small streams and ditches have flooded during and after heavy rains (flash flooding), but there are no major waterways that would sustain long-term flooding (a day or more) within the city.

Planning Capabilities and Status

The City of Afton participated in the Union County HMP approved in 2006. The town is currently working on a comprehensive plan, which should be adopted early in 2013. Afton is actively involved in most of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: comprehensive land use plan (smart plan update) to be adopted in late 2012, participation in the Union County EOP (city latest adoption in 2003), and a community facilities list (2004 Union County HAZMAT plan and 2006 Union County HMP), participation in regional economic development and transportation planning processes.
- Polices and ordinances in effect include: zoning (since 1998), subdivision regulations (since 1998), tree trimming ordinance (since 2010), nuisance ordinance (since 2010), site plan review requirements (building permits), and debris management plan (Part C of the EOP).
- Programs and operations include: active planning/zoning board, ISO fire rating, tree trimming program near power lines, and participation in mutual aid agreements with fire, EMS, law enforcement, and utilities (Iowa Association of Municipal Utilities).
- Maps, studies, and reports include: vulnerable population inventory (senior housing), land use map, and past hazard analysis and risk assessment.
- Staff and departments include: fire department with an emergency response team and HAZMAT expert, participation in the county LEPC and EMA, police chief, public works official, and participation in regional planning through the Southern Iowa Council of Governments.
- NGOs include: utility companies, civic groups, and development groups.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Afton, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 - 28: Afton Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Nursing facilities, senior/handicap housing have built-in alerts, Code Red since 2008 fills gaps
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Install warning sirens for outdoor warning *	Complete	Four sites in town – some aging and will need to be replaced within ten years
Promote/provide tornado safe room design education for builders and developers	Ongoing	With several safe rooms underway and built since 2009, local builders are becoming aware of the programs and technology
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, EU Schools, driver education classes, and law enforcement with bike and traffic safety
Develop electronic directory of local and other resources	Complete	EMA, county website, public service agency websites, regional response/recovery group websites, MATURA, DHS, paper booklets also – could add to Afton website
Develop/enforce snow removal policies/protocols	Complete	Mostly in incorporated places but also policies in effect for specific developed rural areas and county property
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Ongoing	Bi-annual updates; EMA has information but it appears the City of Afton is not given the information pertinent to the City
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities, Iowa Association of Municipal Utilities, Keep Iowa Beautiful, etc.
Inspect water lines	Ongoing	SIRWA owns and inspects regularly
Install and update anti-virus software	Ongoing	City does for City-owned computers
Install speed limit signs	Complete	County and City have signs and enforcement mechanisms
Subdivision ordinances to address hazard interface areas (areas where new development is adjacent to natural areas and conflicting land uses)	Complete	May need updated to reflect hazard mitigation principles
Make all public buildings handicap accessible	Complete	Has been complete for many years

Develop local debris disposal sites	Complete	City has a site in place meeting regulations.
Remove underground fuel storage tanks	Ongoing	Most have been mitigated; more will be when no longer used
Tree planting programs and regulations on ROW areas and public properties	Complete, ongoing	Ordinance restricting certain plantings on ROW areas; tree planting programs on public areas done as funds allow
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; Afton is involved in process.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Designated public information officer	Complete	Mayor technically; EMA also involved
Purchase snow trucks, plows, and sanders	Complete	Adequate on hand
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Bury utility lines in new areas of development	Ongoing	Common practice today by utilities; city subdivision ordinance
Develop reservoirs and lakes	Complete	Major lakes are in place; Afton Lake just outside of city
Install potable water pressure tanks/towers *	Complete	SIRWA has water tower in town
Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City site, access to county transfer station 4 miles west
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, gas line operators, roads, bridges
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Update comprehensive plans to include mitigation measures in the land use planning process and recommendations *	Underway	Smart comprehensive plan is underway and nearly completed
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Afton either by the City or by partnering agencies, such as, but not limited to, County agencies that include the EMA, SIRWA, the local fire department, or utility providers.

Outlook and Future Development

The population of Afton is likely to continue a slow decline, as has been the case for a few decades. However, with some new investments in the community in the past few years, such as the new community center, people see the town becoming more progressive. The nucleus of services and businesses ensures the town will not face significant decline. While little new development is likely, it is possible that a few new homes will be built in existing development areas. Conversion of farmland on any wide scale is not likely, nor is development in possible flood hazard areas. The recent activities of the City, and its active participation in all steps of the planning process, indicate that it is likely that the City will implement many of the proposed mitigation actions in this plan.

City of Arispe

Located in the south central part of the county, Arispe is one of the small towns, with 100 people. The city is managed by a city council of 3 elected members and an elected mayor. One part-time city hall staff member administers the city. The City hires the mowing of city property and performance of basic maintenance.

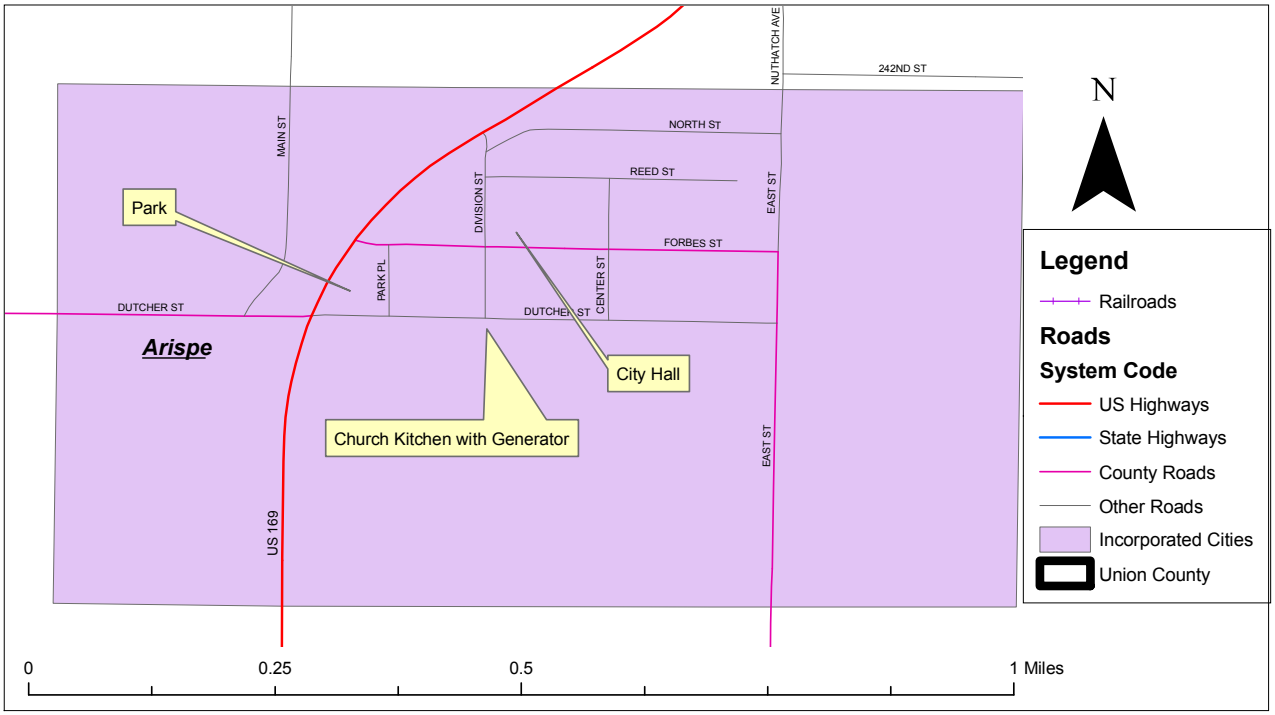
Arispe Historical Context

The town plat was recorded December 31, 1888. It was a station on the Diagonal Railroad. The town's growth ended with the withdrawal of the railroad about two decades ago. After years of decline, the town has shown growth since the sewer system was built around the year 2000. *(source: http://freepages.genealogy.rootsweb.ancestry.com/~unioniowa/arispe.htm)*

Arispe Physical Profile

Arispe is located in Sand Creek Township, three and one half miles from the Ringgold County Line. Arispe is accessed via U.S. Highway 169 south of Afton. It occupies 0.5 square miles on an upland ridge, much of which is residential area, surrounded by agricultural land along the fringes of the city. Approximately 3 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is 1,270 feet. The base map of Arispe below shows the town boundaries, street patterns, and key facilities.

Figure 2 – 29: Map of City of Arispe



Arispe Infrastructure, Services, and Resources

The city council meets monthly at a centrally located building that contains a council meeting room only. The city also owns a city park on the western part of the town.

Potable water is provided from the Twelve-Mile Lake water treatment plant eight miles northwest of Arispe by SIRWA. Water pressure is adequate, although there are no water towers in the city. Water lines are generally in adequate condition to meet existing and likely growth needs at this time.

Virtually all the city is served by a central sewer system operated by SIRWA with sewer lines and a multi-cell lagoon system southeast of town. The lagoons are in good condition and can handle Arispe's potential growth. Sewer lines are in good condition, as they are only about 10 years old.

Alliant Energy operates electric power facilities in Arispe and adequately meets local needs. There is no local production capacity at this time. The Methodist Church on the south side of town contains a fixed power generator so it can serve as a community shelter during and after hazard events.

The town is served by LP services for heating and other fuel energy. Most homes and other businesses contain aboveground tanks that store the fuel. Other properties use wood, corn, or other fuels. There are no pipelines in the immediate area.

The City of Arispe manages roads and sidewalks. Most transportation infrastructure is in poor condition, with the remaining being in fair condition. Highway 169 is in excellent condition. Most streets are gravel surface with modest maintenance investment and no curb and gutter.

Storm water control systems are limited in the town. Most water that falls in Arispe goes into drainage ditches in residential areas and along streets. The town is very flat, and there are few natural waterways (if any), and water often stands in an area rather than flows away.

The town is served by the Afton Fire Department. See the City of Afton profile for details on fire services.

Arispe contracts with the Sheriff for law enforcement. The Union County Sheriff's Office in Creston (14 miles northwest) is the County's E911 dispatch center.

East Union CSD near Afton serves the City.

The Fiscal Year 2010 100% valuations for Arispe were $2.0 million for residential properties, $130,000 for agricultural property, $0.4 million for commercial property, $0 for industrial property, $0 for railroad property, and $0.2 million for utilities. Arispe levied a tax rate of $7.62304 for regular property; the extended tax rate was $40.21311. The Fiscal Year 2012 budget was approximately $35,000.

Arispe is home to a church and a few small businesses. The park has new playground equipment.

Arispe has a warning siren that is remotely sounded by Union County upon notification of a warning for Union County. The Methodist Church has the town's only public backup power generator. Churches have kitchens that can serve the public during and after disaster events. No facilities in the City are designated as tornado safe rooms capable of withstanding 250 MPH winds.

Public service providers for the City of Arispe are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: Southern Iowa Rural Water Association
- Electric: Alliant Energy
- Natural Gas: None; individual LP tanks supplied by local LP dealers
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Union County Sheriff
- Fire protection: Afton Fire Department
- Ambulance: Greater Regional Medical Center (Creston)
- Public notifications: *Afton Star Enterprise*
- Sanitation: Waste Management
- Civic organizations: Lion's Club, church groups

City website: none.

NFIP Participation

Arispe does not participate in the NFIP Program. The town has not been mapped and there are not FEMA designated SFHAs. City officials and the planning team recognize that ditches have flooded during and after heavy rains (flash flooding), but there are no major waterways that would sustain long-term flooding (a day or more) within the city.

Planning Capabilities and Status

The City of Arispe participated in the Union County HMP approved in 2006. Arispe is actively involved in some of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: participation in the Union County EOP, a community facilities list (2006 Union County HMP), participation in regional economic development and transportation planning processes.

- Polices and ordinances in effect include: tree trimming ordinance, nuisance ordinance, and debris management plan (Part C of the EOP).
- Programs and operations include: participation in mutual aid agreements with fire, EMS, law enforcement.
- Maps, studies, and reports include: past hazard analysis and risk assessment.
- Staff and departments include: fire department with an emergency response team and HAZMAT expert (Afton), participation in the county LEPC and EMA, and participation in regional planning through the Southern Iowa Council of Governments.
- NGOs include: utility companies and civic groups.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Arispe, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 - 30: Arispe Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Most people have satellite, which now offers local channels and national offerings such as the Weather Channel
Establish alert systems for vulnerable populations	Ongoing	Outdoor siren and active Code Red reverse E911 program in place
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Install warning sirens for outdoor warning *	Complete	Four sites in town – some aging and will need to be replaced within ten years
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, EU Schools, driver education classes, and law enforcement with bike and traffic safety
Backup jurisdictional files and records – store in alternative location and electronically	Ongoing	Physical location at county courthouse; electronic system used also
Enforce burning restrictions	Ongoing	County has policy, partly enforced by area law and fire services
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities
Inspect water lines	Ongoing	SIRWA owns and inspects regularly
Install and update anti-virus software	Ongoing	City does for City-owned computers, if any
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; Afton is involved in process.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Designated public information officer	Complete	Mayor technically; EMA also involved / CERT team
Develop search and rescue team; develop volunteer base	Complete	CERT team in place addresses these needs
Develop/update/publicize city evacuation plan	Complete	Plan is in place and can be invoked as needed by city and county; numerous routes available to leave town
Purchase snow trucks, plows, and sanders	Complete	Adequate on hand
Develop reservoirs and lakes	Complete	Major lakes are in place regionally
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Install potable water pressure tanks/towers *	Complete	SIRWA water tower in the area serves the town adequately
Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, gas line operators, roads, bridges
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties

Develop local debris disposal sites	Complete	City site, access to county transfer station 4 miles west
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Arispe either by the City or by partnering agencies, such as, but not limited to, County agencies, the Emergency Management Agency, rural water provider, the local fire department, or utility providers.

Outlook and Future Development

The population of Arispe is likely to continue a slow decline, as has been the case for a few decades. However, with some new investments in the community in the past ten years, such as the sewer system and park improvements, people see the town as more progressive. The nucleus of services and some newer housing ensures the town will not face significant decline. While little new development is likely, it is possible that a few new homes will be built in existing development areas. Conversion of farmland on any wide scale is not likely, nor is development in possible flood hazard areas.

City of Creston

Located in the west-northwest part of the county, Creston is the county's largest town with 7,834 people. The city is managed by a city council of 7 elected members and an elected mayor. A city administrator oversees a city clerk and numerous department heads to administer the city. Paid staff work in parks and recreation, law enforcement, fire and rescue, building and zoning, and street departments, and others. Dozens of employees complete projects in the city.

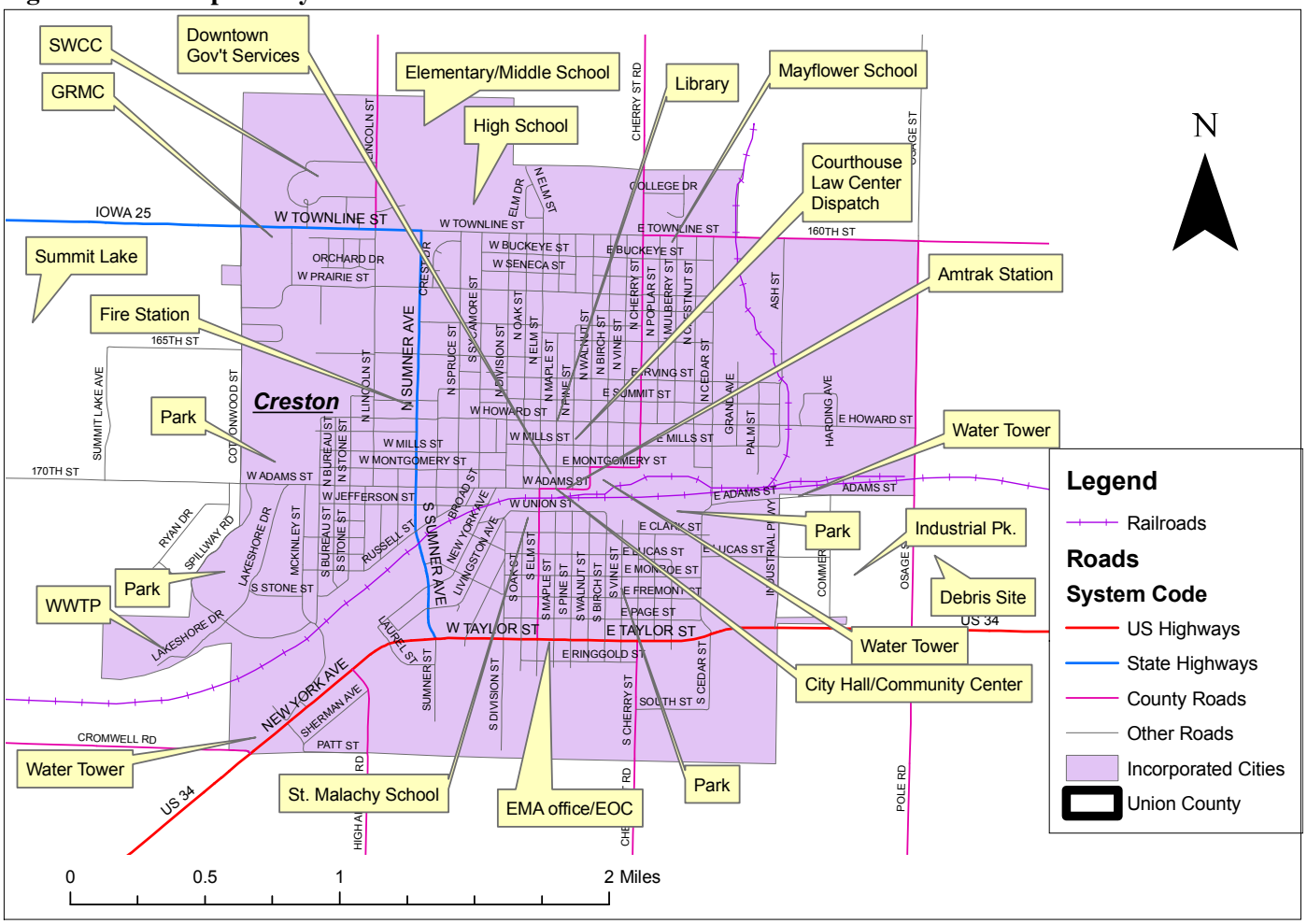
Creston Historical Context

Creston originally settled in 1868 as a survey camp for the workers with the Burlington and Missouri Railroad. The campsite was on the crest on the railroad line between the Missouri and Mississippi, hence the name "Creston." Creston was chosen as the division point for the railroad (now the Burlington Northern-Santa Fe, which built machine shops, roundhouse and a construction camp to the new town. The town was incorporated in 1871. A new railroad station was constructed in 1899 and the three-story structure served passengers for 69 years. The depot was renovated in 1978 to serve as a city hall. The old machine shop building was destroyed by a tornado in 1946. The remainder of the roundhouse burned down in 1981. Today, Amtrak, the national passenger rail system, provides service to Creston, operating its *California Zephyr* daily in both directions. Creston is also a stop on the BNSF Railway. Creston's layout and housing stock portrays the railroad's significance in early development, and it has made Creston the largest town and regional center for a greater 8-county region. Due to these factors, the town has extensive retail, government, regional services, health, and educational assets. The town has also nurtured significant industry. *(source: http://en.wikipedia.org/wiki/Creston,_Iowa)*

Creston Physical Profile

Creston is accessed via U.S. Highway 34 and State Highway 25 and the BNSF mainline railroad. It occupies 5.1 square miles on an upland ridge at the high point between the Missouri and Mississippi Rivers in this part of the Iowa. The town is fairly flat with no large waterways and few significant hills. Creston's land is primarily used for residential, but significant tracts of land are used for commercial, industrial, and public/non-profit land uses. Two small lakes are located along Hurley Creek, which crosses the northern and western parts of the town. The developed part of Creston is surrounded by agricultural land along the fringes of the city. Approximately 50 miles of mostly paved and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is approximately 1,300 feet. The base map of Creston on the following page shows the town boundaries, street patterns, and key facilities.

Figure 2 – 31: Map of City of Creston



Creston Infrastructure, Services, and Resources

The city council meets bi-weekly at its restored historic depot, located in uptown Creston, that contains a council meeting room, offices, storage area, a historic train station waiting room with a model railroad. The city also owns a city shed, WWTP and other buildings, a Waterworks Office, water and other towers, recreational land and buildings throughout the town, sewer lagoons just west of town, a cemetery just south of town, and an airport one mile south of town.

Potable water is provided from the Twelve-Mile Lake water treatment plant (8.5 million gallons per day) four miles east of Creston (1730 Lark Ave.) by Creston Water Works. Three water towers located along the upland ridge near the railroad supply adequate water pressure to the system and meet emergency needs, at the following addresses: 1455 Cromwell Road (1,250,000 gallons), 108 N. Birch St. (500,000 gallons), and 1702 Commerce Road (750,000 gallons). Water lines are generally in adequate condition to meet existing and likely growth needs at this time. Working hydrants are located throughout the town. There is a shortage of capacity at times related to the ability to intake raw water; there are 3 pumps with 5,000 gallons per minute (GPM) capacity at the water plant and 3 pumps with 6,000 gallons per minute (GPM) capacity at the Three Mile Lake intake.

Virtually all the city is served by a central sewer system with sewer lines and a full treatment plant (7.5 million gallons per day capacity) and multi-cell lagoon system at the southwest corner of town along Hurley Creek (710 South Lakeshore Drive). The WWTP is in good condition overall and can handle Creston's potential growth. The Ferrara Candy Company gummy factory on the southeast edge of Creston has its own WWTP. If other industry using large volumes of water comes to Creston, capacity will be exceeded. Sewer lines are of varying condition, whereas the City is working on upgrades in a multi-phase project starting in east and northeast Creston and working

west. There are numerous sewer lift stations, strategically located throughout the town, with the following addresses: 1201 E. Taylor Street (2 pumps, 670 GPM per pump), 901 S. Sumner St. (2 pumps, 1400 GPM per pump), 1116 Patt Street (2 pumps, 160 GPM per pump), 600 North Osage St. (2 pumps, 326 GPM per pump), and 1802 S. Cherry St. (2 pumps, 65 GPM per pump).

Creston franchises for electric power with Alliant Energy. Creston has numerous power lines and a few substations that handle electricity throughout the city. There is no local production capacity at this time. Several key assets contain backup power generators for emergency needs. Alliant has a tree maintenance program to ensure that power lines are less susceptible to damage from falling tree branches due to winds, lightning, ice, and heavy snow.

MidAmerican provides natural gas from its main pipeline that travels through Adair County north of Creston. This line joins the Creston system at a border station along East Townline Street in the northeast corner of town. A line also goes east from this point under Twelve-Mile Lake and to Afton (10 miles east). Most residents and businesses use natural gas for heating and other personal energy needs. Industries are large users.

The City of Creston manages roads, sidewalks, and trails. Most transportation infrastructure is in fair condition, with the remaining being either poor or good condition. Creston has numerous paved streets that are in varying conditions. The City does not have a detailed long-term street plan, so most streets are merely maintained. Many are in need of replacement. Some major streets in older neighborhoods are narrow and, due to the lack of off-street parking on small lots, have parking on one or both sides of the street, which limits access by large emergency vehicles. Many neighborhoods lack sidewalks or decent sidewalks. The town has several quality and popular walking and multipurpose trails, the main one of which connects parks in western Creston and north of town.

Storm water control systems are modest but most of the town is served. Curb and gutter systems are located throughout the town, in most areas, and some have been improved as part of an upgrade project in the northeast part of town and surrounding repaving of Highways 25 and 34. Many sections of underground storm water piping are very old and have failures. The City does not have good data on the systems and they are not often inspected. Storm drains also drain into Hurley Creek and other low-lying areas, which actually speeds up the flash flooding potential of the waterways and causes stream bank deterioration. A continual Hurley Creek watershed improvement project is addressing this issue indirectly, but not by improving the storm drains specifically. Some retention basins, all small, throughout town, are showing some promise to holding water naturally, rather than simply moving it rapidly to drainage areas and streams. Culverts are located strategically to move water to streams and other areas outside of the city. Standing water and water flow issues remain in some locations and the town has a few hilly areas that can offer flash flooding concerns.

The town is served by the Creston Fire Department, which is a combination department. There are 15 full-time members, 6 part-time members, and 15 volunteer members. The fire department also provides EMS/first response services (12 members), fire prevention program, inspections, and code enforcement. The department is part of a multi-jurisdictional mutual aid compact. The department owns eight vehicles and has an ISO rating of 5. The service has non-transport EMS service. The older and undersized fire station is strategically located along four-lane Highway 25 in west central Creston.

Note that the tornado of April 2012 (described in greater detail in *Chapter 4: Hazard Profile*) greatly tested the capabilities of local first response agencies, and since the hospital was damaged, the medical capabilities. Many responders were called from outside of town and many hired staff members worked excessive hours. At this time, a thorough evaluation of the event is not complete. The evaluation surely will affect the countywide EOP and will be reflected in the mitigation strategy related to emergency services for Creston and other jurisdictions in this HMP.

Creston has its own 11-person full-time police force and contracts with the Sheriff for assistance as needed. The Law Enforcement Center in uptown Creston is the County's E911 dispatch center and also houses the police offices and county jail.

The jurisdiction is served by the Creston Community School District. See the profile later in this chapter for information on the district.

The Fiscal Year 2010 100% valuations for Creston were $215 million for residential properties, $0.5 million for agricultural property, $68.7 million for commercial property, $13.3 million for industrial property, $1.4 million for railroad property, and $13.4 million for utilities. Creston levied a tax rate of $13.85255 for regular property; the extended tax rate was $45.68867. The Fiscal Year 2012 budget was $21.8 million.

Creston is home to numerous convenience store/gas stations, day care facilities, banks, churches, and community meeting locations. It also has two nursing homes, and several senior and family housing complexes. Many shopping options, including supplies and materials for emergency needs, are available.

Creston has six warning sirens that are remotely sounded by Creston Fire upon notification of a warning for Union County. The sirens are located at the fire station, 508 S. Lincoln, 621 N. Cedar, 801 W. Spencer, 718 E. Monroe, and 911 N. Spruce. These sirens were purchased new in 2009. Backup power generators are located in several key assets: city hall, GRMC, the schools in the new safe room areas, nursing homes, fire station, law enforcement center, some of the factories, the water treatment plant, Twelve Mile Lake water intake station, Three Mile Lake water intake station, and KSIB radio station. Other facilities would benefit from a fixed power generator. Local churches, a hotel's convention area, the golf and country club, Creston Schools, SWCC, GRMC, the senior meal site at the city hall, and other non-profit and private halls (such as lodges and banks) have kitchens that can serve the public during and after disaster events. One designated tornado safe room is located in McKinley Park in west Creston. Two are being built at Creston Schools for student populations.

Public service providers for the City of Creston are as follows:

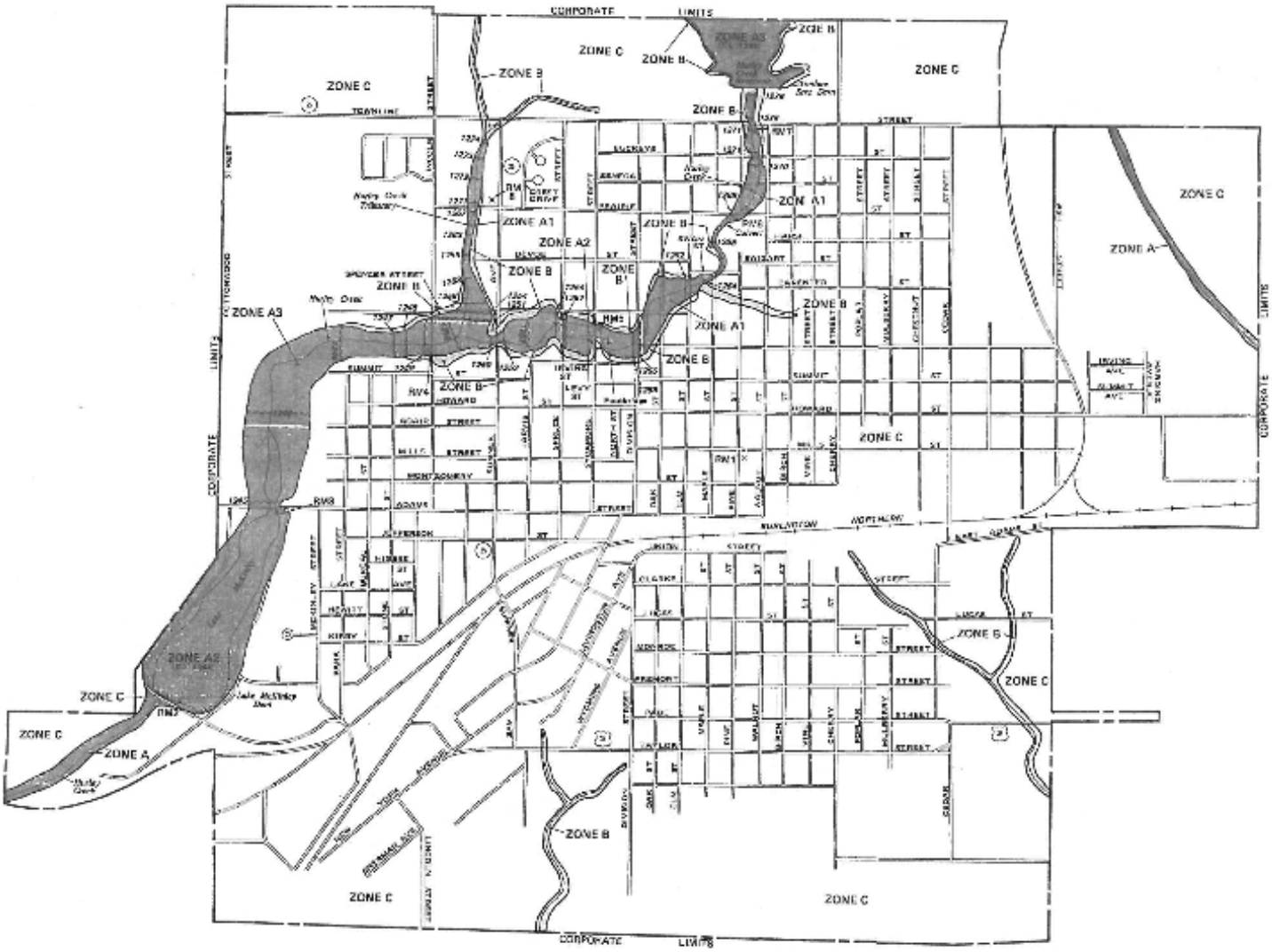
- Water: Creston Water Works
- Sewer: City of Creston
- Electric: Alliant Energy
- Natural Gas: Alliant Energy
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Creston Police Department
- Fire protection: Creston Fire Department
- Ambulance: Greater Regional Medical Center (northwest Creston)
- Public notifications: *Creston News Advertiser*
- Sanitation: Waste Management
- Civic organizations: park board, church groups/ministerial association, Creston Chamber of Commerce, Kiwanis Club, Optimist Club, Lion's Club, Knights of Columbus, Rotary Club, Union County Development Association, FFA, 4-H, fraternal organizations, and many others.

City website: www.crestoniowa.gov.
The City of Creston and its departments invest approximately $10,000 to $25,000 on hazard mitigation activities annually.

NFIP Participation
Creston participates in the NFIP Program. The CID# is 190264#. The City has been in the program since November 2007. There are 22 policies in force (as of October 2010), there have been eight claims of $114,617, and there is one repetitive loss property, which has sustained two incidents of loss totaling $8,486.53.

The City has an initial FIRM map. DFIRMs have not been created for this area. Residential, open space, and agricultural areas, along with the city's sewer lagoons, are located in the SFHA or within areas to be surveyed for inclusion by map updates being performed by the IDNR in the next year.

Figure 2 – 32: FIRM Map for Creston



Other planning and training efforts include:

- Planning capabilities and plans in place include: comprehensive land use plan adopted in 2002, participation in the Union County EOP (city latest adoption in 2003), and a community facilities list (2006 Union County HMP), participation in regional economic development and transportation planning processes, and a strategic short-term action plan.
- Polices and ordinances in effect include: zoning, building code, floodplain ordinance, rental property ordinance (since 2011), subdivision regulations, tree trimming ordinance, nuisance ordinance, storm sewer ordinance, site plan review requirements, historic preservation ordinance, and debris management plan (Part C of the EOP).
- Programs and operations include: active planning/zoning board, ISO fire rating, building code effectiveness grading (BCEG), stream maintenance program, tree trimming program near power lines, economic development program, site design criteria program, and participation in mutual aid agreements with fire, EMS, law enforcement, and utilities.
- Maps, studies, and reports include: past HARA, flood insurance study, original FIRM, vulnerable population inventory (senior housing), land use map, and past hazard analysis and risk assessment.
- Staff and departments include: zoning administrator, building code official/inspector, mapping specialist, engineer (contracted), fire department with an emergency response team and HAZMAT expert, participation in the county LEPC and EMA, police chief, public works official, historic preservation commission, economic development department, sanitation department, and participation in regional planning through the Southern Iowa Council of Governments.

- NGOs include: utility companies, civic groups, a chamber of commerce, and development groups.

The tornado of April 2012 greatly tested the planning capabilities and procedures. At this time, a thorough evaluation of the event is not complete. The evaluation surely will affect the countywide EOP and will be reflected in mitigation strategies related to emergency services for Creston and other jurisdictions in this HMP.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Creston, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 -33: Creston Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Nursing facilities, senior/handicap housing have built-in alerts, Code Red since 2008 fills gaps
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Initial community briefings immediately after events	Ongoing	Worked well directly after the 2012 tornado – mayor, police chief, fire chief, hospital administrator, and county EMA lead
Install warning sirens for outdoor warning *	Complete	Four sites in town – in good working order and adequate volume
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, local schools, driver education classes, and law enforcement with bike and traffic safety
Adopt building codes to address various natural hazards	Complete	City has good codes in place and tries to improve on them; enforcement mechanisms could be improved
Adopt tree trimming ordinances	Complete	In place; enforced by City and Alliant Energy
Back-up jurisdictional files and records – store electronically and in alternate locations (vaults)	Ongoing	Process and locations in place
Conduct engineering studies on water and sewer plants	Ongoing	City working on this regularly with own equipment and hired engineering firms
Conduct study in the illegal use of sump pumps and sewer discharges into creek	Ongoing	Worked much on problem areas in northeast and eastern Creston and near the Hurley Creek area
Designate/enforce area HAZMAT transportation routes	Complete	Signage in place; may need to update away from more residential areas
Develop/implement watershed studies and plans for possible flood prone area	Complete	Hurley Creek and Summit Lake projects have been assessed; work has been done to reduce storm water issues
Develop electronic directory of local and other resources	Complete	EMA, county website, public service agency websites, regional response/recovery group websites, MATURA, DHS, paper booklets also – could add to Creston website
Develop/enforce snow removal policies/protocols	Complete	Mostly in incorporated places but also policies in effect for specific developed rural areas and county property
Enforce burning restrictions	Ongoing	City fire dept enforcement when put in effect by City or County
Enforce multi-family housing extinguisher laws	Ongoing	Fire dept enforcement and inspections, City has new rental ordinance
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Ongoing	Bi-annual updates; EMA has information and shares with Creston Fire Dept.
Formally designate and stock community post-disaster shelters (food and lodging- support Red Cross and others)	Ongoing	Several lodging and kitchen options available; most have generators; NGO support is adequate, as demonstrated by 2012 tornado
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities, Iowa Association of Municipal Utilities, etc.
Implement/update and enforce zoning ordinances	Ongoing	In place and enforced with active planning commission; may need to update text to address hazard mitigation
Investigate alternative water sources for fire suppression	Complete	Good hydrants, local lakes, dry hydrants in the area, dept has tanker truck
Inspect water lines	Ongoing	Creston Water Works owns and inspects regularly

Install and update anti-virus software	Ongoing	City does for City-owned computers
Install speed limit signs	Complete	County and City have signs and enforcement mechanisms
Make all public facilities handicap accessible	Complete	All key facilities and infrastructure (city owned and others) are fully accessible
Subdivision ordinances to address hazard interface areas (areas where new development is adjacent to natural areas and conflicting land uses)	Complete	May need updated to reflect hazard mitigation principles
Lightning protection of tall buildings and towers	Complete	All buildings and towers are protected as far as known; risk acceptable
Remove asbestos from public buildings	Complete	All buildings have been mitigated as far as known; risk acceptable
Repair structurally weak homes/weatherization	Underway	Several sources of funding working on this, including City, but needs are very great
Tree planting programs and regulations on ROW areas and public properties	Complete, ongoing	Ordinance restricting certain plantings on ROW areas; tree planting programs on public areas done as funds allow
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Develop/implement an extreme heat event medical response plan	Complete	EMS services have equipment and training for effects of extreme heat
Develop/implement a thorough recovery plan for power failure	Complete	City and utility companies have a plan to address response to power failure using local and outside personnel
Develop search and rescue teams	Complete	Creston Fire is certified and trained in this area
Emergency response guidebooks in all emergency vehicles and select City vehicles	Complete	Supplied by IDOT and purchased as needed
Establish HAZMAT decontamination sites	Complete	Creston Fire/GRMC; portable trailer available
Maintain an EOC with 24-hour capability	Complete	Creston law center now serves such purposes
Purchase fire trucks and ambulances	Complete	Creston Fire/GRMC have newer vehicles and future replacement plans
Purchase new, modernize, and/or harden existing mobile and personal first response communications equipment/systems	Underway	Working on narrow banding requirements; installing modern fixed equipment at law center and on towers; communications upgrade plan in place and being followed
Purchase road closure barricades	Complete	City has adequate supply, shown to be adequate after 2012 tornado
Purchase self-contained breathing apparatus (SCBAs) for firefighters	Complete	Adequate supply on hand, replacement plan in place to replace on rotation as needed
Purchase vehicle extrication equipment	Complete	Creston Fire purchased in 2012 with local and grant funds
Require the burial of power lines in new development or redevelopment areas	Complete, ongoing	City code requirement
Construct public safe rooms in parks, campgrounds, mobile home parks, special housing facilities, and other community assets	Complete	McKinley Park safe room in operation; more contemplated (see proposed mitigation actions)
Construct or elevate wastewater lift stations	Complete	City has these in place in strategic locations; some need upgrades and are being upgraded via phased citywide sewer improvement project now underway
Designate public information officer	Complete	Mayor technically; EMA also involved
Purchase snow trucks, plows, and sanders	Complete	Adequate on hand
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Construct or repair dams	Complete	Summit Lake dam repair is just completed; more contemplated (see proposed mitigation actions)
Develop reservoirs and lakes	Complete	Major lakes are in place; Two dams in the city on Hurley Creek
Install potable water pressure tanks/towers *	Complete	Three water towers
Demolish abandoned properties	Underway	Many have been demolished in recent years but need is still great (see proposed mitigation actions)
Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City site, access to county transfer station 5 miles east
Flush dead end water mains	Ongoing	Creston Waterworks owns and maintains; publicizes when flushing occurs
GIS mapping system implementation an digital hazard maps	Underway	City is working on a city GIS system – will need to add maps from plan and other hazard maps as relevant over time
Install alternative or sustainable storm water control options such as rain gardens, bioswales, buffer strips, etc.	Underway	ISU Extension, NRCS, and some business owners have partnered with City on development
Install flood gauges	Complete	Installed at Hurley Creek Reservoir to warn of flooding potential

		in waterway through town
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	City and other providers have processes in place.
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA
Install backflow devices	Ongoing	This is a new project that has been underway for only two years, and more phases need to be completed as a continued project.
Hire or designate a local public information officer.	Complete	Mayor has been designated and served the purpose adequately during 2012 tornado. Continued exercises are advised.
Remove underground fuel storage tanks	Complete	It is believed there are no more issues.

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Creston either by the City or by partnering agencies, such as, but not limited to, County agencies, the EMA, service and response agencies, and utility providers.

Outlook and Future Development

The population of Creston is likely to remain stable with fluctuations from time to time the reflect changes in enrollment at SWCC and hiring and layoff cycles of local industry. The importance of the town as a regional cultural, economic, and services center ensures the town will not face significant decline. Development of homes, businesses, and other assets is very likely. Conversion of farmland on any wide scale is not likely, although possible. There is pressure to develop some flood hazard areas, but permits must be obtained before development can proceed. The April 2012 tornado destroyed numerous buildings in the northwest part of Creston. Some of them will need to be rebuilt, and some of those may be built in a different location in town or outside of town, which may affect traffic patterns, land use patterns, and farmland. The recent activities of the City, and its active participation in all steps of the planning process, indicate that it is likely that the City will implement many of the proposed mitigation actions in this plan.

City of Cromwell

Located in the far west-central part of the county, Cromwell is home to 107 people. The city is managed by a city council of 5 elected members and an elected mayor. One part-time city hall staff member administers the city. The City hires the mowing of city property and performance of basic maintenance.

Cromwell Historical Context

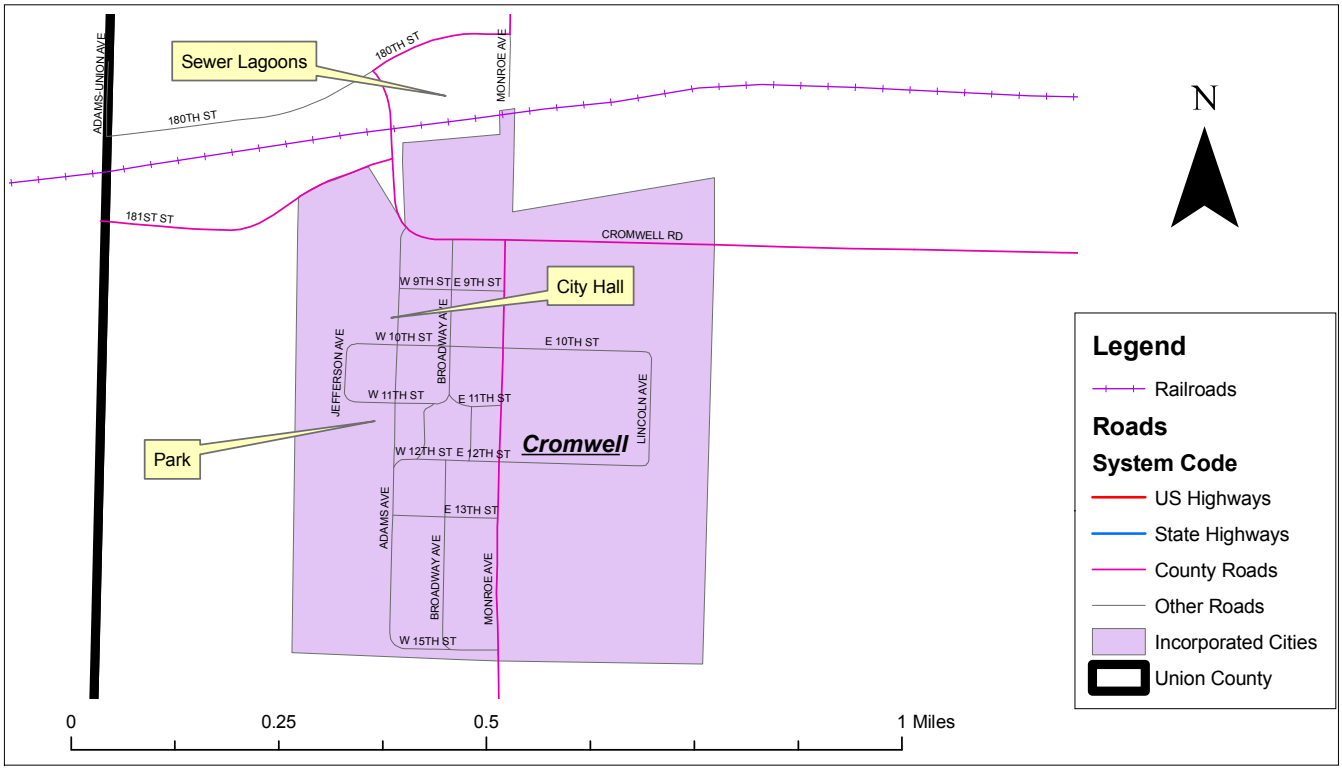
When it was laid out, in 1868, it was believed that the Cromwell would be the west Iowa division of the B. and M. R. R., and many invested there accordingly, only to be disappointed when Creston was selected. The first house was built by Thomas Ballard in the fall of 1868. The railroad was built through the town site in 1869 (and still exists). The town was surrounded by a fine country, and was a good trading point. A public school (since removed), two churches, a newspaper, flouring mills, and businesses of all kind made it quite a trade center. After years of decline, the town has stabilized as a "suburb" of Creston. Virtually all the employed residents of Cromwell work in Creston. *(source: http://freepages.genealogy.rootsweb.ancestry.com/~unioniowa/cromwell1889.htm)*

Cromwell Physical Profile

Cromwell is located in the far west part of the county, only one mile from the Adams County line. Cromwell is accessed via Union County Highway H-33 just four miles west of the southwest corner of Creston. It occupies 0.3 square miles on an upland ridge facing to a valley near the railroad on the north edge of town, much of which is

residential area, surrounded by agricultural land along the fringes of the city. Approximately 3 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is approximately 1,300 feet. The base map of Cromwell below shows the town boundaries, street patterns, and key facilities.

Figure 2 – 34: Map of City of Cromwell



Cromwell Infrastructure, Services, and Resources

The city council meets monthly at a centrally located building that contains a council meeting room. The city also owns a city park in the middle of town.

Potable water is provided by SIRWA from the Twelve-Mile Lake water treatment plant nine miles east of Cromwell. Water pressure is adequate, although there are no water towers in the city. Water lines are generally in adequate condition to meet existing and likely growth needs at this time.

Virtually all the city is served by a central sewer system with sewer lines and a multi-cell lagoon system at the north edge of the town, across the railroad from the rest of the town. The lagoons are in good condition and can handle Cromwell's potential growth. Sewer lines are in good condition, as they are only about 15 years old.

Alliant Energy operates electric power facilities in Cromwell and adequately meets local needs. There is no local production capacity at this time. There are no substations in the city.

The town is served by LP services for heating and other fuel energy. Most homes and other businesses contain aboveground tanks that store the fuel. Other properties use wood, corn, or other fuels. There are no pipelines in the immediate area.

The City of Cromwell manages roads and sidewalks. Most transportation infrastructure is in fair condition, with the remaining being in poor condition. Highway H-33 is in good condition. Most streets are gravel surface with modest maintenance investment and no curb and gutter.

Storm water control systems are limited in the town. Most water that falls in Cromwell goes into drainage ditches in residential areas and along streets. The town slopes downhill toward the north at a modest grade. The water from the city flows toward the small waterway just south of the railroad.

The town is served by the Creston Fire Department from a station 5 miles east of Cromwell. See the City of Creston profile for fire department information.

Cromwell contracts with the Sheriff for law enforcement. The Union County Sheriff's Office in central Creston (5.5 miles northeast) is the County's E911 dispatch center.

Creston CSD serves the City and surrounding area from a campus on the north part of Creston, six miles east. See the Creston CSD profile later in this chapter for more district information.

The Fiscal Year 2010 100% valuations for Cromwell were $3.0 million for residential properties, $0 for agricultural property, $0.13 million for commercial property, $0 for industrial property, $0.2 million for railroad property, and $0.17 million for utilities. Cromwell levied a tax rate of $6.51351 for regular property; the extended tax rate was $38.343963. The Fiscal Year 2012 budget was approximately $33,000.

Cromwell is home to several churches and a few small businesses. The park has new playground equipment.

Cromwell has one unreliable warning siren, in its city park on Broadway Street, that is remotely sounded by Creston Fire upon notification of a warning for Union County. There are no backup power generators located in Cromwell. The main church in town or some other meeting place could benefit from a fixed generator. The Congregational Church of Christ has a kitchen that can serve the public during and after disaster events. Cromwell has no designated tornado safe rooms designed to withstand 250 MPH winds.

Public service providers for the City of Cromwell are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: Southern Iowa Rural Water Association
- Electric: Alliant Energy
- Natural Gas: None; individual LP tanks supplied by local LP dealers
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Union County Sheriff
- Fire protection: Creston Fire Department
- Ambulance: Greater Regional Medical Center (northwest Creston)
- Public notifications: *Creston News Advertiser*
- Sanitation: Waste Management
- Civic organizations: limited

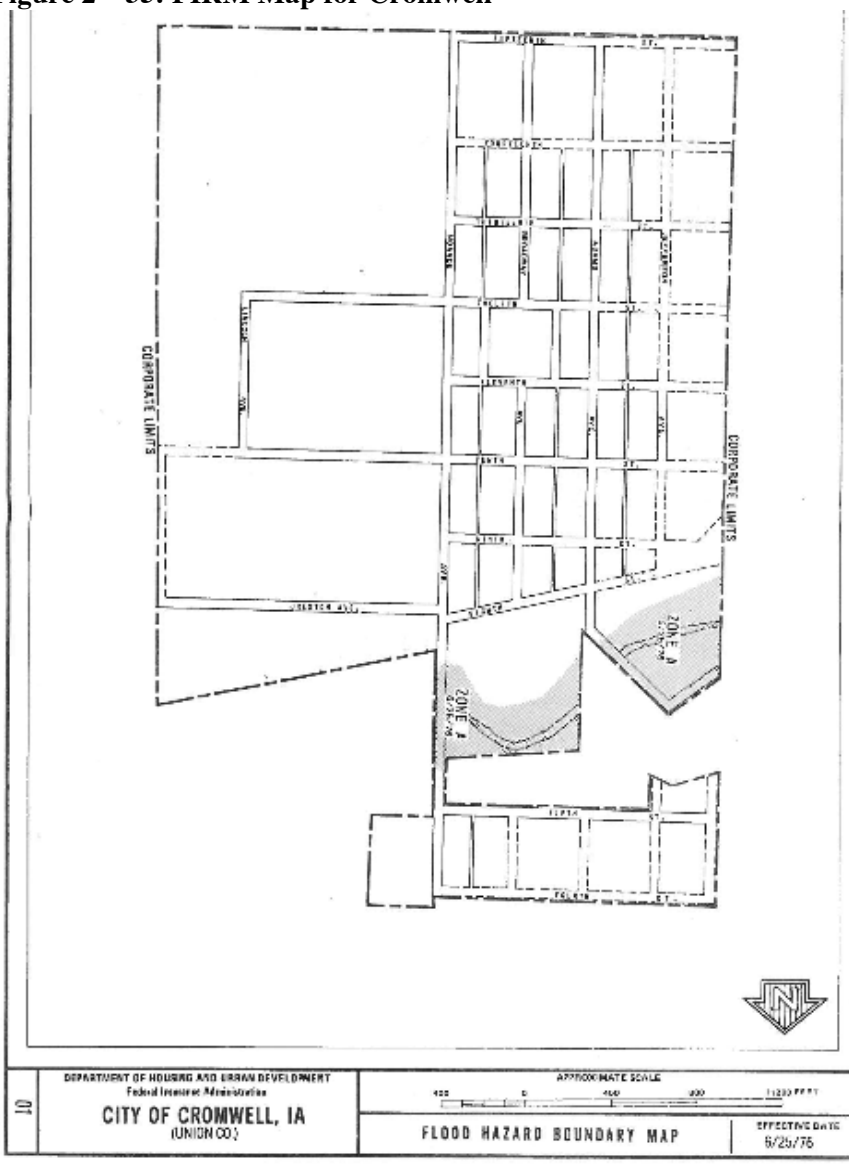
City website: None.

NFIP Participation

Cromwell participates in the NFIP Program. The CID# is 190519#. The City has been in the program since August 2005. There are no policies in force (as of October 2010), there have been no claims, and there are no repetitive loss properties.

The City has an initial FIRM map. DFIRMs have not been created for this area. Open space and agricultural areas, along with the city's sewer lagoons, are located in the SFHA or within areas to be surveyed for inclusion by map updates being performed by the IDNR in the next year.

Figure 2 – 35: FIRM Map for Cromwell



Planning Capabilities and Status

The City of Cromwell participated in the Union County HMP approved in 2006. Cromwell is actively involved in some of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: participation in the Union County EOP, a community facilities list (2006 Union County HMP), participation in regional economic development and transportation planning processes.
- Polices and ordinances in effect include: flood plain development ordinance, nuisance ordinance, and debris management plan (Part C of the EOP).
- Programs and operations include: NFIP participation (since 2005), participation in mutual aid agreements with fire, EMS, law enforcement, tree trimming by City as needed (public and private property).
- Maps, studies, and reports include: past hazard analysis and risk assessment, FIRM map (1976)
- Staff and departments include: fire department with an emergency response team and HAZMAT expert (Creston), participation in the county LEPC and EMA, and participation in regional planning through the Southern Iowa Council of Governments. The mayor serves as the floodplain administrator.

- NGOs include: utility companies and civic groups.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Cromwell, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 - 36: Cromwell Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Initial community briefings protocol, PSAP, for information after or during event	Ongoing	Part of the countywide EOP and drills/trainings; mayor designated for city
Install warning sirens for outdoor warning *	Complete	Siren installed and tested regularly – not reliable and needs to be replaced when funding is available.
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, Creston Schools, driver education classes, and law enforcement with bike and traffic safety
Adopt tree trimming ordinance	Complete	No ordinance, but issue is minor and the city addresses already
Develop electronic directory of local and other resources	Complete	EMA, county website, public service agency websites, regional response/recovery group websites, MATURA, DHS, paper booklets also
Develop/enforce snow removal policies/protocols	Complete	City has policy in place but very limited; minimal enforcement
Discourage/prohibit development in flood plain areas – Join NFIP	Complete, ongoing	Joined in 2005; ordinance in place; city council educated on issues
Enforce OSHA's regulations on hazardous materials	Ongoing	City not directly involved; limited materials in city except on trains
Enforce burning restrictions	Ongoing	County function mostly
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities, etc.
Inspect water lines	Ongoing	SIRWA owns and inspects regularly
Install and update anti-virus software	Ongoing	City does for City-owned computers
Remove unused chemical containers and underground tanks	Complete	All removed as known or are otherwise mitigated
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; Cromwell needs to be more involved and to adopt the plan.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Designated public information officer	Complete	Mayor technically; EMA also involved
Purchase snow trucks, plows, and sanders	Complete	Adequate on hand
Build rail overpass over highway	Complete	Completed years ago so crossing of tracks is easier
Develop reservoirs and lakes	Complete	Major lakes are in place in the area to supply water
Install potable water pressure tanks/towers *	Complete	SIRWA has water tower in the area; water pressure is adequate
Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	Access to a local site, access to county transfer station 10 miles east
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, County, IDOT
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned

Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Install fire hydrants	Complete	SIRWA installed
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Cromwell either by the City or by partnering agencies, such as, but not limited to, County agencies, the Emergency Management Agency, SIRWA, Creston Fire Department, or utility providers.

Outlook and Future Development

The population of Cromwell is likely to remain stable with very slight variations. The location in close proximity to Creston and low cost of living (such as low-cost building lots and housing) ensures the town will not face significant decline. While little new development is likely, it is possible that a few new homes will be built in existing development areas. Conversion of farmland on any wide scale is not likely, nor is development in possible or mapped flood hazard areas. The recent activities of the City, and its active participation in the planning process, indicate that it is likely that the City will implement many of the proposed mitigation actions in this plan.

City of Lorimor

Located in the northeast corner of the county, Lorimor is the third largest town with 360 people. The city is managed by a city council of 5 elected members and an elected mayor. A city clerk administers the city. The City also has part-time maintenance/public works personnel.

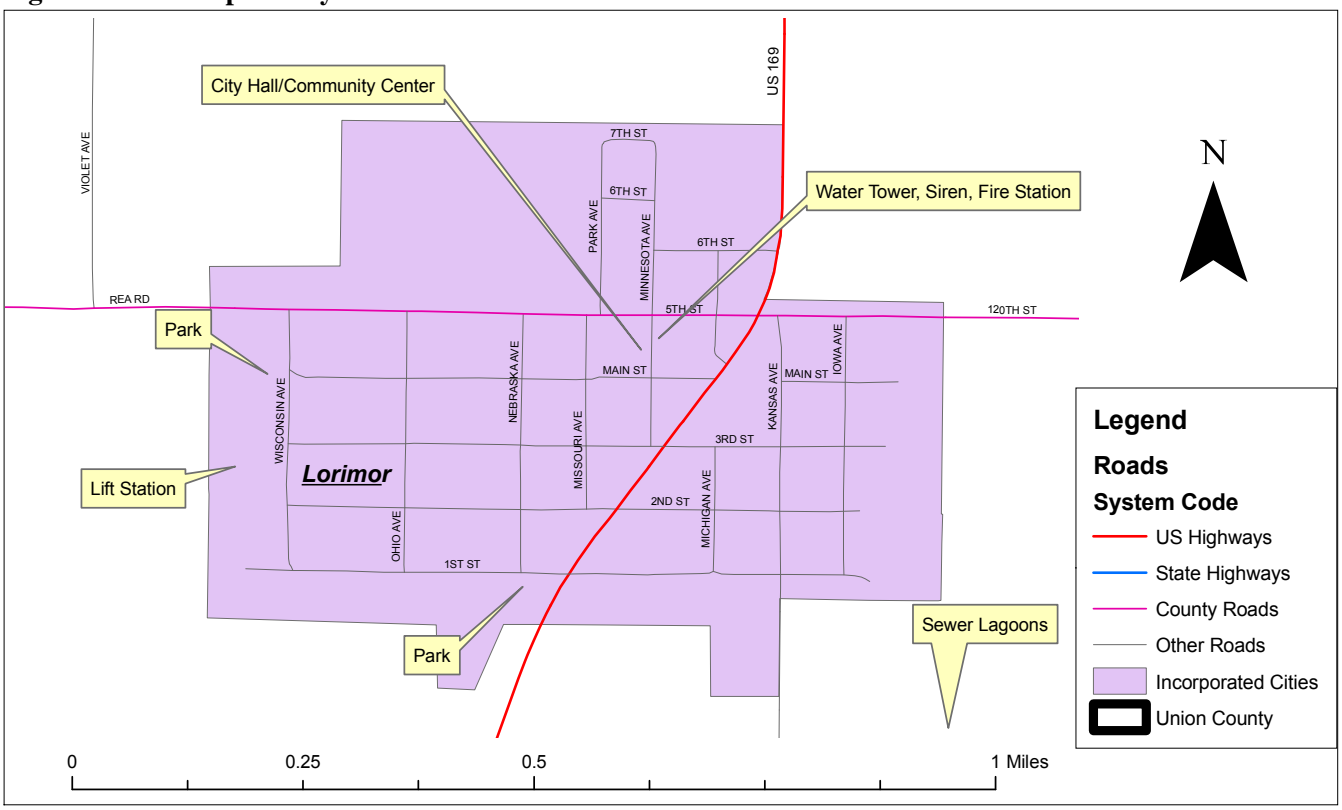
Lorimor Historical Context

The area of Lorimor was initially developed in the late 1840s, first by random settlements and then by the Mormon Expedition that traveled four miles south of the city, which set up the Mount Pisgah settlement. In that time, J.S. Lorimor purchased 1200 acres in New Hope Township from the government. In 1886, news came that the Chicago, St. Paul, and Kansas City Railroad would build a railroad through the township. Mr. Lorimor offered a right-of-way through his land and in 1887 Mr. Lorimor began platting land for development around the right-of-way. Rail service continued from that time. In 1892, after years of growth, the town was incorporated. At one time, passengers could easily travel from Lorimor to Des Moines and Kansas City, and beyond. Dozens of businesses of every nature were found in Lorimor. However, over the past 30 years, the economy has transformed, the railroad was abandoned (1986), businesses closed, and the school building was closed (1994). Nonetheless, the community remains a quality place to live and work. The community had grown in population since 1990 through 2005 due to the effects of suburbanization of the Des Moines metro area. As Des Moines continues to spread westward, more and more families are living in the Lorimor area despite working in Des Moines, particularly as a result of rapidly increasing housing prices and concerns over school quality and crime. People see a need for the small town life. Growth has stalled since the closure of the Winnebago plant several years ago. *(Source: Lorimor 2012 Smart Plan)*

Lorimor Physical Profile

Lorimor is accessed via U.S. Highway 169 and County Highway H-17. It occupies 0.56 square miles on an upland ridge east of the Grand River, much of which is residential area, surrounded by agricultural land along the fringes of the city. Approximately 6 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is approximately 1,190 feet. The base map of Lorimor below shows the town boundaries, street patterns, and key facilities.

Figure 2 – 37: Map of City of Lorimor



Lorimor Infrastructure, Services, and Resources

The city council meets monthly at a downtown building that contains a council meeting room, offices, and a reception area. The city also owns a city shed, a fire station, recreational land throughout the town, sewer lagoons just southeast of town, and a cemetery one mile south of town.

Potable water is provided from the Twelve-Mile Lake water treatment plant fifteen miles southwest of Lorimor by SIRWA. A water tower is located near the fire station in the middle of town to supply adequate water pressure to the system and meet emergency needs. Water lines are generally in adequate condition to meet existing and likely growth needs at this time.

Virtually all the city is served by a central sewer system with sewer lines and a three-cell lagoon system southeast of town near a small unnamed stream. The lagoons are in good condition and can handle Lorimor's potential growth. Sewer lines are in deteriorating condition; the City has recently hired an engineer to study them and make recommendations for improvements. There are two sewer lift stations, strategically located throughout the town.

Lorimor contracts with Alliant Energy for electric energy. Alliant owns a substation located along Highway 169 one mile south of Lorimor. There is no local production capacity at this time.

The City of Lorimor operates a natural gas utility from its main pipeline coming from Madison County. The gas is purchased through the Lenox Municipal Utilities gas department. A border station in the north part of Lorimor allows for controls to the system. Most residents and businesses use natural gas for heating and other personal energy needs.

The City of Lorimor manages roads, sidewalks, and trails. Most transportation infrastructure is in fair condition, with the remaining being either poor or good condition. Most streets are gravel or blacktop surface with modest maintenance investment and no curb and gutter. Many streets are in very poor condition.

Storm water control systems are limited in the town. The City commissioned a study on the issue about four years ago, and it was recommended that underground pipes with curb and gutter systems be built in the downtown area and other key locations. Culverts are located strategically to move water to streams and other areas outside of the city. Standing water and water flow issues remain in some locations; there are many ditches along streets, which can flood yards if they are not maintained.

The town is served by the Lorimor Fire Department, which is a small all-volunteer force based in a sturdy pole building fire station. The fire department also provides EMS/first response services. The department is part of a multi-jurisdictional mutual aid compact.

Lorimor has contracts with the Sheriff for assistance as needed. The Union County Sheriff's Office in Creston (23 miles southwest) is the County's E911 dispatch center.

East Union CSD serves the City and surrounding area from a campus about a half-mile east of the Afton on High School Drive (14 miles southwest). There is busing daily for students living in Lorimor.

The Fiscal Year 2010 100% valuations for Lorimor were $5.6 million for residential properties, $129,000 for agricultural property, $848,000 for commercial property, $0.2 million for industrial property, and $0.4 million for utilities. Lorimor levied a tax rate of $12.722156 for regular property; the extended tax rate was $44.83540. The Fiscal Year 2012 budget was $421,000.

Lorimor is home to a convenience store, several churches, and a senior/family low-income apartment complex. The five-year old community center offers meeting space, a kitchen, and limited capabilities for lodging and medical care in the event of emergencies.

Lorimor has a warning siren in the center of town that is sounded by Lorimor Fire/EMS upon notification of a warning for Union County. Currently, there are no public backup power generators. In addition to the community center, local churches and the Lion's Hall have kitchens that can serve the public during and after disaster events. Lorimor has no facilities designated as tornado safe rooms capable of withstanding 250 MPH winds.

Public service providers for the City of Lorimor are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: City of Lorimor
- Electric: Alliant Energy
- Natural Gas: City of Lorimor (via Lenox Municipal Utilities)
- Internet and Phone: Grand River Mutual, cable and wireless providers
- Police protection: Union County Sheriff
- Fire protection: Lorimor Fire Department
- Ambulance: Greater Regional Medical Center (Creston); Lorimor EMS
- Public notifications: *The New Lorimorian*
- Sanitation: Waste Management
- Civic organizations: park board, church groups, Lorimor Booster Club, Lion's Club, Lorimor Community Development Corporation.

City website: www.lorimor.org (not an official city website).

NFIP Participation

Lorimor does not participate in the NFIP Program. The town has not been mapped and there are not FEMA designated SFHAs. City officials and the planning team recognize that small streams and ditches have flooded during and after heavy rains (flash flooding), but there are no major waterways that would sustain long-term flooding (a day or more) within the city.

Planning Capabilities and Status

The City of Lorimor participated in the Union County HMP approved in 2006. The town is currently working on a Smart Comprehensive Plan, which should be adopted in early 2013. Lorimor is actively involved in most of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: comprehensive land use plan (smart plan update) to be adopted in spring 2013, participation in the Union County EOP, and a community facilities list (2013 as part of comprehensive plan and previous Union County HMP), participation in regional economic development and transportation planning processes.
- Polices and ordinances in effect include: zoning (since 2001), tree trimming ordinance (since 2010), nuisance ordinance, site plan review requirements (building permits), and debris management plan (Part C of the EOP).
- Programs and operations include: active planning/zoning board, ISO fire rating, tree trimming program near power lines, and participation in mutual aid agreements with fire, EMS, law enforcement, and utilities.
- Maps, studies, and reports include: vulnerable population inventory (senior housing), land use map, and past hazard analysis and risk assessment.
- Staff and departments include: fire department with an emergency response team and HAZMAT expert, participation in the county LEPC and EMA, police chief, public works official, and participation in regional planning through the Southern Iowa Council of Governments.
- NGOs include: utility companies, civic groups, and development groups.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Lorimor, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 – 38: Lorimor Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Nursing facilities, senior/handicap housing have built-in alerts, Code Red since 2008 fills gaps
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Install warning sirens for outdoor warning *	Complete	Siren is centrally located, has enough volume, and functions well
Reverse E-911 program	Ongoing	Code Red program in active use since 2008.
Adopt building codes to address various natural hazards	Complete	Modest but in place; may need to be updated; development is limited so enforcement issues not a factor right now
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, EU Schools, driver education classes, and law enforcement with bike and traffic safety
Adopt tree trimming ordinances	Complete	City has process; Alliant Energy maintains trees over power lines
Assure jurisdictional plans are in place and current	Underway	City has several plans in place; updated HMP and comprehensive plan being completed at same time
Conduct engineering studies on water and sewer plants/systems	Underway	SIRWA has been studying water needs; consulting engineer is updating is completing inflow and infiltration study
Conduct study on possible illegal use of sump pumps	Underway	Consulting engineer is updating as part of sewer inflow and infiltration study
Designate/enforce area HAZMAT transportation routes	Complete	Routes are designated with signage. Very unlikely all traffic will be confined to a few streets that are rural highways
Develop/enforce snow removal policies	Complete	City has equipment and policies in place for snow emergencies
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Ongoing	Bi-annual updates; EMA has information; City aware of potential issues
Formally designate and stock community post-disaster shelters (food and lodging – support of	Complete	City hall is designated and has most amenities but needs backup fixed power source.

Red Cross or other groups)		
Implement zoning	Ongoing	City has zoning in place – needs to update to include mitigation
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities, etc.
Inspect water lines	Ongoing	SIRWA owns and inspects regularly
Install speed limit signs	Complete	County and City have signs and enforcement mechanisms
Make all public buildings handicap accessible	Complete	Has been complete for many years
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; Lorimor is involved in process.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Develop search and rescue teams	Ongoing	Local volunteers serve on a regional team
Implement bomb squad program	Ongoing	Available through Des Moines Fire/regional team
Maintain Emergency Operations Center with 24-hour capability	Ongoing	Union County EMA working on this issue
Purchase snow trucks, plows, and sanders	Complete	Adequate on hand
Designated public information officer	Complete	Mayor technically; EMA also involved
Purchase road closure barricades	Complete	City has a few but adequate number of barricades
Purchase snow trucks, plow, sanders	Complete	City has adequate equipment for near future
Purchase thermal imaging equipment	Complete	Fire department has one functional unit
Purchase vehicle extrication equipment	Complete	Fire department has one functional unit
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Bury utility lines in new areas of development	Ongoing	Common practice today by utilities; however, not city required
Construct or elevate wastewater lift stations	Complete	In place and not in a flood hazard area; works well
Install potable water pressure tanks/towers *	Complete	SIRWA has water tower in town
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
GIS mapping system implementation and digital hazard maps	Ongoing	Maps in place on county websites; FEMA will be doing flood maps; regular maps are part of comprehensive plan
Identify need for and extent of non-English literature and programs *	Ongoing	Translation apps on audio and video have improved; first responders and civic leaders trained in Spanish, translators available; many information brochures available in Spanish now
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, gas line operators, roads, bridges
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Update comprehensive plans to include mitigation measures in the land use planning process and recommendations *	Underway	Comprehensive plan is underway and nearly completed
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Lorimor either by the City or by partnering agencies, such as, but not limited to, County agencies, the EMA, SIRWA, the local fire department, or utility providers.

Outlook and Future Development

The population of Lorimor is likely to continue a slow decline, as has been the case for the past decade. The nucleus of services and businesses ensures the town will not face significant decline. While little new development is likely, it is possible that a few new homes will be built in existing development areas. However, Lorimor continues to have potential for continued infill residential growth with modest potential for industrial and commercial growth if the right investments are made in the city and property costs remain affordable. Conversion of farmland on any wide scale is not likely, nor is development in possible flood hazard areas. The recent activities of the City, and its active participation in most steps of the planning process, indicate that it is likely that the City will implement many of the proposed mitigation actions in this plan.

City of Shannon City

Located in the south central edge of the county, and crossing partially into Ringgold County, Shannon City is one of the small towns with 66 people, nearly all living in the Union County side of town. The city is managed by a city council of 5 elected members and an elected mayor. A city clerk administers the city. The City also contracts for maintenance and public works on a limited basis.

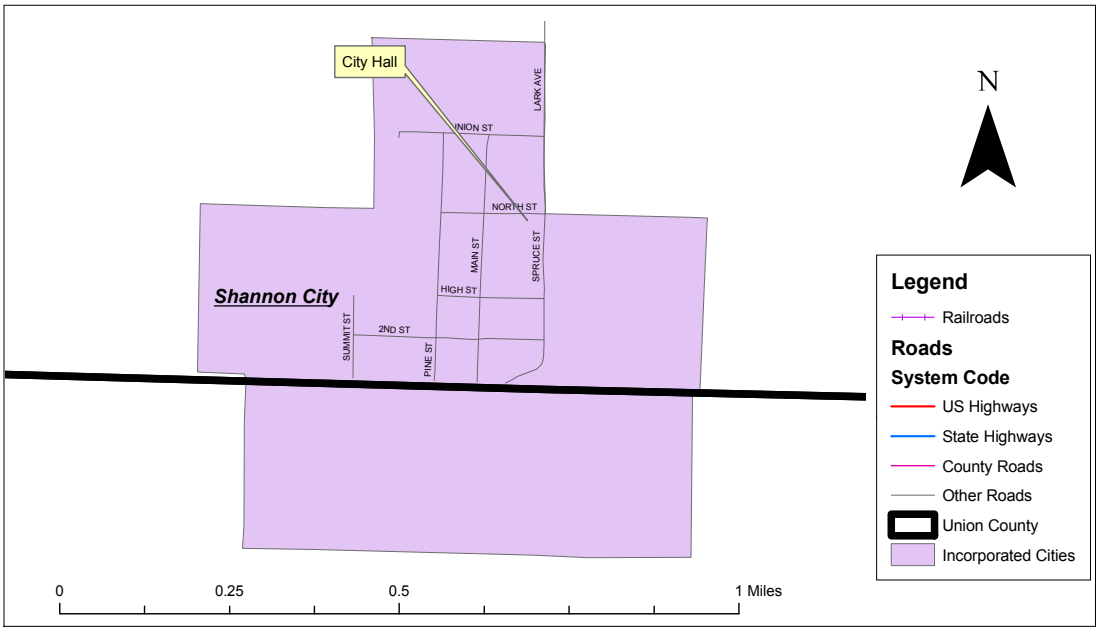
Shannon City Historical Context

Shannon City was located in Grant Township, Union County, and adjoins the Ringgold County line, on the Diagonal railroad. It was laid out June 5, 1888. It contained three stores, post office, blacksmith shop, hotel, boarding house, and brass band and drum corps. *(Source: Directory Of Shannon City, 1888 & 1889: (http://freepages.genealogy.rootsweb.ancestry.com/~unioniowa/shannoncity.htm)*

Shannon City Physical Profile

Shannon City is accessed via U.S. Highway 169, which passes 2 miles east of town) and County Ringgold-Union Street. It occupies 0.15 square miles on a sloping area facing south, much of which is residential area, surrounded by agricultural land along the fringes of the city. Approximately 2 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is approximately 1,149 feet. The base map of Shannon City below shows the town boundaries, street patterns, and key facilities.

Figure 2 – 39: Map of City of Shannon City



Shannon City Infrastructure, Services, and Resources

The city council meets monthly at a central building that contains a council meeting room. The City owns no other significant property.

Potable water is provided from the Twelve-Mile Lake water treatment plant fifteen miles northwest of Shannon City by SIRWA. A water tower is located near the town that supports adequate water pressure and meets firefighting needs. Water lines are generally in adequate condition to meet existing and likely future growth.

SIRWA manages via a franchise with the City individual onsite septic systems in compliance with State law. The systems were installed about five years ago and generally meet local needs.

Shannon City contracts with Alliant Energy for electric energy. The town has no substations. There is no local production capacity at this time.

The town is served by LP services for heating and other fuel energy. Most homes and other businesses contain aboveground tanks that store the fuel. Other properties use wood, corn, or other fuels. There are no pipelines in the immediate area.

The City of Shannon City manages roads and sidewalks. Most transportation infrastructure is in poor condition, with the remaining being either fair or good condition. Most streets are gravel or blacktop surface with modest maintenance investment and no curb and gutter. Many streets are in very poor condition. The City is seeking funding to improve streets in 2012-13.

Storm water control systems are limited in the town. Most water that falls in Shannon City goes into drainage ditches in residential areas and along streets. Culverts are located strategically to move water to streams and other areas outside of the city. Standing water and water flow issues remain in some locations; there are many ditches along streets, which can flood yards if they are not maintained. A moderate slope to the south ensures that most water flows through the town.

Shannon City is served by the Afton Fire Department 12 miles northeast of town. See the City of Afton profile for details on fire services.

Shannon City contracts with the Sheriff for law enforcement. The Union County Sheriff's Office in Creston (20 miles northwest) is the County's E911 dispatch center.

East Union CSD near Afton serves the City from a campus 13 miles northeast of Shannon City.

The Fiscal Year 2010 100% valuations for Shannon City were $1.2 million for residential properties, $127,000 for agricultural property, $17,000 for commercial property, and $0.12 million for utilities. Shannon City levied a tax rate of $6.99228 for regular property; the extended tax rate was $39.58235. The Fiscal Year 2012 budget was almost $15,000.

Shannon City is home to churches and a few small businesses.

Shannon City does not have a warning siren for outdoor warnings. Instead all residents have been given or have other access to weather radios. At this time, there are no public backup power generators. Local churches kitchens that can serve the public during and after disaster events. No facilities in the City are designated as tornado safe rooms capable of withstanding 250 MPH winds.

Public service providers for the City of Shannon City are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: Southern Iowa Rural Water Association
- Electric: Alliant Energy
- Natural Gas: none; individual LP tanks supplied by LP distributors
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Union and Ringgold County Sheriff
- Fire protection: Afton Fire Department
- Ambulance: Greater Regional Medical Center (Creston); Ringgold County Hospital (Mount Ayr)
- Public notifications: *Afton Star Enterprise*
- Sanitation: Waste Management
- Civic organizations: church groups.

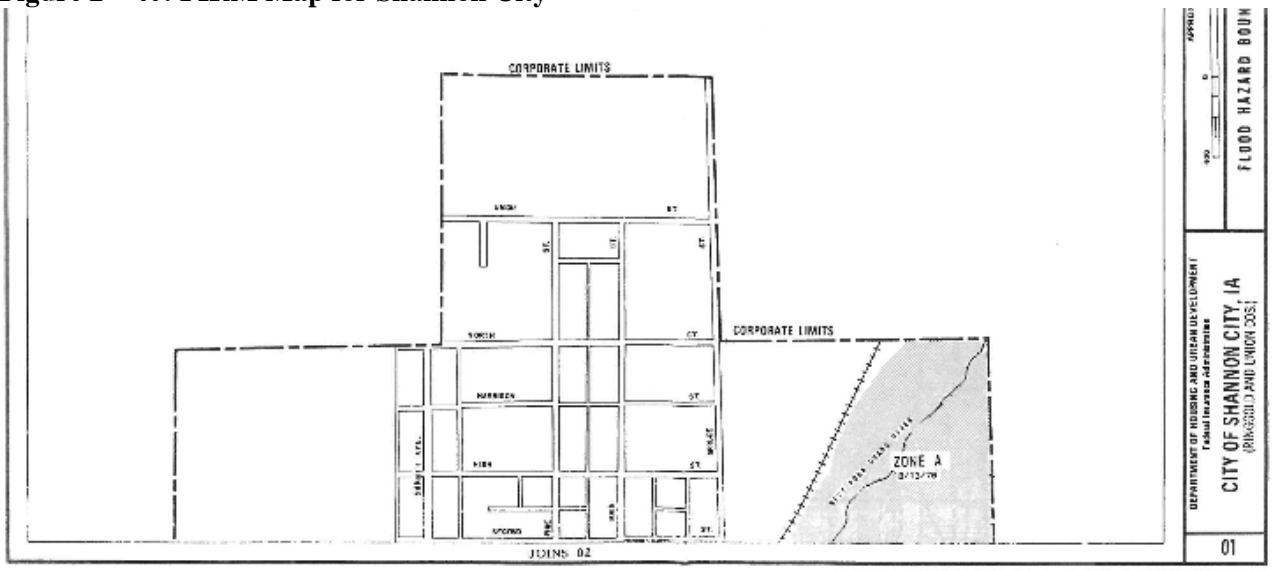
City website: none.

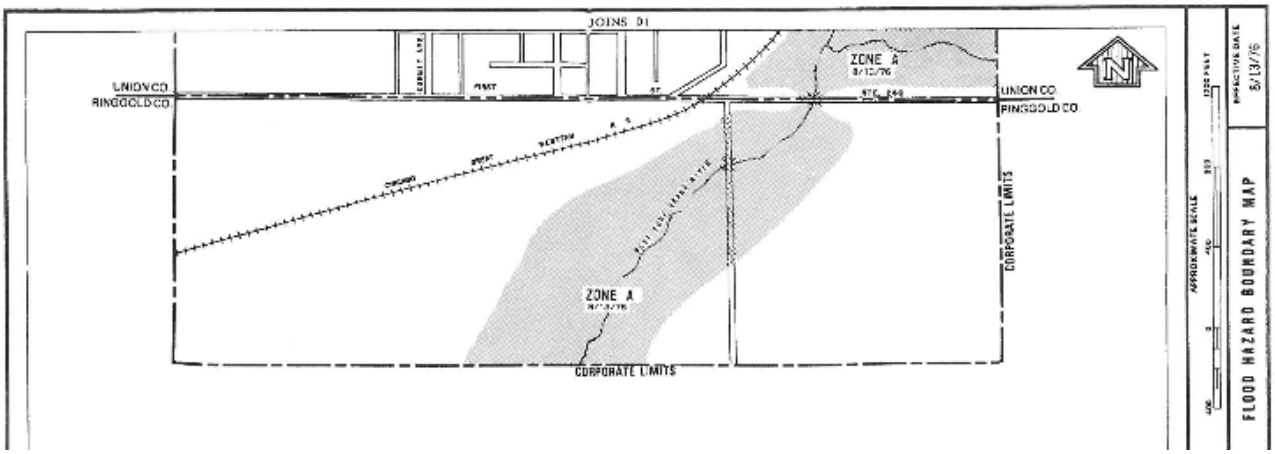
NFIP Participation

Shannon City participates in the NFIP Program. The CID# is 190521#. The City has been in the program since August 2005. There are no policies in force (as of October 2010) and there have been no claims.

The City has an initial FIRM map. DFIRMs have not been created for this area. Residential, open space, and agricultural areas are located in the SFHA or within areas to be surveyed for inclusion by map updates being performed by the IDNR in the next year.

Figure 2 – 40: FIRM Map for Shannon City





Planning Capabilities and Status

The City of Shannon City participated in the Union County HMP approved in 2006. The town is actively involved in most of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: participation in the Union County EOP, a community facilities list (2006 Union County HMP), participation in regional economic development and transportation planning processes, and watershed plan in collaboration with Union and Ringgold County NRCS/SWCD agencies.
- Polices and ordinances in effect include: flood plain development ordinance, drainage ordinance, nuisance ordinance, storm water ordinance, and debris management plan (Part C of the EOP).
- Programs and operations include: NFIP participation, hazard awareness program, ISO fire rating, tree trimming program near power lines, and participation in mutual aid agreements with fire, EMS, law enforcement, and utilities.

- Maps, studies, and reports include: vulnerable population inventory (senior housing), flood insurance study, flood hazard map, evacuation plan map, and past hazard analysis and risk assessment.
- Staff and departments include: fire department with an emergency response team and HAZMAT expert, participation in the county LEPC and EMA, and participation in regional planning through the Southern Iowa Council of Governments.
- NGOs include: utility companies, American Red Cross through the County contract.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Shannon City, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 -41: Shannon City Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Nursing facilities, senior/handicap housing have built-in alerts, Code Red since 2008 fills gaps
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Promote NOAA weather radio – give-away or rebate program	Complete	EMA and city worked on a giveaway program; not sure if all residents use them regularly
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, EU Schools, driver education classes, and law enforcement with bike and traffic safety
Acquire modern chemicals and equipment for firefighting	Complete	Afton Fire; replacing turnout gear at this time
Develop/implement watershed studies and plans for possible flood prone areas	Underway	Participation with Union and Ringgold County Soil and Water Conservation Districts and NRCS staff
Enforce burning restrictions	Complete	In place; when declared County and Afton Fire take lead role
Establish partnerships with other jurisdictions to control storm water	Ongoing	Two counties involved along with farmers in the area
Formulate partnerships to gain legislation	Ongoing	City part of Iowa League of Cities, etc.
Inspect water lines; ensure adequate water supply and sources	Ongoing	SIRWA owns and inspects regularly; SIRWA has water source lake plan
Install and update anti-virus software	Ongoing	City does for City-owned computers
Install speed limit signs	Complete	County and City have signs and enforcement mechanisms
Promote good landscaping practices among property owners	Ongoing	City, NRCS, FEMA NFIP education provided
Remove asbestos from public buildings	Complete	No known hazards in city remain
Remove underground fuel storage tanks	Ongoing	Most have been mitigated; more will be when no longer used
Develop soil erosion stabilization projects	Complete	Projects done in the area; stream is managed well; flood potential is limited onto developed land; erosion limited
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; city is involved in process.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Create continuity of operations and maintenance plan for the city *	Complete	In place; may need updated from time to time
Develop/implement an extreme heat event medical response plan	Complete	Equipment available by two county EMS providers (Union and Ringgold) and area fire departments
Develop/update/publicize evacuation plan *	Complete	In place; there is only one main road entering city
Participate in a regional HAZMAT team	Ongoing	Union/Ringgold contract with regional team
Purchase snow trucks, plows, and sanders	Complete	County or private individuals provide on contract
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Develop reservoirs and lakes	Complete	Major water source lakes are in place; flood control reservoir near town not needed
Clear and deepen ditches on right-of-ways	Ongoing	Last round done citywide 3 years ago; not needed now
Install potable water pressure tanks/towers *	Complete	SIRWA has water towers in the area

Community drills *	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City site, access to county transfer station 16 miles north
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Full review of policies, procedures, and codes to include mitigation	Ongoing	EMA and city have worked on; may need another review after plan is complete
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, roads, bridges
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Shannon City either by the City or by partnering agencies, such as, but not limited to, County agencies, the Emergency Management Agency, SIRWA, the local fire department, or utility providers.

Outlook and Future Development

The population of Shannon City is likely to continue a slow decline, as has been the case for the past decade or more. Development of any kind on new property is very unlikely, and the town could face disincorporation after the next five years. Conversion of farmland on any wide scale is not likely, nor is development in possible flood hazard areas. The recent activities of the City, and its active participation in most steps of the planning process, indicate that it is likely that the City will implement many of the proposed mitigation actions in this plan.

City of Thayer

Located in the far eastern central part of the county in Jones Township, Thayer is one of the small towns with 59 people. The city is managed by a city council of 5 elected members and an elected mayor. A city clerk administers the city. The City also contracts for maintenance and public works on a limited basis.

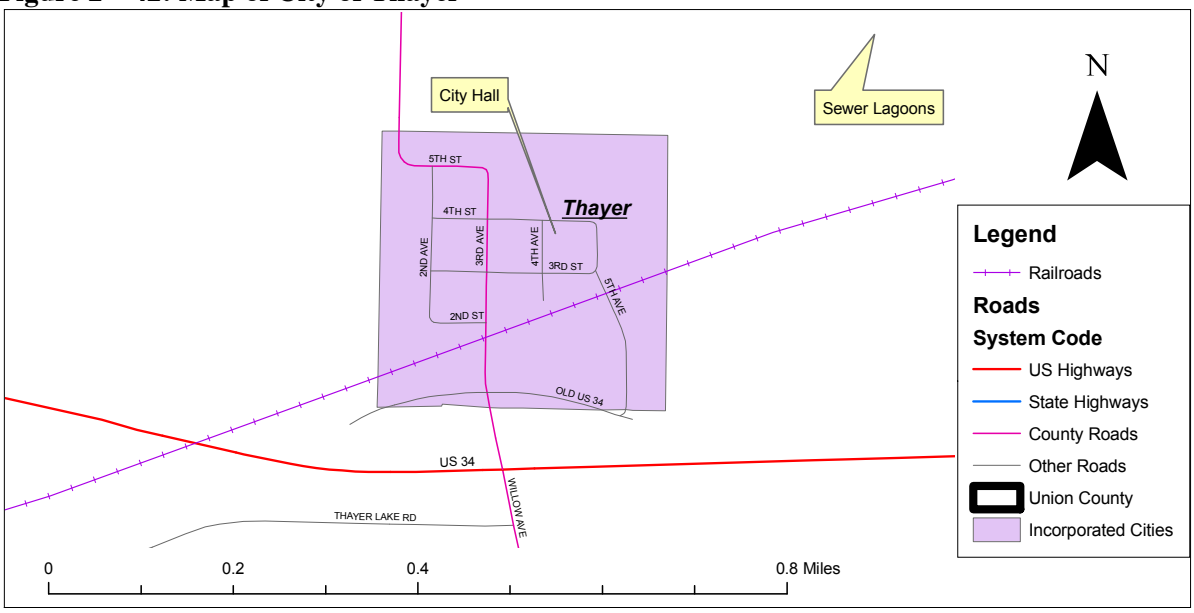
Thayer Historical Context

One of the oldest towns in the county, Thayer had well over 100 persons in 1893 and nearly 300 in the 1920s. It once held a school, bank, lumber store, barber shop, lodges, and businesses, some of which utilized the railroad. *(sources: www.iagenweb.org/union/history/thayer.htm)*

Thayer Physical Profile

Thayer is accessed via U.S. Highway 34, which passes just to the south of the town limits. The BNSF main line railroad travels through the town. It occupies 0.3 square miles on a sloping area facing south, much of which is residential area, surrounded by agricultural land along the fringes of the city. Approximately 2 miles of mostly gravel and blacktop roads are found in the city, occupying a mostly grid pattern. The town's mean elevation is approximately 1,107 feet. The base map of Thayer on the next page shows the town boundaries, street patterns, and key facilities.

Figure 2 – 42: Map of City of Thayer



Thayer Infrastructure, Services, and Resources

The city council meets monthly at a former church in the northeast part of the city. The City owns no other significant property.

Potable water is provided from the Twelve-Mile Lake water treatment plant fifteen miles west of Thayer by SIRWA. A water tower is located near the town that supports adequate water pressure and meets firefighting needs. Water lines are generally in adequate condition to meet existing and likely growth needs at this time.

Virtually all the city is served by a new central sewer system operated by SIRWA with sewer lines and a multi-cell lagoon system northeast of town. The lagoons are in good condition and can handle Thayer's potential growth. Sewer lines are in good condition, as they are only about three years old.

Thayer contracts with Alliant Energy for electric energy. The town has no substations. There is no local production capacity at this time.

The town is served by LP services for heating and other fuel energy. Most homes and other businesses contain above-ground tanks that store the fuel. Other properties use wood, corn, or other fuels. There are no pipelines in the immediate area.

The City of Thayer manages roads and sidewalks. Most transportation infrastructure is in poor condition, with the remaining being in fair condition. Most streets are gravel or blacktop surface with modest maintenance investment and no curb and gutter. Some streets are low-maintenance roads where traffic is restricted.

Storm water control systems are limited in the town. Most water that falls in Thayer goes into drainage ditches in residential areas and along streets. Culverts are located strategically to move water to streams and other areas outside of the city and under the railroad. Standing water and water flow issues remain in some locations; there are many ditches along streets, which can flood yards if they are not maintained. A moderate slope to the south reduces the incidence of standing water.

The town is served by the Lorimor Fire Department, located 9 miles northwest of Thayer. See the City of Lorimor profile for district information.

Thayer has contracts with the Sheriff for assistance as needed. The Union County Sheriff's Office in Creston (20 miles west) is the County's E911 dispatch center.

East Union CSD serves the City and surrounding area from a campus about a half-mile east of the Afton on High School Drive (10 miles west).

The Fiscal Year 2010 100% valuations for Thayer were nearly $514,000 for residential properties, $7,000 for agricultural property, $45,000 for commercial property, $97,000 for railroad property, and $95,000 for utilities. Thayer levied a tax rate of $8.10 for regular property; the extended tax rate was $40.69007. The Fiscal Year 2012 budget was just over $15,000.

Thayer is home to very limited non-profit and for-profit entities.

Thayer has one centrally located warning siren for outdoor warnings, which is sounded remotely from Lorimor Fire/EMS when a warning is issued. At this time, there are no public backup power generators. Local churches kitchens can serve the public during and after disaster events. Thayer has no facilities designated as tornado safe rooms capable of withstanding 250 MPH winds.

Public service providers for the City of Thayer are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: Southern Iowa Rural Water Association
- Electric: Alliant Energy
- Natural Gas: none; individual LP tanks supplied by LP distributors
- Internet and Phone: Grand River Mutual, cable and wireless providers
- Police protection: Union County Sheriff
- Fire protection: Afton and Murray Fire Departments.
- Ambulance: Greater Regional Medical Center (Creston)
- Public notifications: *Afton Star Enterprise*
- Sanitation: Waste Management
- Civic organizations: church groups.

City website: none.

NFIP Participation

Thayer does not participate in the NFIP Program. The town has not been mapped and there are no FEMA designated SFHAs. City officials and the planning team recognize that ditches have flooded during and after heavy rains (flash flooding), but there are no major waterways that would sustain long-term flooding (a day or more) within the city.

Planning Capabilities and Status

The City of Thayer participated in the Union County HMP approved in 2006. The town is actively involved in most of the county and regional planning efforts that affect hazard mitigation; the town is also active in the Union County Emergency Management Agency.

Other planning and training efforts include:

- Planning capabilities and plans in place include: participation in the Union County EOP and a community facilities list (2006 Union County HMP).
- Polices and ordinances in effect include: flood plain development ordinance, drainage ordinance, nuisance ordinance, storm water ordinance, and debris management plan (Part C of the EOP).
- Programs and operations include: utility-ran tree trimming program near power lines and participation in mutual aid agreements with fire, EMS, law enforcement, and utilities.
- Maps, studies, and reports include: past hazard analysis and risk assessment.

- Staff and departments include: fire department with an emergency response team and HAZMAT expert, participation in the county LEPC and EMA, and participation in regional planning through the Southern Iowa Council of Governments.
- NGOs include: utility companies, American Red Cross through the County contract.

Current, Underway, and Ongoing Hazard Mitigation Efforts and Programs

The town of Thayer, groups within the city, or groups outside the city that directly impact the city participate in a number of mitigation actions. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive. An * denotes those hazard mitigation projects that were proposed in the previous five-year plan that are now underway, ongoing, or completed.

Figure 2 – 43: Thayer Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Increase public awareness on household hazardous materials	Ongoing	Prairie Solid Waste Agency runs a HHM collection center and an active HHM education program
Install warning sirens for outdoor warning *	Complete	Siren is centrally located, has enough volume, and functions well
Reverse E-911 program	Ongoing	Code Red program in active use since 2008 to alert people with phones for all kinds of hazards
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, EU Schools, driver education classes, and law enforcement with bike and traffic safety
Inspect water lines; ensure adequate water supply and sources	Ongoing	SIRWA owns and inspects regularly; SIRWA has water source lake plan
Develop soil erosion stabilization projects	Complete	Projects done in the area where slopes are created by railroad
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan *	Underway	Updates underway at this time at EMA level with collaboration of applicable local jurisdictions; city is involved in process.
Annual storm spotter training *	Ongoing	Held every spring, free, and public is invited via local media
Purchase snow trucks, plows, and sanders	Complete	County or private individuals provide on contract
Flush dead end water mains	Ongoing	SIRWA owns and maintains; publicizes when flushing occurs
Continue partnering with local, regional, and statewide energy suppliers *	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors *	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements *	Ongoing	SIRWA, energy suppliers, roads, bridges
Develop regional water supply plans in concert with SIRWA *	Complete	Regional looping study completed; lakes in region planned
Maintain mutual aid compacts; file at EMA; continue mutual aid services *	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding *	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Continue participation in regional economic development strategy *	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

* Proposed projects in 2006 HMP that have been implemented (may be worded differently in original plan)

Dozens of actions are being undertaken in Thayer either by the City or by partnering agencies, such as, but not limited to, County agencies, the Emergency Management Agency, SIRWA, service and response agencies, or utility providers.

Outlook and Future Development

The population of Thayer is likely to continue a slow decline, as has been the case for the past decade or more. Development of any kind on new property is very unlikely. Conversion of farmland on any wide scale is not likely, nor is development in possible flood hazard areas. Thayer has invested limited effort in the planning process and it is likely that only very low-cost mitigation actions will be implemented, despite potential need for many actions.

Creston Community School District

The Creston Community School District is a relatively large district in the northeast part of the county. The 2010-11 enrollment was 1,541 students from pre-K to 12th Grade. In 2011-12 the enrollment was 1,429 and there were 130 teachers and 123 administrators and classified staff. The district serves the communities of Creston and

Cromwell and approximately 40% of the rural county. Creston CSD benefits from the support of residents, parents, and taxpayers in the western part of the county.

Creston CSD Infrastructure, Services, and Resources

All school assets are found in Creston and are listed as part of the city of Creston critical asset list in *Chapter 5*. The facilities are located in various parts of the town. Instructional centers include the high school, elementary/middle school, the early childhood center, and the alternative high school (High Lakes Academy). Accessory uses include athletic fields, parking areas, transportation facilities, and other outbuildings. See *Figure 2 – 31* for a map showing the locations of main assets. Addresses of schools include:

- High School: 601 W. Townline Street
- Middle/Elementary School: 805 Academic Avenue
- Early Childhood Center (commonly called the ECC): 901 N. Elm St.
- High Lakes Academy: 801 N. Elm St.

Many community organizations and some civic groups use the school assets for programs and events outside of school hours.

As described in the hazard profile (*Chapter 4*), many Creston School assets were moderately to severely damaged in the April 2012 tornado.

In FY 11-12, Creston CSD levied a tax rate of $15.96018 for regular property. The total levy was almost $4.9 million. In FY 11-12, the district had the following assessed valuations: $300 million residential, $96 million agricultural, $73 million commercial, $19 million industrial, $6 million railroads, $46 million utilities, for a total of $537 million. Other tools to implement mitigation projects include: debt through bonding, property taxes, grants, fundraising, and a local option sales tax for infrastructure.

The school uses many of the services available in the city in which the buildings are located. With prepared lunches available and the large size of buildings, the school assets are available for community feeding shelters during and after severe weather.

The school's website is www.creston.k12.ia.us/.

Public service providers for the Creston CSD are as follows:

- Water: Creston Water Works
- Sewer: City of Creston
- Electric: Alliant Energy
- Natural Gas: Alliant Energy
- Internet and Phone: Windstream, Iowa Communications Network (ICN)
- Police protection: Creston Police Department
- Fire protection: Creston Fire Department
- Ambulance: Greater Regional Medical Center
- Public notifications: *Creston News Advertiser*
- Sanitation: Waste Management
- Other school infrastructure: athletic fields, ball diamonds, tennis courts, elementary playgrounds, practice facilities, bus building

Creston School District invests approximately $20,000 annually on mitigation activities. The exception in recent years has been the local funding of at least $700,000 for a two FEMA funded tornado safe rooms.

NFIP Participation

The City of Creston is participating in the NFIP. The ECC property on North Elm Street includes part of the Hurley Creek FHA. The creek travels through school property and under part of the building (gym area) in a 1,000' long concrete pipe. The gym has suffered some settling in this area, akin to a minor slow sinkhole.

Planning Capabilities and Status

The Creston CSD participated in the County's Emergency Operations Plan (EOP) prepared with the assistance of the Union County EMA.

Other planning and training efforts include:

- Plans in place include a five-year facility plan adopted in 2010, a hard surface road policy and plan for bussing, and track and safe room storm water control plans.
- Codes are enforced by annual inspections of the State Fire Marshal.
- All building plans must be State approved and go through public comment.
- The District has a maintenance director that serves as a building official.
- District has a public awareness program focusing on tornadoes, fires, train safety, and bus evacuations.
- Evacuation plans are in place and each building has a policy and maps for proper evacuation of the building.
- District is a member of the LEPC and the EMA.
- District has a transportation department to manage buses and bussing programs.
- District is National Incident Management Systems (NIMS) compliant.
- Mutual aid agreements are on file for all services.

Current Mitigation Actions

Creston Schools has been involved in hazard mitigation actions affecting school assets only, not all areas of the school district. In addition to the planning and emergency response plans and policies available in each community, the school district maintains handbooks for each school. Handbooks include prevention and response information for potential emergencies such as tornado, fire or weapons. The school also has a written crisis policy. All visitors to the school campuses are required to check in at the main offices to obtain permission to be in the buildings. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive.

Figure 2 – 44: Creston CSD Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Promote/provide tornado safe room design education for builders and developers	Ongoing	With two safe rooms underway, local builders are aware of the programs and technology, could be expanded
Promote NOAA weather radio on site	Complete	Central Office has one; evaluating need for others in two bldgs
Improve public awareness of hazard risks – dispense information (written and online)	Ongoing	School has active programs for students and completes regular drills
Rail and highway transportation programs	Ongoing	Performed by BNSF Railroad, Creston Schools, driver education classes, and law enforcement with bike and traffic safety
Install warning siren systems	Complete	Creston updated sirens in the neighborhoods of schools to warn children outside for recess, etc.
Post an information sign or kiosk	Complete	In front of High School and within buildings
Enforce/follow OSHA HAZMAT regulations	Ongoing	Staff trained and protocols followed
Assure local plans are in place and current	Ongoing	Plans are in place currently to address aspects of mitigation and other elements of emergency management
Install speed limit signs	Complete	City has signs and enforcement mechanisms as well as road markings
Install and update anti-virus software	Ongoing	District does for District-owned computers
Formally designate and stock community post-disaster shelters (food and lodging)	Complete, ongoing	Third party agreements are in negotiation; cafeteria and other buildings used during area hazard events and those on campus
Formulate partnerships to gain legislation	Ongoing	District is part of several advocacy groups
Develop electronic directory of local and other resources	Complete	District program is on computers but not available to students, staff, and general public
Develop/enforce snow removal policies	Ongoing	Policies in place for staff and equipment use and for student parking areas
Backup jurisdictional files and records – store in alternative locations	Complete, ongoing	Policy and facilities in place; backup process is ongoing
Restricted access procedures	Ongoing	Policies and equipment in place and implemented during certain

		emergencies
Make all school facilities handicap accessible	Complete	All buildings now meet ADA requirements
Lightning protection of tall buildings/towers	Complete	Campus buildings and all light poles are protected
Remove asbestos from schools	Complete	Certified asbestos free
Integrate safe room retrofits into critical assets	Underway	FEMA funded for two sites as part of addition to buildings
Install windbreaks	Complete	Needed and since installed to west and north of Elem/Middle School and bus barn – trees are not yet mature
Demolish abandoned properties	Complete	All school properties not used have been sold or demolished
Tree trimming projects for school property	Ongoing	District has equipment and staff in place – addresses well
Tree planting programs on school property	Ongoing	District plans trees regularly throughout school properties
Remove dead vegetation on school property	Ongoing	Policy and staff in place; District handles well
Install backflow devises	Complete	Installed with new construction and modification of existing building sewers
Adopt/promote a terrorism response plan	Complete	Crisis plan in place with a focus on specific terrorism issues
Develop recovery plan for power failure	Underway	School has means to conserve energy and focus on certain parts of the campus when power needs restored
Annual storm spotter training	Ongoing	Held every spring, free, and public is invited via local media
Develop/implement an extreme heat event medical response plan	Complete	Equipment available EMS providers and area fire departments; all buildings air conditioned; students dismissed when it will be too hot; sports practices canceled when needed
Review/update hazardous materials emergency plan	Complete	Limited issue in district property, but some risks with science classrooms and cleaning supplies
Develop/update/publicize evacuation plan	Complete	Evacuation plan in place for various hazards and plans to address going to nearby churches and other areas during a threat
Hire or designate a public information officer	Complete	Superintendent is designated
Create continuity of operations and maintenance plan for the District	Complete	In place; may need updated from time to time
Purchase road closure barricades	Ongoing	Able to borrow from City or County for the rare times needed
Develop volunteer base of trained persons	Complete	Campus staff and student groups
Purchase new, modernize, and/or harden existing mobile and personal first response communication equipment and systems	Complete	New digital radios are modern and meet interoperability and FCC standards; are programmed to communicate with emergency responders in the area
Purchase snow trucks, plows, and sanders	Complete	School has adequate equipment for school properties
Install GPS units in school vehicles	Complete	In busses
Full sprinkler systems	Complete	Two buildings sprinkled; third is not required to be sprinkled
Construct school safe rooms on school property	Underway	Two are being built to serve schools and athletic facilities
Purchase/install backup fixed power generators and pumps	Underway	As part of safe room projects
Purchase stand-by portable pumps	Complete	On hand
Investigate and implement alternative energy sources	Ongoing	New Elem/Middle School building is very efficient; has looked at additional energy projects; may continued to do so
Full review of policies, procedures, and codes to include mitigation	Ongoing	EMA and School have worked on; may need another review after plan is complete
Community drills	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Complete	Cameras and lighting are strategically placed and monitored at two buildings
Install sustainable storm water control options such as buffer strips, bioswales, rain gardens	Complete	Retention basin pond near new school building
Place law enforcement in schools	Complete	Juvenile liaison officer
Alternate bus routes and plans for road closures	Complete	Plan in place and updated as needed
Ensure NIMS compliance among all sectors	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible

Note that the schools did not directly participate in the original planning process in terms of listing specific mitigation actions. After the approval of the original plan, Creston Schools adopted an amended version with a limited list of mitigation actions, including the construction of tornado safe rooms. This was done as part of an HMGP application that was funded by FEMA and the State of Iowa.

Dozens of mitigation actions are being undertaken in the District either by District leadership or by partners, including the EMA, City of Creston, utility providers, and State/Federal agencies, on behalf of the District.

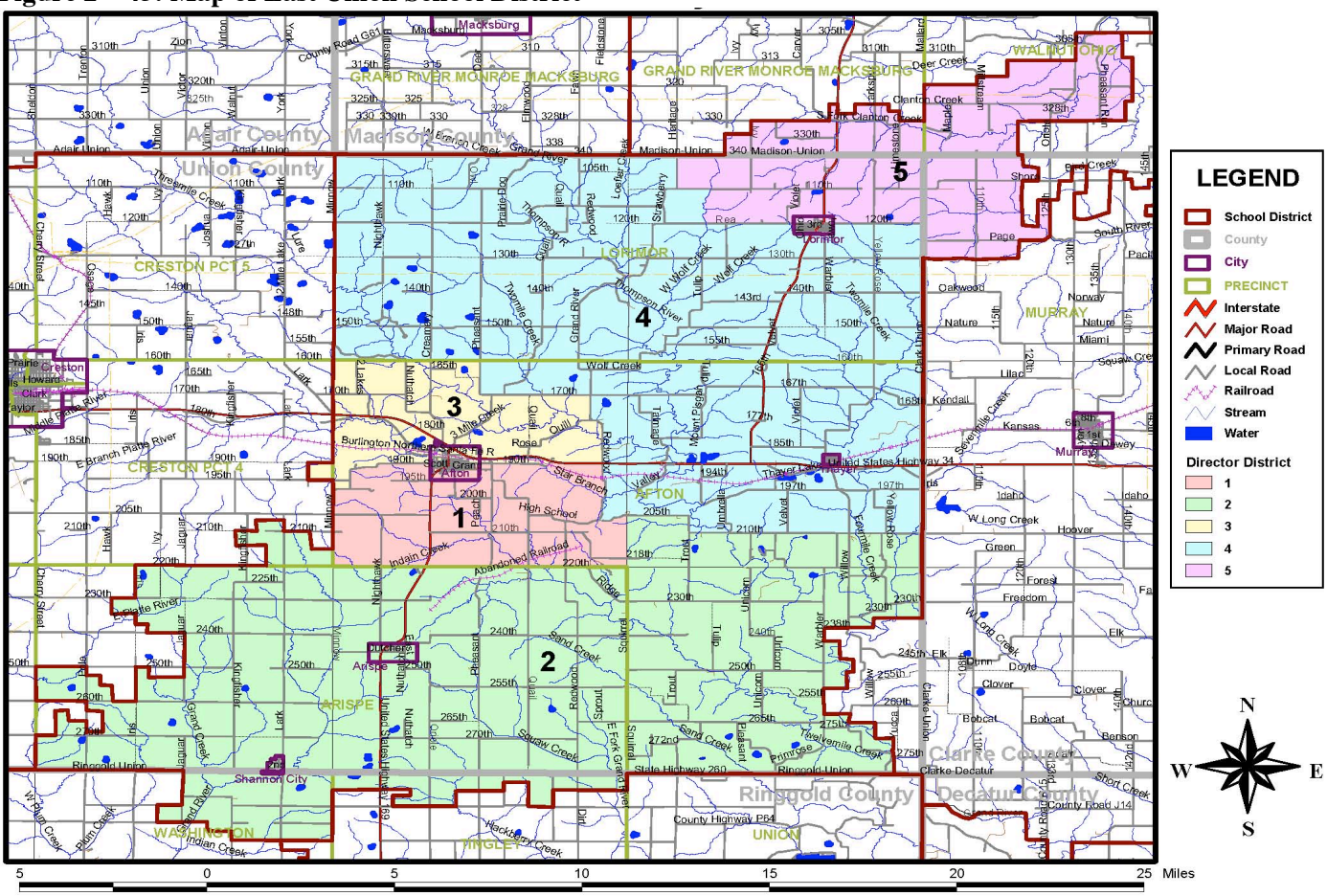
Outlook and Future Development

Creston Community School District will likely invest in very modest growth of assets, mostly on the same properties already owned. The district recently built the new elementary/middle school and is building two safe rooms. The buildings are adequate to meet enrollment potential in the next five years. Some new construction to replace buildings and assets damaged by the 2012 tornado is already underway. School equipment is expensive and the value of properties is likely to continue to increase even without annual construct ion projects.

East Union Community School District

The East Union Community School District is a relatively large district in the eastern part of the county. The 2010-11 enrollment was 448 students from pre-K to 12th Grade. The district serves the communities of Afton, Arispe, Thayer, Shannon City, Lorimor, and approximately 40% of the rural county. East Union CSD benefits from the support of residents, parents, and taxpayers in the western part of the county. The following map shows the school district as currently constituted.

Figure 2 – 45: Map of East Union School District



Source: East Union Schools

East Union CSD Infrastructure, Services, and Resources

All school assets are found just outside of Afton and are listed as part of the Union County critical asset list in *Chapter 5*. Instructional centers include the K-8 school and the pre-school. Accessory uses include athletic fields, parking areas, transportation facilities, and other outbuildings. All school assets are now at 1916 High School Drive just east of Afton on 40 acres of land. Phone number is 641.347.5215. Many community organizations and some civic groups use the school assets for programs and events outside of school hours.

In FY 11-12, East Union CSD levied a tax rate of $16.71413 for regular property. The total levy was almost $2.1 million. In FY 11-12, the district had the following assessed valuations: $77 million residential, $98 million agricultural, $7 million commercial, $1 million industrial, $5 million railroads, $14 million utilities, for a total of $202 million. Other tools to implement mitigation projects include: debt through bonding, property taxes, grants, fundraising, and a local option sales tax for infrastructure.

The school uses many of the services available in the city in which the buildings are located. With prepared lunches available and the large size of buildings, the school assets are regularly used as community feeding shelters during and after severe weather.

The school's website is www.east-union.k12.ia.us/.

Public service providers for the East Union CSD are as follows:

- Water: Southern Iowa Rural Water Association
- Sewer: City of Afton
- Electric: City of Afton; Alliant Energy
- Natural Gas: MidAmercian Energy
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Union County Sheriff
- Fire protection: Afton Fire Department
- Ambulance: Greater Regional Medical Center (Creston)
- Public notifications: *Afton Star Enterprise*
- Sanitation: Waste Management
- Other school infrastructure: athletic fields, ball diamonds, playgrounds, practice facilities, bus building

NFIP Participation

There are no SFHAs affecting the school assets or property. The area has not been mapped. Most of the property is located on an upland ridge where floodwaters would not have a direct impact. Flash flooding impacts some areas.

Planning Capabilities and Status

The East Union CSD participated in the County's Emergency Operations Plan (EOP) prepared with the assistance of the Union County EMA.

Other planning and training efforts include:

- District is National Incident Management Systems (NIMS) compliant.
- Mutual aid agreements are on file for all services.
- The school has a safe room operations and maintenance plan.

Current Mitigation Actions

East Union Schools has been involved in hazard mitigation actions affecting school assets only, not all areas of the school district. In addition to the planning and emergency response plans and policies available in each community, the school district maintains handbooks for each school. Handbooks include prevention and response information for potential emergencies such as tornado, fire or weapons. The school also has a written crisis policy. All visitors to the school campuses are required to check in at the main offices to obtain permission to be in the buildings. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive.

Figure 2 – 46: East Union CSD Current, Underway, and Ongoing Mitigation Actions

Mitigation Action	Status	Notes
Establish alert systems for vulnerable populations	Complete	Fire and storm warning devices on site
Increase public awareness on household hazardous materials	Complete	Signage is used for hazardous storage areas – school related hazard issues are shared with students and staff
Initial community briefings after events	Complete	System in place on school property; PA system in safe room

		addition to building
Install warning sirens	Complete	One of Afton's sirens is close to the school and can be heard by those who are outdoors
Adopt building codes to address hazards	Complete	District uses State Building Code
Develop snow removal policies	Complete	School has parking policies and equipment in place
Formulate partnerships to gain legislation	Complete	School is member or lobbying and advocacy organizations
Install and/or update anti-virus software	Ongoing	In place and updated on a regular basis
Install speed limit and bus stop signs	Complete	Signs around school campus and along highways with bus stops
Make all public facilities handicap accessible	Complete	School buildings and outdoor assets are now accessible
Restricted access procedures	Complete	In place; enforced as necessary to keep students on or not allow people on campus
Adequate smoke detectors, fire alarms, sprinklers, and extinguishers	Complete	Many in place; inspected regularly by local fire department and State Fire Marshal's office
Install windbreaks	Complete	Adequate to north and west of key areas of campus
Integrate tornado safe rooms into critical school	Complete	FEMA funded in 2010; built in 2011/12 as part of new addition
Remove unused chemical containers	Ongoing	Has been done to date and is done as new containers are used
Annual storm spotter training	Ongoing	Annually provided on a countywide basis; administrators and bus drivers participate
Develop/update/publicize school evacuation plan	Ongoing	Plan in place and promoted to users of the facilities; updated when needed; buses available to move people away
Develop volunteer bases – trained and stand-by	Ongoing	CERT group; PTA volunteers/leaders
Establish backup communications center or facilities	Complete	Elementary work room has adequate facilities to communicate throughout campus and with external response personnel
Maintain Emergency Operations Center with 24-hour capability	Complete	School has 24-hour monitoring with call out if more help is needed.
Purchase snow trucks, plows, sanders	Complete	School district has equipment to maintain campus grounds.
Construct public/school safe room	Complete	Completed as part of the school addition in 2010-12. Adequate for campus needs.
Construct storage facilities for pesticides, insecticides, chemicals	Complete	Adequate on campus grounds.
Construct storm water drainage (underground, curb and gutter, culverts, etc.	Complete	All of campus issues addressed in 2011 construction efforts.
Community drills	Ongoing	Annual activity both within the school and as part of communitywide drills and exercises.
Replace, expand, or improve water and sewer lines	Complete	City and school have updated systems to accept larger building and fix problem areas in town.
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Ongoing	School has cameras strategically placed.
Sprinkling systems	Complete	In place in key areas of the school as required by law.
Install new fire hydrants	Complete	Installed in 2011 construction efforts.

Note that the schools did not directly participate in the original planning process in terms of listing specific mitigation actions. After the approval of the original plan, East Union Schools adopted an amended version with a limited list of mitigation actions, including the construction of a tornado safe room. This was done as part of an HMGP application that was funded by FEMA and the State of Iowa.

Dozens of mitigation actions are being undertaken in the District either by District leadership or by partners, including the EMA, City of Afton, utility providers, and State/Federal agencies, on behalf of the District.

Outlook and Future Development

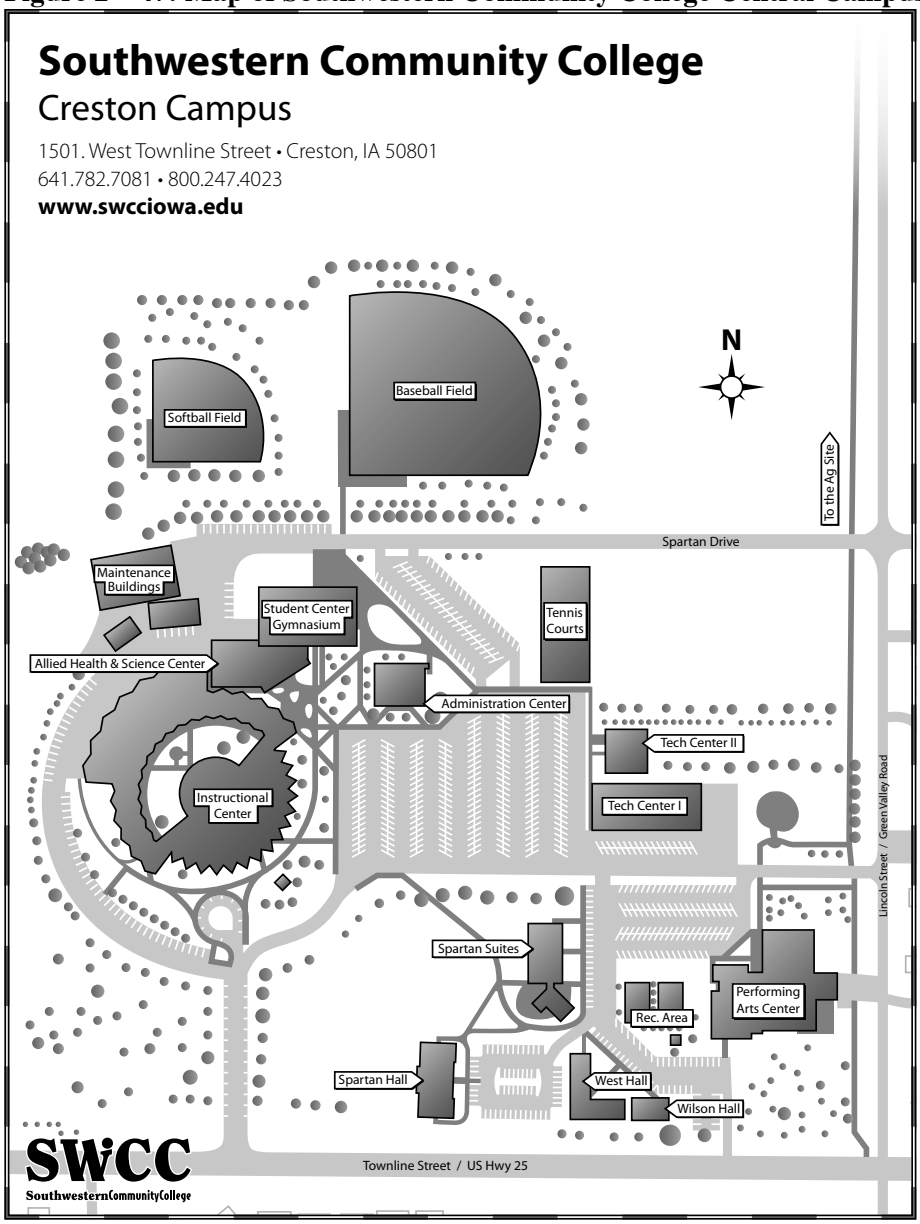
East Union Community School District will likely invest in very modest growth of assets, mostly on the same property already owned. The district recently built the new elementary school with a tornado safe room. The building is adequate to meet enrollment potential in the next five years. School equipment is expensive and the value of properties is likely to continue to increase even without annual construction projects.

Southwestern Community College

Southwestern Community College operates from a 400-acre campus in the northwest part of Creston. It is the only institution of higher education in the county. SWCC, founded in 1966, is a public two-year college serving 8 counties in the southwest part of the state of Iowa. It offers traditional programs, adult and continuing education programs, job training programs, and many other academic, athletic, and cultural activities. Approximately 1,400

students are enrolled at the main campus in Creston at this time, many of them full-time students. Approximately 10,000 people are enrolled in one or more continuing education programs annually. Some of these students go on to Buena Vista University, also housed at SWCC, to complete a four-year education. Two affiliated centers of education are found in Red Oak and Osceola, which are outside of the planning area. The campus map follows.

Figure 2 – 47: Map of Southwestern Community College Central Campus



SWCC Infrastructure, Services, and Resources

An estimated 15 buildings are located on the campus, including several student residence halls. There are seven key buildings that are listed as critical assets in *Chapter 5*. These are the Student Center, Instructional Center, dorms, Administration Building, Technical Center, Allied Health Building, and the Maintenance Building. Many community organizations and some civic groups use the college's assets for programs and events during all hours.

The institution is a public college, which collects a modest (at least compared to most other taxing districts) amount of revenue from each property owner in the region. Additionally, student tuition, room and board, grants, and donations fund and will in the future fund mitigation projects.

The college uses many of the services available in the city in which the buildings are located. With prepared lunches available and the large size of buildings, the college assets are used as community feeding shelters during and after severe weather. For example, the campus housed passengers of an Amtrak train that derailed in the area; it houses people when power (and heat) is lost during the winter, and it housed medical services as a triage after the 2012 tornado. It is also an emergency areas for those at Green Valley State Park (3 miles north) when there is severe weather.

SWCC was damaged extensively by the tornado that hit Creston in April 2012. All dorms were damaged and the Performing Arts Center was closed for months after the tornado. See the hazard profile for more information.

The college's website is www.swcciowa.edu.

Public service providers for Southwestern Community College are as follows:

- Water: Creston Water Works
- Sewer: City of Creston
- Electric: Alliant Energy
- Natural Gas: Alliant Energy
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Creston Police Department
- Fire protection: Creston Fire Department
- Ambulance: Greater Regional Medical Center (one block from campus)
- Public notifications: *Creston News Advertiser*
- Sanitation: Waste Management
- Other campus infrastructure: athletic fields, ball diamonds, tennis courts, open spaces, cultural center/YMCA, loading and unloading facilities, and parking

SWCC invests approximately $30,000 annually in hazard mitigation activities.

NFIP Participation

The City of Creston is participating in the NFIP. No college assets are within the FHA of the current FIRM.

Planning Capabilities and Status

SWCC participated in the County's Emergency Operations Plan (EOP) prepared with the assistance of the Union County EMA.

Other planning and training efforts include:

- Several plans were adopted by the college in 2010 and 2011: comprehensive plan, capital improvement plan (now being updated), EOP, economic development plan (updated annually), and fire mitigation plan.
- Other plans are the five-year strategic plan (recently updated and available online) and the recovery plan adopted in 2000.
- Policies and ordinances include a building code and debris management plan.
- Programs include: Storm Ready, economic development program, and public education/awareness programs.
- The site was assessed for flood hazards in 2008. No areas have been identified. An evacuation route and plan was created in 2011.
- Other studies include a critical facilities inventory and land use map adopted in 2011.
- SWCC relies upon the City of Creston or Union County of staffing related to building inspections, zoning, emergency management, law enforcement, fire and EMS, and sanitation. SWCC has its own building and grounds team, engineer, economic development team, housing program, transportation fleet management, and historic preservation program.
- Non-governmental organizations partnering with SWCC include: utility companies, American Red Cross, Creston Chamber of Commerce, some community groups, and Union County Development Association.

Current Mitigation Actions

Southwestern Community College has been involved in hazard mitigation actions affecting the campus and its student body. The following table describes the status of mitigation actions that are reported. This list may not be comprehensive.

Figure 2 – 48: Southwestern Community College Current, Underway, and Ongoing Mitigation Actions

Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource
Establish alert systems for vulnerable populations	Ongoing	Campus housing has built-in alerts, Code Red since 2008 fills gaps
Improve public awareness of hazard risks – dispense information (written and online)	Ongoing	Student orientation, residence hall meetings, student/college newspaper
Initial community briefings immediately after events	Ongoing	Policy in place for campus leadership in partnership with City of Creston, County, and State of Iowa
Install hazard signs in area campgrounds, parks, and open spaces	Complete	Signs placed on campus to direct people to safe areas of buildings, to escape fires, etc.
Install warning sirens	Complete	City replaced sirens recently; one is very close to campus and would alert those outside on campus properties
Promote NOAA weather radio	Complete	Radios in key campus buildings
Reverse E-911 program	Complete	College part of countywide Code Red program in use
Rail and highway safety education for youth	Complete	Supports programs of local schools
Institute tree trimming program	Complete	Trees are well maintained by staff members
Assure jurisdictional plans are in place and current	Complete, ongoing	Many requisite plans are modern and give at least basic consideration to mitigation planning principles
Backup jurisdictional files and records – store in alternative locations	Complete, ongoing	Policy and facilities in place; backup process is ongoing
Develop/enforce snow removal policies	Ongoing	Policies in place for staff and equipment use and for student parking areas
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Complete	Leadership and EMA know where the limited amount of materials are located at a given time
Enforce or follow OSHA HAZMAT regulations	Ongoing	Staff trained and protocols followed
Enforce multi-family housing extinguisher laws	Ongoing	Enforced as required by State Fire Marshal – college buildings have adequate number of which are tested
Formally designate and stock community post-disaster shelters (food and lodging)	Complete, ongoing	Red Cross and EMA agreements in place; cafeteria and other buildings used during area hazard events and those on campus
Formulate partnerships to gain legislation	Ongoing	Part of community college empowerment organizations
Install and update anti-virus software	Ongoing	SWCC does for SWCC-owned computers
Inspect water lines; ensure adequate water supply and sources	Ongoing	City of Creston handles for the campus area
Install speed limit signs	Complete	SWCC has signs and enforcement mechanisms for campus roads
Make all campus buildings handicap accessible	Complete	All older buildings have been retrofitted; new are designed for ADA compliance; road and sidewalk network allows good access to all buildings.
Promote good landscaping practices on campus projects	Ongoing	Campus has good landscaping program that considers topography of site
Restricted access procedures	Complete	Procedures and implementation mechanism are in place
Smoke detectors in habitable structures	Complete	All buildings have modern smoke detector program
Promote private insurance purchase	Underway	After April 2012 tornado there has been new effort to promote renter's insurance for students on and off campus
Lightning protection of tall buildings/towers	Complete	Three stories is tallest building height; those buildings and all light poles are protected
Maintain sandbags in dry storage	Complete	Available when buildings may experience flash flooding
Install backflow devises on sewer systems	Complete	Complete for vulnerable campus buildings
Remove dead vegetation on public properties and nuisance areas	Ongoing	Policy and staff in place; SWCC handles well
Annual storm spotter training	Ongoing	Held every spring, free, and public is invited via local media
Create continuity of operations and maintenance plan for the school	Complete	In place; may need updated from time to time
Develop/implement an extreme heat event medical response plan	Complete	Equipment available by nearby hospital and ambulance service, nursing program has some equipment on campus
Develop/implement a thorough recovery plan for power failure	Complete	Working with City/Alliant on power needs; some buildings have backup generators
Develop/update/publicize evacuation plan	Complete	In place; students directed to go to specific locations off campus
Develop volunteer base of trained persons	Complete	Campus staff and student groups
Emergency response guidebooks in all emergency vehicles	Complete	SWCC busses and other vehicles have these as needed
Establish backup communications facilities	Complete	Communications system is duplicated

Hire or designate a public information officer	Complete	PR person on staff at direction of President
Purchase new, modernize, and/or harden existing mobile and personal first response communication equipment and systems	Complete	Systems are modern and meet interoperability and FCC standards
Purchase road closure barricades	Compete	SWCC has limited number on campus; adequate for needs
Purchase snow trucks, plows, and sanders	Complete	SWCC partnership with City; college has equipment also
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Bury utility lines on campus	Complete	All campus lines buried; policies in place for new development
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Complete	Good system on campus where there are roads and parking areas
Harden campus buildings	Complete	All buildings are built to withstand hazards to modern codes (not necessarily FEMA 361)
Improve roads	Complete	Roads and parking areas are in good condition
Install pressure tanks/towers for potable water	Complete	Creston has water towers that provide adequate pressure to area
Install water impervious manhole covers	Complete	Good sewer system and manholes on campus
Community drills	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City site, access to county transfer station 7 miles southeast
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Complete	Cameras and lighting are strategically placed and monitored
Flush dead end water mains	Ongoing	City owns and maintains; publicizes when flushing occurs
Full review of policies, procedures, and codes to include mitigation	Ongoing	EMA and SWCC have worked on; may need another review after plan is complete
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Underway	More may be installed for open areas near buildings
Install fire hydrants	Complete	Adequate placement and capacity
Purchase/install backup fixed power generators and pumps	Complete	Could use more generators, but key buildings used for sheltering during disasters are served
Purchase standby portable pumps and generators	Complete	A few on hand; some also available from Creston Fire, SIRWA, other organizations
Continue partnering with local, regional, and statewide energy suppliers	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements	Ongoing	City, energy suppliers, roads, bridges
Maintain mutual aid compacts; file at EMA; continue mutual aid services	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the communications equipment – narrow banding	Underway	Compliance issues nearly met but there are some coverage issues in rural areas affecting numerous services
Continue participation in regional economic development strategy	Ongoing	SICOG's regional economic development strategy involving each jurisdiction and approved by Federal EDA

Dozens of mitigation actions are being undertaken at Southwestern Community College either by institutional leadership and staff or by partners, including, but not limited to, the EMA, City of Creston, utility providers, and State/Federal agencies.

Outlook and Future Development

SWCC to grow and it is likely that more campus buildings will be added in future years. The campus could, but is not likely to, expand to new areas. None of the new areas are likely to include flood hazard areas. The value of the campus properties is likely to continue to increase more than the local rate of inflation.

Greater Regional Medical Center

Greater Regional Medical Center is the only Union County hospital that serves residents from a campus in Creston. The hospital's mission is: "Greater Regional Medical Center is committee to providing the highest quality healthcare and service in southwest Iowa." The facility is located in the northwest corner of Creston on an upland ridge adjacent to Iowa Highway 25.

The hospital has been in operation for many years, first as a county hospital and then expanding to include numerous other clinics and services; it is now a regional hospital, providing services not found in most county hospitals in the surrounding counties.

GRMC Infrastructure, Services, and Resources

The GRMC campus includes a fixed power generator (to power certain emergency facilities, equipment, and lighting only), extensive medical equipment, EMS and transport equipment, a helipad, emergency room, fire protection systems, alert and alarm systems, and in-patient beds. The campus also contains medical clinics, specialty clinics, ambulance service, ICU, ER, surgery areas, and training and communications facilities. All GRMC facilities (Medical Center, Medical Arts Plaza, and Crest Ridge Estates) are located on the one approximately 20-acre campus except the hospice home located across the street to the east of the campus (1111 Country Club Drive).

GRMC's website is www.greaterregional.org/. The website includes extensive helpful information that addresses human disease incident and pandemic prevention, response, and treatment. The website also has information about the Greater Regional Healthcare Foundation, which is a resource for projects and for services to low-income persons. Organized volunteer programs are also detailed.

The April 2012 tornado that hit Creston did extensive damage to the hospital. While the building was structure, which is primarily brick, was not severely damaged, certain parts of the roof and many windows were broken. Winds and rain coming into the building damaged much of the building and destroyed records. More information on this event is found in the tornado hazard profile.

Public service providers for the GRMC's assets are as follows:

- Water: Creston Water Works
- Sewer: City of Creston
- Electric: Alliant Energy
- Natural Gas: Alliant Energy; Agriland (Orient, Iowa)
- Internet and Phone: Windstream, cable and wireless providers
- Police protection: Creston Police Department
- Fire protection: Creston Fire Department
- Ambulance: Greater Regional Medical Center – 10 staff members, 2 vehicles
- Public notifications: *Creston News Advertiser*
- Sanitation: Waste Management
- Other hospital infrastructure: ambulances, helipad, food service and dining area, and parking areas

NFIP Participation

The City of Creston is participating in the NFIP at this time. No hospital assets are within the FHA of the current FIRMs. The concern caused by small streams and waterways to the south and east of the hospital has resulted in a request for an updated map for the area, which will be completed in the next few years.

Planning Capabilities and Status

The GRMC participated in the County's Emergency Operations Plan (EOP) prepared with the assistance of the Union County EMA.

Other planning and training efforts include:

- Plans include: capital improvements plan, existing HMP (not FEMA DMA 2000), transportation plan, fire mitigation plan, strategic plan, and critical facilities plan
- GRMC is National Incident Management Systems (NIMS) compliant.
- Mutual aid agreements are on file for EMS and certain medical services.
- Staff and volunteers are constantly being trained and are involved in drills and exercises.
- GRMC has a MOU with SWCC for the preparation and use of a community shelter at that site.

Current Mitigation Actions

GRMC has been involved in hazard mitigation actions affecting the hospital campus locations and the general public is serves. While the hospital is concerned mostly with medical-related hazards, protection of the structures and contents of the hospital campus means that it is also concerned with the direct impact of certain other natural

and man-made hazards to the properties. The table below describes the status of mitigation actions that are reported. This list may not be comprehensive.

Figure 2 – 49: Greater Regional Medical Center Current, Underway, and Ongoing Mitigation Actions

Availability of cable and satellite with weather advisory overrides	Complete	Local channels participate, those with limited stations can access, satellite on board with local networks now, Weather Channel, KSIB radio is also a good resource.
Establish alert systems for vulnerable populations	Ongoing	Clinical housing, patients in private homes, and senior housing have built-in alerts; Code Red since 2008 fills gaps.
Improve public awareness of hazard risks – dispense information (written and online) on hazards	Ongoing	Website, signage in the hospital, newsletter, related to hazards handled by the hospital and emergency responders
Initial community briefings immediately after events	Ongoing	Policy in place hospital leadership in partnership with City of Creston, County, and State of Iowa
Install hazard signs in area campgrounds, parks, and open spaces	Complete	Signs placed on campus to direct people to safe areas of buildings, to escape fires, etc.
Install warning sirens	Complete	City replaced sirens recently; one is close to campus and would alert those outside on campus properties.
Promote NOAA weather radio	Complete	Radios in key campus buildings
Reverse E-911 program	Complete	Hospital part of countywide Code Red program in use
Institute tree trimming program	Complete	Trees are well maintained by staff members.
Assure jurisdictional plans are in place and current	Complete, ongoing	Many requisite plans are modern and give at least basic consideration to mitigation planning principles.
Business and residential preparedness programs	Underway	A program is being developed for annual implementation.
Designate/enforce HAZMAT transportation routes	Complete	HAZMAT vehicles and equipment are directed to certain parts of campus.
Develop electronic directory of local and other resources	Complete	Online and a directly held in-house for hospital staff needs; working with EMA on communicating needs
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Complete	Leadership and EMA know where the moderate amount of materials are located at a given time.
Enforce or follow OSHA HAZMAT regulations	Ongoing	Staff trained and protocols followed
Enforce multi-family housing extinguisher laws	Ongoing	Enforced as required by State Fire Marshal – hospital buildings have adequate number of which are tested
Establish partnerships with other jurisdictions to control storm water	Ongoing	Working with City, area landowners, and other groups to control storm water and small waterways on the south and east part of the campus
Formulate partnerships to gain legislation	Ongoing	Part of Iowa Hospital Association and other trade groups
Install sprinklers	Complete	Sprinklers in place in key parts of the buildings
Install and update anti-virus software	Ongoing	GRMC does for its owned computers.
Inspect water lines; ensure adequate water supply and sources	Ongoing	City of Creston handles for the campus area
Install speed limit signs	Complete	SWCC has signs on campus and to alert people of ER entrance
Make all campus buildings handicap accessible	Complete	Remodeled building meets ADA compliance; road and sidewalk network allows good access to all buildings.
Promote good landscaping practices on campus projects	Ongoing	Campus has good landscaping program that considers topography of site
Restricted access procedures	Complete	Procedures and implementation mechanism are in place
Smoke detectors in habitable structures	Complete	All buildings have modern smoke detector program
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Underway	CERT program allows for volunteers to assist professionals in monitoring and meeting the needs of special populations before, during, and after a disaster event.
Lightning protection of tall buildings and towers	Complete	Three stories is tallest building height; those buildings and all light poles are protected
Remove asbestos on public buildings	Complete	All hazard areas have been addressed in recent remodels
Maintain sandbags in dry storage	Complete	Available when buildings may experience flash flooding
Post “no dumping signs” to address specific hazards	Complete	Main issue is the disposal of syringes and related equipment; proper containers are provided in applicable locations
Install backflow devises on sewer systems	Complete	Complete for vulnerable campus buildings
Remove dead vegetation on public properties and nuisance areas	Ongoing	Policy and staff in place; GRMC handles well
Develop soil erosion stabilization projects	Complete	Small pond on east edge of campus; small waterways have been enhanced by riprap and landscaping to slow flow of water

Tree planting programs on public property and ROW areas	Ongoing	GRMC addresses this well
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan	Underway	Complete, reviewed, and updated annually along with EMA support
Annual storm spotter training	Ongoing	Held every spring, free, and public is invited via local media
Create continuity of operations and maintenance plan for the school	Complete	In place at hospital with support and assistance of the Union County Public Health
Develop/implement a thorough recovery plan for power failure	Complete	Working with City/Alliant on power needs; main building has backup generators
Develop search and rescue team	Complete	Hospital EMS staff participates in multi-jurisdictional service
Develop/update/publicize evacuation plan	Complete	In place; students directed to go to specific locations off campus
Develop volunteer base of trained persons	Complete	Several organized volunteer programs
Emergency response guidebooks in all emergency vehicles	Complete	EMS and other vehicles have proper guidebooks
Establish HAZMAT decontamination sites	Complete	Mobile facility with local fire departments, special facility in hospital as a medical service to those exposed to hazards
Establish backup communications facilities	Complete	Communications system is duplicated
Hire or designate a public information officer	Complete	Designated person on staff at direction of Board of Directors
Purchase new, modernize, and/or harden existing mobile and personal first response communication equipment and systems	Complete	Systems are modern and meet interoperability and FCC standards
Maintain an 24-hour EOC	Complete	Since hospital is always open, it serves as a secondary EOC
Participate in a regional HAZMAT team	Ongoing	Part of EMA effort
Purchase new ambulances	Complete	Purchasing cycle is used to budget purchases over multiple years
Purchase road closure barricades	Complete	On hand to direct traffic after disasters at hospital site or at EMS and fire scenes
Purchase snow trucks, plows, and sanders	Complete	GRMC partnership with City; hospital has equipment also
Train first responders, EMTs, firefighters, and emergency disaster responders	Ongoing	Constant training; current on certifications; recruiting of new members remains an issue
Bury utility lines on campus	Complete	All campus lines buried; policies in place for new development
Construct chemical storage facilities	Complete	Medical chemicals are well protected, signed, and monitored
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Complete	Good system on campus where there are roads and parking areas
Harden campus buildings	Complete	All buildings are built to withstand hazards to modern codes (not necessarily FEMA 361)
Improve roads	Complete	Roads and parking areas are in good condition; most were improved with most recent hospital remodel
Install pressure tanks/towers for potable water	Complete	Creston has water towers that provide adequate pressure to area
Redundant systems and looping (water, sewer, electric, gas)	Complete	Generally available to campus from multiple directions
Community drills	Ongoing	Have been done as needed for numerous topics related to various hazards and scenarios; terrorism and pandemic focus
Develop local debris disposal sites	Complete	City site, access to county transfer station 7 miles southeast
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Complete	Cameras and lighting are strategically placed and monitored
Flush dead end water mains	Ongoing	City owns and maintains; publicizes when flushing occurs
Full review of policies, procedures, and codes to include mitigation	Ongoing	EMA and GRMC have worked on; may need another review after plan is complete
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Underway	Pond installed on east part of campus by hospice house; landscaping and buffer strips along waterways at east and south part of campus
Install chain leak fences around chemical tanks	Complete	Adjacent to building key tanks are secured and properly signed
Install fire hydrants	Complete	Adequate placement and capacity
Purchase/install backup fixed power generators and pumps	Complete	Could use more generators, but key buildings used for sheltering during disasters are served
Purchase standby portable pumps and generators	Complete	A few on hand; some also available from Creston Fire, SIRWA, other organizations
Continue partnering with local, regional, and statewide energy suppliers	Ongoing	Relationships have been improved with recent disasters that have required more collaboration and cooperation
Ensure NIMS compliance among all sectors	Current	All compliance is now met to do basic functions; new hires are being trained as soon as possible
Annually inspect key infrastructure elements	Ongoing	Hospital campus assets, water, sewer, electric gas
Maintain mutual aid compacts; file at EMA; continue mutual aid services	Ongoing	Local Fire, EMS, medical facility, and law enforcement, plus collaborations with surrounding counties
Improve interoperability of the	Underway	Compliance issues nearly met but there are some coverage issues

communications equipment – narrow banding		in rural areas affecting numerous services

Dozens of mitigation actions are being undertaken by GRMC directly or by partners, including the EMA, County, City of Creston, utility providers, and State/Federal agencies.

Outlook and Future Development
GRMC will likely invest in modest growth of assets, mostly on the same properties already owned. If demand increases over time, it will likely be in small amounts, and entire new campuses are unlikely. Medical equipment is expensive and the value of properties is likely to continue to increase even without annual construction projects.

2.3: Summary Considerations

The following paragraphs summarize the capabilities of the planning area and the jurisdictions within it.

Accessibility and Infrastructure Limitations
While good paved highways exist and provides access to all the important populated areas, necessary levels of accessibility is limited in some instances because of the following issues:

- Language barriers (primarily Spanish-speaking individuals);
- Aging roads and bridges, especially in small towns and rural areas that make it difficult for emergency vehicles to reach those areas;
- Many older buildings are not handicap accessible (most of which are privately owned).
- Debris that could enter the roadways during disasters, such as tornados, windstorms, floods, and ice storms;
- Broadband communications are limited in some areas of the county, while other areas, especially within Creston, have multiple options and widespread fiber coverage.

Financial Resources for Hazard Mitigation
It is vital that the hazard mitigation process considers the ability and capacity to access the funds it needs in the event a hazard event occurs. It is vital that the EMA and other key partners have a comprehensive funding matrix with addresses and phone numbers for various programs, so that in the case of a disaster, all parties will know whom to contact for back-up or emergency funding. One thing that was discussed was the inability to hold large reserves in the event a disaster occurs so the local funds would be available to match other funds and quickly fund immediate cleanup and recovery and the lingering costs of the initial response. One way it was discussed to remedy this is to develop a statewide fund that local communities can leverage, like a trust fund, and then this fund would not tie up a large local reserve.

Mitigation funding decisions in the context of available funds (previously described) are based on the expected damage and death/injury impacts. All local jurisdictions have relied heavily upon federal disaster declarations in cases of widespread damage. Sources have included FEMA, IHSEMD, IDNR, IDOT, IDED, and USDA.

Concerns raised about financial capabilities include:

- Lack of even basic funding to address large-scale emergencies while State and Federal declarations are considered and implemented;
- Inability to access to state and federal funds quickly due to regulations and bureaucratic processes;
- Inability to have a large emergency reserve to meet long-term pre- and post-disaster needs;
- Lack of certified and readily available personnel locally to handle some parts of the post-mitigation activities – such as managing a safe room once built;
- Outside authorities are contacted but are not prepared or properly trained or equipped to meet specific local needs.

Local Planning Limitations
The reasons for ordinance limitations in some jurisdictions include:

- Minimal staff to understand and implement the code structure.
- Reliance upon outside professionals or potentially unqualified personnel to do special functions.
- Inability to date to enforce ordinances on certain existing “grandfathered” structures.

- Costs and personnel to enforce ordinances - give permits, do inspections, and prosecute offenders.
- Ever-changing state and federal standards and regulations are difficult to follow with small staffs and budgets.
- Small towns may lack the understanding of what each ordinance does and why it is necessary.

Generally, local plans are meaningful at least in that they further some mitigation goal; however, some jurisdictions have worked on many projects without consideration of impacts to other projects and existing assets. Most of the proposals are not mitigation-based, but rather they are operations-based-i.e, they result in some improvement in service because of past failures, not because of a noted hazard mitigation effect. Some of the measures in the existing plans are also included as possible mitigation measures (*Chapter 8*), as relevant.

2.4: Statement of Comprehensiveness

This profile is in no way intended to be exhaustive and simply provides a baseline understanding of the demographic, social, and economic characteristics and the capacities, capabilities, current policies of communities and organizations in Union County.

The information on this chapter combined with the hazard risk assessment in the following chapters and the goals and problem statements in *Chapter 7* help to develop the hazard mitigation strategy in *Chapter 9*.

Chapter 3: Hazard Identification

3.1: Introduction

The second phase of the planning process is to develop a hazard analysis and risk assessment, which includes: 1) hazard identification, 2) hazard profiling, 3) identification of assets at risk, and 4) loss estimation. Before a community can assess the on-going mitigation activities, evaluate mitigation measures that should be undertaken, or outline a strategy for implementing mitigation projects, it must be aware of those hazards that, if they occur, could harm the community.

Hazard analysis and risk assessment answers the following fundamental question: "What hazards can occur and what would happen if a hazard event occurred in your community?"

Hazard analysis and risk assessment is the process of measuring the potential loss of life, injury, economic loss, and property loss resulting from hazards. Further, risk assessment teaches us:

- The hazards to which your community is susceptible;
- What these hazards can do to physical, social, and economic assets;
- What areas are most vulnerable to damage from these hazards; and
- The resulting costs of damages or costs avoided through future mitigation activities.

The hazard analysis identifies potential hazards that could affect Union County and the various jurisdictions in the county for the purposes of mitigation planning. It is important to note 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 will not necessarily include all of or the same hazards identified for preparedness, response, or recovery.

The risk 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 community decide what mitigation measure should be undertaken and how to implement the activities they select.

This chapter covers the first step in the HARA process, the identification of hazards. In order to identify hazards, the planning consultant used the 2007 State of Iowa Hazard Mitigation Plan and local data to create a list of possible hazards and then used the master list and definitions for planning team input to complete the identification. Hazards are identified as either: a) cannot occur, b) can occur but has not occurred, or c) has occurred.

3.2: Hazard Definitions and Descriptions

For this assessment, the following definitions are used for each hazard to be considered:

Dam Failure: A break in or imposed threat from, any water retention fixture in which may endanger population downstream of the containment area.

Drought: A period of prolonged lack of precipitation for weeks at a time producing severe dry conditions.

Earthquake: Any shaking or vibration of the earth caused by the sudden release of energy that may impose a direct threat on life and property.

Expansive Soils: Soils and soft rock that tend to swell or shrink excessively due to changes in moisture content.

Extreme Heat: Summertime weather that is substantially hotter and/or more humid than average for a location at that time of year.

Flash Flood: A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Grass and Wildland Fire: An uncontrolled fire that threatens life and property in either a rural or wooded area.

Hailstorm: An outgrowth of a severe thunderstorm in which balls or irregularly shaped lumps of ice greater than 1.0 inch in diameter fall with rain.

Landslide: A downward and outward movement of slope-forming materials reacting under the force of gravity.

Levee Failure: The failure of a formal levee system in the protection of a flood hazard area from flooding due to

structural or mechanical failure of the levee, or due to being overtopped.

River Flood: 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.

Severe Winter Storm: Severe winter weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold.

Sinkhole: The loss of surface elevation due to the removal of subsurface support.

Thunderstorm and Lightning: Atmospheric imbalance and turbulence that may result in thunder, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 58 mph resulting in tornadoes, or surface hail of at least 1 inch in diameter, and lightning.

Tornado: A violent, destructive, rotating column of air taking the shape of a funnel-shaped cloud that progresses in a narrow, erratic path.

Windstorm: Extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very strong pressure gradients.

Air Transportation Incident: Any incident involving a military, commercial, or private aircraft.

Animal/Crop/Plant Disease: An outbreak of disease that can be transmitted from animal to animal and to plants.

Communications Failure: The widespread breakdown or disruption of normal communication capabilities.

Enemy Attack: An intentional attack on the community by an enemy force, which would cause massive destruction and extensive casualties.

Energy Failure: An extended interruption of electric, petroleum or natural gas service, which could create a potential health problem for the population and possibly mass panic.

Fixed Hazardous Materials Incident: Accidental release of chemical substances or mixtures that presents danger to public health or safety during production or handling at a fixed facility.

Fixed Radiological Incident: Accidental release of radiological substances that present danger to public health or safety during production or handling at a fixed facility.

Highway Transportation Incident: A single or multi-vehicle incident which results in property damage and/or death(s)/injury(s).

Human Disease Incident: A medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation).

Human Disease Pandemic: A pandemic is defined as a disease that has spread around the world to many people.

Pipeline Transportation Incident: A break in a pipeline creating a potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation.

Public Disorder: Mass demonstrations or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes.

Rail Transportation Incident: A derailment or a train accident that directly threatens life or property, or that adversely impacts a community's capabilities to provide emergency services.

Structural Failure: The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings.

Structural Fire: An uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities.

Agro-Terrorism: An action causing intentional harm to an agricultural product or vandalism of an agricultural / animal related facility.

Biological Terrorism: Use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Chemical Terrorism: Use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Conventional Terrorism: Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Cyber Terrorism: Electronic attack using one computer system against another in order to intimidate people or disrupt other systems.

Radiological Terrorism: The use of radiological materials against a person or persons in order to bestow fear upon a larger group of people.

Transportation Hazardous Materials Incident: An accidental release of chemical substances or mixtures that present a danger to public health or safety as a result of transportation.

Transportation Radiological Incident: An incident resulting in a release of radioactive material during transportation.

Waterway/water body Incident: An accident involving any vessel that threatens life or which adversely impacts a community's capability to provide emergency services.

Please note that the above definitions have changed slightly in some cases since the original HMP was approved in 2006.

Chapter 4, the hazard profile, includes detailed descriptions for each of the profiled hazards.

3.3: Potential Hazards in Union County

The State of Iowa Homeland Security and Emergency Management Division (IHSEMD) has created a list of identified hazards that can occur in the State of Iowa. Such hazards include natural hazards, those that occur in nature, and non-natural hazards, those that are technological or infrastructure-based, which may or may not be triggered by natural hazards. The State Hazard Mitigation Plan, which was adopted and approved in late 2007, includes 40 hazards—16 of which are natural hazards and 24 of which are not natural hazards. The Union County planning team did not add to this list. You will notice in the table below that the hazards can sometimes cross the blurry boundary between natural and non-natural. FEMA requires that all natural hazards be studied in the mitigation plan. However, the Union County Hazard Mitigation Planning Team recognized the need for and importance of planning for non-natural hazards and identified many occurrences of non-natural hazards in Union County.

Union County and its Hazard Mitigation Planning Committee identified several hazards that are addressed in the County's Multi-jurisdictional Hazard Mitigation Plan. The identification process involved several sources: 1) the planning team, 2) public input, 3) past local hazard assessments, 4) the consultant's experience having grown up and lived all his life within 100 miles of the community, 5) local documents and reports, 6) maps and reports from websites, and 7) the 2007 and 2010 State of Iowa Hazard Mitigation Plans. Throughout this plan, as practical, the natural hazards were listed alphabetically first followed by the non-natural hazards.

Table 3 – 1: Potential Hazards In Union County Or One Or More Jurisdictions In The County

Natural Hazards	Where Information Found, Planning Team Comments	Has Occurred	Can Occur	Cannot Occur
Dam Failure	State Mitigation Plan, Watershed maps, Conservation Board, and the planning team states it can happen at the various smaller to mid-sized earthen public and private dams in and upstream of county, which are not often inspected. Several large lakes exist in the county and all are inspected regularly. This event can occur in some jurisdictions.	X		
Drought	State Mitigation Plan, USDA websites, past disaster declarations, local news media, consultant personal experience, planning team indicates droughts are common and affect rural areas severely.	X		
Earthquake	State Mitigation Plan, geological and seismic maps, maps of past events. Minor tremors have been noted in the County in the late 1980s. Epicenters of minor quakes have occurred 100 miles southwest in Fremont County and 250 miles east near Davenport. Events have been limited with no felt effects.		X	
Expansive soils	State Mitigation Plan, soils maps, USDA and USGS websites, small areas of expansive soils have occurred in a widespread area in the county due to clay soils, the planning team reports. Officials serving the rural area and many of the towns report this event has happened. Many basements have been impacted by slowly occurring events.	X		
Extreme heat	State Mitigation Plan, NCDC, NWS, Weather Channel, local news media, consultant personal experience, and planning team comments. Excessive heat occurs at least once most summers.	X		
Flash flood	State Mitigation Plan, past disaster declarations, county/city surveys, NCDC, consultant personal experience, planning team, and local news media. Flash flooding is found in most areas of the county after the heaviest of rains. Some areas have common events.	X		

	Undersized infrastructure is the main concern or problem, with topography a close second. Most jurisdictions report past events and the remaining indicate potential events.			
Grass and wildland fire	State Mitigation Plan, local news media, fire dept. reports, planning team, city/county surveys. The team indicates that small grass and forest fires occur during dry seasons annually. Most jurisdictions report past events and most others indicate potential events.	X		
Hailstorm	State Mitigation Plan, NCDC, city/county surveys, NWS, Weather Channel, consultant personal experience, and planning team. Large hail has occurred in all areas of the county and can occur in all seasons. Some buildings may not be susceptible.	X		
Landslide	State Mitigation Plan, city/county surveys, planning team, soils maps, county engineer, and conservation staff. Landslides were not identified as possible in the 2006 plan but the committee now believes they are possible in very isolated locations.		X	
Levee failure	State Mitigation Plan, planning team, area maps, USDA and FEMA information sites. The planning team knows of no levees. Agricultural terraces can and do fail, impacting cropland only with no long-term damages.			X
River flood	State Mitigation Plan, NCDC, FIRM maps, past disaster declarations, city/county surveys, consultant personal experience, watershed maps, and planning team comments. Flooding can and has occurred in rural areas and several jurisdictions. There are no mapped or locally identified river flood hazard areas in some jurisdictions.	X		
Severe winter storm	State Mitigation Plan, NCDC, past disaster declarations, local news media, Weather Channel, NWS, consultant personal experience, planning team. Heavy snow, ice storms, and/or severe wind chills occur most winters.	X		
Sinkhole	State Mitigation Plan, USGS, maps of past mining and caverns, city/county surveys, planning team. After review of data, planning team indicates sinkholes can occur in several jurisdictions. Mining is not common in the past, but installation of infrastructure can result in small-scale incidents.		X	
Thunderstorm – lightning	State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Thunderstorms that are deemed severe by the NWS occur almost every year and most years several occur.	X		
Tornado	State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Tornados of EF0-EF2 occur most years in the county and EF3 and larger have occurred. Warnings and sighting have occurred in all jurisdictions but not necessary all jurisdictions have been directly hit.	X		
Windstorm	State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Straight-line winds can be over 70 MPH, even on sunny days, and damage has occurred.	X		
Man-made and Combination Hazards				
Air transportation incident	State Mitigation Plan, local news media, air flight maps, planning team. Team states that small events have occurred in rural areas and can occur anywhere due to the numerous planes that fly over the county.	X		
Animal/crop/plant disease	State Mitigation Plan, local news media, Iowa Dept. of Public Health website, USDA website, planning team. Team members indicated no major outbreaks but remain concerned over oncoming diseases and pests.		X	
Communications failure	State Mitigation Plan, city/county surveys, planning team, first responders. The hazard has occurred in a few jurisdictions but has not been reported in all.	X		
Enemy attack	State Mitigation Plan, DHS website, planning team. Team indicates with the AFB in Omaha and Camp Dodge in Des Moines, as well as other installations in the region, indirect affects could occur but actual direct attack on the county is unlikely.		X	
Energy failure	State Mitigation Plan, city/county surveys, planning team, first responders, and utility orgs, local news media. Energy failures have occurred all over the county.	X		
Fixed hazardous materials incident	State Mitigation Plan, EPA Tier II facility maps, IDNR incident reports, planning team, first responders, planning team. Events have occurred in Creston and can occur in most jurisdictions because of sewer lagoons, factories, and agricultural facilities.	X		
Fixed radiological incident	State Mitigation Plan, IDPH and EPA websites, planning committee. There are no appreciable radiological sites identified in the county. GRMC and some other facilities have modest levels in controlled environments. The group considers this hazard low risk but an incident could occur and affect some locations.		X	
Highway transportation incident	State Mitigation Plan, IDOT crash data, planning team, first response agencies, and local news media. With the Interstate and other highways, events occur requiring extensive response and road closures each year. Several jurisdictions have had incidents.	X		
Human disease incident	State Mitigation Plan, local news media, Iowa Dept. of Public Health website, Union County Public Health, planning team. Team indicates that the problem has been minor in scope but occurs in public and populated areas and can occur in all jurisdictions.	X		
Human disease pandemic	State Mitigation Plan, Iowa Dept. of Public Health website, Union County Public Health, regional TV stations, planning team. Public Health reports past pandemics.	X		
Pipeline transportation	State Mitigation Plan, pipeline maps, Iowa Utilities Board, DOE website, pipeline	X		

incident	company websites, planning team, first responders. Most jurisdictions can have events but none of significance has been reported in the county except in Creston.			
Public disorder	State Mitigation Plan, local news media, first responders, planning team. Public disorder is not known to occur, but planning team believes some jurisdictions are large enough in population that events could occur.	X		
Rail transportation incident	State Mitigation Plan, planning team, IDOT maps. Planning team reports past incidents including fatalities. The BNSF mainline and Amtrak travel through the county.	X		
Structural failure	State Mitigation Plan, planning team, local news media, visual survey of building condition, assessor's data on age of buildings. Some buildings and structures have collapsed, mostly on a small scale. There have been no sudden major failures. Can occur in all jurisdictions.	X		
Structural fire	State Mitigation Plan, planning team, local news media, first responders. Structural fires, including those that require expensive assistance to extinguish, are not uncommon in all areas of the county. Has occurred in most jurisdictions. Can occur in all of them.	X		
Terrorism – Agro-terrorism	State Mitigation Plan, DHS website, USDA website, news media, planning team. No reported event in the county but planning team agrees it is possible.		X	
Terrorism – Biological Terrorism	State Mitigation Plan, DHS website, USDA website, news media, planning team. After review of data, team indicates events are possible but have not occurred.		X	
Terrorism – Chemical Terrorism	State Mitigation Plan, DHS website, EPA and other federal websites, news media, planning team. After review of data, team indicates events are possible but have not occurred.		X	
Terrorism – Conventional Terrorism	State Mitigation Plan, DHS website, other federal websites, news media, planning team, first responders. There have been bomb threats at schools and large industries.	X		
Terrorism – Cyber Terrorism	State Mitigation Plan, DHS website, communications websites, news media, planning team. After review of data, team indicates events are possible but have not occurred.	X		
Terrorism – Radiological Terrorism	State Mitigation Plan, DHS website, other federal websites, news media, planning team. After review of data, team indicates events are possible but have not occurred.		X	
Transportation Hazardous Materials	State Mitigation Plan, local news media, planning team, first responders, IDOT and IDNR crash data and incident reports. Trans HAZMAT events have occurred in many areas of the county and can occur in most jurisdictions.	X		
Transportation Radiological Incident	State Mitigation Plan, federal radiological transportation data/plans, planning team. Railroads and Highway 34 are routes for radiological materials, and other routes are also likely (169 and 25), so events could occur in some jurisdictions. Team is not highly concerned due to amount of materials in one shipment is low and containers are sturdy.		X	
Waterway – water body incident	State Mitigation Plan, local lakes maps, conservation staff, first responders, planning team. Drownings have occurred and water bodies are popular in all seasons for fishing, swimming, and boating.	X		

During the second planning team meeting, the Union County Hazard Mitigation Planning Team reviewed all the possible hazards and identified by the State and determined that 28 of the hazards (12 natural and 16 human/combo) have occurred, 11 (3 natural and 8 human/combo) can occur but have not been recorded, and 1 (levee failure) cannot occur in this county.

The following details the Iowa Presidential declarations since 1990.

Table 3 – 2: Iowa Disaster Declarations (1990 to June 2012)

Event	Declaration By	Year	Impact on Union County
Severe storms and flooding	Federal, 4018-DR	2011	Does not include Union County
Severe storms, straight-line winds, and flooding	Federal, 4016-DR	2011	Does not include Union County
Flooding	Federal, 1998-DR	2011	Does not include Union County
Severe storms, tornadoes, straight-line winds	Federal, 1977-DR	2011	Does not include Union County
Severe storms, flooding, and tornadoes	Federal, 1930-DR	2010	Includes Union County
Severe storms and flooding	Federal, 1928-DR	2010	Does not include Union County
Severe winter storms	Federal, 1880-DR	2010	Includes Union County – public assistance only
Severe winter storms and snowstorms	Federal, 1877-DR	2010	Does not include Union County
Severe Storm	Federal, 1854-DR	2009	Does not include Union County
Severe storms, tornadoes, and flooding	Federal, 1763-DR	2008	Includes Union County
Severe winter storm (ice storm)	Federal, 1737-DR	2008	Includes Union County – public assistance only
Severe storms and flooding	Federal, 1727-DR	2007	Includes Union County – public assistance only
Severe storms, flooding, and tornadoes	Federal, 1705-DR	2007	Includes Union County
Severe winter storms	Federal, 1688-DR	2007	Does not include Union County
Snow (Emergency Dec.)	Federal, 3275	2007	Does not include Union County

Hurricane Katrina (Emergency Dec.)	Federal	2005	All counties, funds to evacuees
Tornadoes and severe storms	Federal, 1518-DR	2004	Does not include Union County
Storms and flooding	Federal, 1420-DR	2002	Does not include Union County
Storms and flooding	Federal, 1367-DR	2001	Does not include Union County
Storms and flooding	Federal, 1282-DR	1999	Does not include Union County
Storms, flooding, tornados	Federal, 1277-DR	1999	Does not include Union County
Severe storms, flooding, and tornados	Federal, 1230-DR	1998	Includes Union County – individual assistance only
Severe snow storm	Federal, 1191-DR	1997	Includes Union County – public assistance only
Flooding (second event of year)	Federal, 1133-DR	1996	Does not include Union County
Flooding (first event of year)	Federal, 1121-DR	1996	Does not include Union County
Flooding, severe storm (2nd event of yr)	Federal, 996-DR	1993	Does not include Union County
Flooding, severe storm (1st event of yr)	Federal, 986-DR	1993	Does not include Union County
Flooding, severe storm	Federal, 965-DR	1992	Does not include Union County
Ice Storm	Federal, 928-DR	1991	Does not include Union County
Flooding, severe storms	Federal, 911-DR	1991	Does not include Union County
Flooding, severe storm (2nd event of yr)	Federal, 879-DR	1990	Does not include Union County
Flooding, severe storm (1st event of yr)	Federal, 868-DR	1990	Does not include Union County

Source: www.fema.gov, 6/2012

Since 1990 (and even before then), the county has been involved in many incidents, including those that have and have not resulted in Presidential declarations. Since 1990, damages resulting on Federal declarations have occurred seven (7) times in Union County.

3.4: Hazard Identification by Jurisdiction

It is important to know where the hazards can occur. Hazards are identified by jurisdiction in order to: a) meet DMA 2000 requirements and b) to best distribute resources. All governmental jurisdictions contain land and buildings that can be impacted by various disasters. The following table shows the potential hazards in the county and the jurisdictions in which they have occurred, could occur, or cannot occur.

Table 3 – 3: Hazard Identification by Jurisdiction

Hazard	Rural County	City of Afton	City of Arispe	City of Creston	City of Cromwell	City of Lorimor	City of Shannon City	City of Thayer	Creston CSD	East Union CSD	SWCC	GRMC
Dam Failure	Y	N	N	P	N	N	N	N	N	N	N	N
Drought	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Earthquake	P	P	P	P	P	P	P	P	P	P	P	P
Expansive soils	Y	Y	P	Y	P	P	P	P	Y	P	Y	P
Extreme heat	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Flash flood	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grass and wildland fire	Y	Y	Y	P	P	P	P	P	P	P	P	N
Hailstorm	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Landslide	P	N	N	N	N	N	N	N	N	N	N	N
Levee failure	N	N	N	N	N	N	N	N	N	N	N	N
River flood	Y	N	N	Y	Y	N	Y	N	N	N	N	N
Severe winter storm	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sinkhole	P	P	P	P	P	P	P	P	P	P	P	P
Thunderstorm – lightning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tornado	Y	Y	P	Y	P	P	P	P	Y	P	Y	Y
Windstorm	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Air transportation incident	Y	P	P	P	P	P	P	P	P	P	P	P
Animal/crop/plant disease	P	P	P	P	P	P	P	P	N	N	P	N
Communications failure	Y	Y	Y	Y	Y	P	P	Y	P	P	Y	Y
Enemy attack	P	P	P	P	P	P	P	P	P	P	P	P
Energy failure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Fixed HAZMAT incident	Y	Y	N	Y	N	N	N	N	P	P	P	P
Fixed radiological incident	N	N	N	P	N	N	N	N	N	N	N	P
Highway transportation incident	Y	P	P	P	P	P	N	N	N	N	P	P
Human disease incident	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Human disease pandemic	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pipeline transportation incident	P	P	N	Y	N	P	N	N	P	P	P	P
Public disorder	P	Y	P	Y	P	P	P	P	P	Y	P	P
Rail transportation incident	Y	Y	N	Y	P	N	N	P	N	P	N	N
Structural failure	Y	P	P	Y	P	P	P	P	P	P	P	P
Structural fire	Y	Y	Y	Y	Y	Y	Y	Y	P	Y	P	P
Terrorism – Agro-terrorism	P	P	P	P	P	P	P	P	P	P	P	N
Terrorism – Biological	P	P	P	P	P	P	P	P	P	P	P	P
Terrorism – Chemical	P	P	P	P	P	P	P	P	P	P	P	P
Terrorism – Conventional	P	P	P	P	P	P	P	P	Y	Y	P	P
Terrorism – Cyber	P	Y	P	P	P	P	P	P	P	P	P	P
Terrorism – Radiological	P	P	P	P	P	P	P	P	P	P	P	P
Transportation HAZMAT incident	Y	Y	P	Y	P	P	N	P	P	P	P	P
Transportation Radiological incident	P	P	P	P	P	P	N	P	N	N	P	P
Waterway – water body incident	Y	N	N	P	N	N	N	N	N	N	N	N

N= cannot occur in jurisdiction; Y= can occur and has occurred; P= potential hazard that has not occurred to date (at least not reported or known)

Based on local, state, and national data, we have been able to determine with some certainty in which jurisdictions hazards have, can, and cannot occur. Of course, the above list is based on the best available data. Unfortunately, data is incomplete about most man-made hazards, especially about events that happened more than 15 years ago. Many of the events listed as possible are likely to have happened at some point but there is no known record of the event. Hazards that cannot occur have been identified because the conditions needed for the event are impossible, such as a railroad or pipeline transportation event where neither exist in or near a community, or the impacts would be so small that the effect on human life and property would be too minimal to be considered further.

It is important to understand that the various jurisdictions have differing vulnerabilities to hazards, both natural and man-made. No community is impacted or can be impacted by all hazards. The rural area, due to its large area of land and water, and Creston, have more people, land, and assets that can be impacted and have been impacted by more hazard events from more types of hazards. Some hazards are fixed as to where they can occur and do not impact all jurisdictions, such as river flooding, landslides, and dam failure. In this way, small towns are likely to be impacted by fewer hazards, especially man-made hazards. Similarly, schools (i.e., school property) are located in smaller defined areas within only a few of the towns.

Note: it is possible that some hazards can cross boundaries into jurisdictions in which the hazard is not recognized as a hazard occurring in that jurisdiction. One example is dam failures. Dam failures upstream from a town can cause flooding and other impacts to a downstream town, such as the impact of the failure of Twelve Mile Lake dam on the Afton sewer lagoons.

All the hazards that <u>have occurred</u> and those that <u>can occur</u> in any jurisdictions of the county are included and detailed in the next chapter. The profile details the risk to each jurisdiction by hazard.

Chapter 4: Hazard Profile

4.1: Introduction

This chapter details the process for profiling each potential hazard in Union County and provides the data profiles themselves, which assist in providing a ranking of hazard risk later in this report.

The hazard profile is a more detailed investigation of each identified hazard to determine more precisely the potential impact on each jurisdiction each hazard could have. This chapter provides greater detail on the hazards the affect each jurisdiction. Data from various sources is used to determine how each hazard affects the county and its jurisdictions. This profile looks at several scoring criteria of each potential hazard for each jurisdiction. It is provided in order to rank the relative risk each hazard has on each jurisdiction, which will then enable the planning team to best develop goals, objectives, and mitigation actions for each jurisdiction later in the report.

This HARA process is not new to communities in Union County. The first HMP completed in 2006 included a HARA. This process has also been used with success in surrounding counties. State, regional, and past local HARA data is included in this chapter.

Note that each of the following profiles covers each jurisdiction. Within each profile for each hazard is a description of whether and how different communities have different risks to hazards.

Each hazard was analyzed and scored based on seven factors: 1) historical occurrence, 2) probability, 3) vulnerability, 4) maximum extent, 5) severity of threat, 6) speed of onset, 7) duration of event.

Note: The following risk assessment (Chapters 4-6) was conducted on a planning area wide basis rather than analyzing each hazard for each individual jurisdiction. Unique conditions within the participating jurisdictions are noted in each hazard profile. For example, flooding will likely impact jurisdictions with Special Flood Hazard Areas (SFHAs) more than those without SFHAs. Unless otherwise stated in the risk analysis, the partnering organizations and other non-incorporated jurisdictions not specifically profiled will have the same risk analysis as that of the underlying jurisdiction in which the organizations and assets are located. School districts, Southwestern Community College, and Greater Regional Medical Center are profiled in terms of how hazards impact assets on their properties.

4.2: Explanation of Hazard Scoring Criteria

The following tables provide explanation of the seven above scoring criteria. The planning team, with the assistance of the planning consultant, used the same scoring criteria used in the State Hazard Mitigation Plan to rate each hazard. Members of the Union County Hazard Mitigation Planning Team were asked to discuss each of the hazards during the third planning meeting. They were also asked to provide a score of one (1) through nine (9) using the scoring guides provided to them. A weighting factor of 1 was used to ensure that each of the seven criteria was considered equally. The sum of the scores for each hazard for each jurisdiction were then added and ranked by community. Following the profile, the remaining part of this chapter details the results of this analysis.

It was important for the assessment team to score each hazard as a single event. Only impacts from that particular hazard were to be considered in the analysis. Scores were recorded at the third planning meeting using examples from "Understanding Your Risks." The forms used at the meeting are in *Appendix D* of this plan.

Union County planning team profiled hazards without consideration of secondary or cascading impacts and events. See the State Hazard Mitigation Plan for details on their scoring criteria and how the scoring was completed.

NOTE: While the State used criteria such as, "Less than 400 occurrences in the past 25 years" for a 1 score, it was imperative to modify such criteria to reflect the fact that Union County is only one of 99 counties. Therefore, such criteria were reduced to something on the order of one-hundredth of the State plan value.

4.2.1: Historical Occurrence

Very simply, how many times has this hazard occurred in the past? Each hazard may or may not have a comprehensive documented historical record. Because each hazard has a different period for which historical occurrences have been collected, each hazard was prorated to a twenty-five year period. Local, state, and federal government agencies have increasingly improved record keeping with respect to incidents, accidents, and disasters that affect people and property. The National Weather Service, a division of the National Oceanic and Atmospheric Administration (NOAA), maintains a thorough history of weather events, as does the State Climatologist's Office. Agencies in recent years have initiated record-keeping efforts in the areas of hazardous materials incidents, transportation accidents, and fires.

Table 4 – 1: Historical Occurrence Scoring

Historical Occurrence: The number of times that a hazard has occurred in the past 25 years	
Score	Description
1	No known incidents in the past 25 years
2-3	Less than 4 occurrences in the past 25 years
4-5	4-7 occurrences in the past 25 years
6-7	8-11 occurrences in the past 25 years
8-9	12 or more occurrences in the past 25 years

4.2.2: Probability

The probability score reflects the estimated frequency of the hazard occurrence in the future. Many times the historical occurrence can be extrapolated into the future, but sometimes this is not accurate. If a hazard or its impacts have been mitigated, the future occurrence will most likely be less than the historical occurrence. The opposite can also be true. There may be new hazards that present themselves to the community. For example, a new industry that produces a hazardous material may have moved into the community where, before, the hazard was not there.

Table 4 – 2: Future Probability Scoring

Probability: Reflects the likelihood of the hazard occurring again in the future, sometimes without regard to the hazard's historical occurrence		
Score	Description	
1	Unlikely	Less than 10% probability in the next year
2-3	Possible	Between 10% and 25% probability in the next year
4-5	Likely	Between 26% and 50% probability in the next year
6-7	Highly Likely	Between 51% and 75% probability in the next year
8-9	Often	Likely More than 75% probability in the next year

4.2.3: Vulnerability

The vulnerability score represents adverse impacts to citizens, visitors, and emergency responders. It is important to consider only adverse affects as vulnerability. Many hazards occur which do not significantly impact people.

Table 4 – 3: Vulnerability to Jurisdiction Population Scoring

Vulnerability: Measure of the percentage of people that will be adversely affected by the occurrence of the hazard		
Score	Description	
1	Negligible	Less than 1% of the total population of the jurisdiction
2-3	Limited	1% to 10% of the total population of the jurisdiction
4-5	Moderate	11% to 20% of the total population of the jurisdiction
6-7	Critical	21% to 50% of the population of the jurisdiction
8-9	Catastrophic	More than 50% of the total population of the jurisdiction

4.2.4: Maximum Geographic Extent

The maximum geographic extent is the percentage of the jurisdiction impacted by the hazard. As an example, a snowstorm will likely impact the entire community, whereas a hazardous materials incident may cover only a few city blocks.

Table 4 – 4: Maximum Geographical Extent of Incident Scoring

Maximum Threat: The potential spatial extent of the impacted area		
Score	Description	
1	Negligible	Less than 1% of the total area of the jurisdiction
2-3	Limited	1% to 10% of the total area of the jurisdiction
4-5	Moderate	11% to 20% of the total area of the jurisdiction
6-7	Critical	21% to 50% of the total area of the jurisdiction
8-9	Catastrophic	More than 50% of the total area of the jurisdiction

4.2.5: Severity of Impact

The severity of impacts is the most complex of the scoring guides. Many considerations must be accounted for including, at a minimum, the following:

- Health and safety of persons in the affected area at the time of the incident (injury and death);
- Health and safety of personnel responding to the incident;
- Continuity of operations;
- Property, facilities, and infrastructure;
- Delivery of services;
- The environment;
- Economic and financial condition;
- Regulatory and contractual obligations; and
- Reputation of the entity.

The net impact to each of the above is used in each profile to determine the total severity profile score.

Table 4 – 5: Severity of Impact Scoring

Severity of Impact: Assessment of severity in terms of injuries and fatalities, personal property, and infrastructure		
Score	**Description**	
1	Negligible	• Few if any injuries and/or illness • Minor quality of life lost, little or no damage • No response needed • Brief interruption of essential facilities/services for less than 4 hours
2-3	Limited	• Minor injuries and/or illness • Minimal risk to response personnel • Minor or short term property damage • Shutdown of essential facilities services for 4-24 hours
4-5	Moderate	• Serious injury and/or illness • Moderate risk to response personnel • Major or long term property damage which threatens structural stability • Shutdown of essential facilities and services for 24-72 hours
6-7	Critical	• Serious impacts to multiple categories. Possible deaths but no Federal response.
8-9	Catastrophic	• Multiple deaths/ illness involving Federal response • High risk to response personnel • Property destroyed or beyond repair • Complete shutdown of essential facilities and services for 3 days or more

4.2.6: Speed of Onset

The speed of onset is quite simply 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 4 – 6: Speed of Onset Scoring

Speed of Onset: Rating of the potential amount of warning time that is available before the hazard occurs	
Score	**Description**
1	More than 24 hours warning time
2-3	13 to 24 hours warning time
4-5	7 to 12 hours warning time
6-7	Minimal warning (1 to 6 hours warning time)
8-9	Virtually no warning (seconds to minutes to less than 1 hour)

4.2.7: Duration of Event

The duration of event scoring the length of time a typical event, not counting the cascading events, response, or recovery times. The duration will be from the genesis to the termination of the event in a given area, or the time when warning is sounded or damage begins until an all-clear signal or direct damage ends.

Table 4 – 7: Duration of Event Scoring

Duration of Event: The length of time the event itself continually occurs, not including cascading effects	
Score	Description
1	Event is instant and may last only a few seconds to one minute
2-3	Event lasts more than 1 minute to 1 hour
4-5	Event lasts more than 1 hour to 6 hours
6-7	Event lasts more than 6 hours to 1 day
8-9	Event lasts more than 1 day to many weeks or even months

4.3: Natural Hazard Profiles

The following 15 natural hazards are profiled in alphabetical order.

4.3.1: Dam Failure

Definition: A break in, or imposed threat from, any water retention fixture in which may endanger population downstream of the containment area.

Description:

Iowa has over 1,500 locally owned, 87 State owned, and 4 federally owned impoundments. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation. Flooding, operating error, poor construction, lack of maintenance, damage due to burrowing animals, vandalism, terrorism, and earthquakes can cause dam failure. Dams are classified into three categories based on the potential risk to people and property should a failure occur: High Hazard - If the dam was to fail, lives would be lost and extensive property damage could result; Moderate Hazard - Failure could result in loss of life and significant property damage; and Low Hazard - Failure results in minimal property damage only. The classification may change over time due to 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. 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 6 feet high regardless of storage capacity and dams less than 15 acre feet of storage regardless of height.

The county has eight lakes with dams that have been given a hazard class by the State of Iowa. Further, the county has dozens of small farm ponds generally up to 25 acres; these small dams are not considered a threat.

Table 4 – 8: State-identified Dams in Union County

Lake and Dam	Location	Height	Acre-Feet Storage	Classification
Afton Reservoir Dam	41.0346, -94.2112, just west of Afton	51	470	Moderate
Creston Flood Prevention Dam	41.0721, -94.3614, north part of Creston	27	556	High
Green Valley Lake Dam	41.1062, -94.3883, 2 miles NW of Creston	37	6,100	Moderate
McKinley Lake Dam	41.0505, -94.3874, west part of Creston	19	290	Moderate
Summit Lake Dam	41.0594, -94.3964, 1 mile west of Creston	26	2,680	Moderate
Three Mile Reservoir Dam	41.0724, -94.3964, three miles N of Afton	63	29,950	Moderate
Twelve Mile Creek Watershed Site D-62-1	41.0518, -94.2670, between Creston and Afton	35	315	Moderate
Twelve Mile Creek Watershed Site M-1	41.0530, -94.2569, between Creston and Afton	66	27,200	High

Sources: Iowa DNR and Iowa HSEMD

Table 4 - 9: Dam Failure Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	There have been two major dam failures in Iowa's modern history: in 1968 in Waterloo and in 2010 at Lake Delhi in eastern Iowa. Both failures had catastrophic losses. The Waterloo incident had one confirmed fatality. Smaller dams, such as farm ponds, have failed without notice on many occasions in Iowa. There have been no significant dam failures in Union County, although two small dams – Thayer Lake being one of them – (neither on State list) have had partial failures since 2008. Creston's Hurley Creek Dam had a leak in 2008. Afton Reservoir failed with minimal damage circa 1920. Union County Conservation received some FEMA funding for dam repair circa 2005 at Talmage Hill Wildlife Area east of Afton.	2
Probability	There are several public dams in Union County, eight of which are on the State list. With increased attention to sound design, quality construction, and continued maintenance and inspection, dam failure probability can be reduced. It is important to consider that, by 2020, 85% of the dams in the United States will be more than 50 years old (the design life of a dam). The State-listed dams are routinely inspected by the State and local officials. All dams are of earthen design. Farm ponds will from time to time fail, usually slowly over time, with no risk to major public assets or human life. Dam failures can impact directly central parts of Union County and parts of Creston by flooding of those areas. Indirect impacts could be to most other jurisdictions due to impacts on water supplies and flooding of roads and utilities upon which other jurisdictions depend. The total or sudden failure of any significant dam is very unlikely to occur in the next year or even five years.	1
Vulnerability	People and property along streams and just below dams are most vulnerable to failures of these dams. Based on the topographical characteristics of these dams and outflow areas, it is possible that some bridges, buildings, and agricultural land could be impacted. Roads, including streets in Creston, and Highway 34, could be closed, and a few homes could possibly be impacted. If Hurley Creek Dam and Twelve Mile Lake Dam fail, many properties could be severely damaged. Failure of McKinley Lake Dam could flood Creston's wastewater treatment plant. Three Mile and Twelve Mile dam failures would deprive the county and surrounding areas necessary water supplies for households, industry, and firefighting. The score here represents the direct impact. Dam failure presents some indirect vulnerability to communities that are not profiled here. In Union County, a catastrophic failure would be very unlikely, and only 1% of total assessed value would likely be affected directly. First responders and individuals in the area would likely not be impacted.	4
Maximum Extent	The area impacted following a dam failure would be limited to those areas in and near the floodplain. People and property outside the floodplain could also be impacted depending on the proximity to the dam and the height above the normal stream level. The team does not know specifically the size of inundation areas, but areas below dams include roads, power lines, pipelines, agriculture areas, sewer and water treatment facilities, and some homes and outbuildings. Parts of Creston would be impacted by failures in the form of flooding.	3
Severity	a) Health and safety of persons in area: Persons could be injured or drowned if they live below stream or are driving below the dam when the dam breaks or if they are on the dam or in a boat close to the dam. Few people would be within the immediate area of the event and most would be able to get out of the way if warned. **6** b) Health and safety of response personnel: Limited unless a further break occurs that widens the floodwater flow while responders are in the area; also, communications can be lost. Rescuers going into the waters could be drowned. **4** c) Continuity of operations: The loss of a lake would have impacts on continuation of recreation and water supply services. **6** d) Property, facilities, and infrastructure: Failure of each of the dams would result mostly in crop and livestock grazing land flooding and road and bridge damage or loss. Several bridges and roads can be taken out, mostly on secondary roads. Several businesses and a few homes could be damaged or destroyed. State properties could be destroyed. **7** e) Delivery of services: Damage to roads and water supplies would disrupt the delivery of freight, traffic, and some potable drinking water in much of the county. **7** f) Environment: Fish populations and vegetation in the lakes would be harmed. Downstream flash flooding would harm vegetation and wildlife and may cause storage facilities below to fail, which may dump more contamination into the waterway. HAZMAT releases would be possible. **5** g) Economic and financial: Loss of the lakes themselves represents lost tourism and recreation dollars in the county. The public lakes and others have fishing and camping facilities that would be damaged, resulting in lost revenue and tourism dollars. The closure and detour of roads in the impacted area, including Highways 34 and county roads, would result in extensive costly detours to gravel roads to get to and from the towns and various rural areas. Thousands of acres of farmland could be submerged and livestock could be lost downstream. This would be emotionally and financially devastating to Union County. The cost to replace	5

	or repair dams like 3-Mile and 12-Mile would be many millions of dollars. **7** h) Regulatory and contractual obligations: It is likely that few regulatory or contractual obligations would be hindered in Union County. **2** i) Reputation: If any rescue is botched or if funds allocated to improve dams are not spent property, leading to the dam failure, the impact could be severe; otherwise, limited. **3**	
Speed of Onset	A dam failure can be immediate and catastrophic leaving little or no time to warn those downstream of the imminent hazard. With maintenance and monitoring, weak areas and possible failure points can be identified allowing time for evacuation and securing of the dam. Most dams are only inspected periodically thus allowing problems to go undetected until a failure occurs. The major dams in Union County are larger and are often inspected; therefore, the risk of slowly forming failures is low; however, an event that triggered a sudden failure could result in an incident within about an hour or two.	7
Duration of Event	A dam failure may start slowly and take a moderate period of time to complete its destruction. The event could last from a few hours to days before all the water is released. The longer duration of event will likely result in less damage and fatalities because the initial torrent of water after the incident begins will be less.	7

Rural Union County: 29	City of Cromwell: ---	Creston Schools: ---
City of Afton: ---	City of Lorimor: ---	East Union Schools: ---
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: ---
City of Creston: 29	City of Thayer: ---	Greater Regional Medical Center: ---

4.3.2: Drought

Definition: A period of prolonged lack of precipitation for weeks at a time producing severe dry conditions.

Description:

There are three types of drought conditions that are relevant to Iowa: Meteorological drought, which refers to precipitation deficiency; hydrological drought, which refers to declining surface water and groundwater supplies; and agricultural drought, which refers to soil moisture deficiencies. Droughts can be spotty or widespread and last from weeks to a period of years. A prolonged drought can have serious economic impact on a community. 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.

According to the National Climactic Data Center, Iowa has had twenty (20) periods of drought from 1980-2009. With the exception of one statewide event, the other 19 events affected anywhere from 11 to 51 percent of the state. Statewide there has been $2.1 billion in crop damage from droughts in modern history. No events have been reported since March 2006.

According to the National Climactic Data Center, there have been 6 drought events were reported in Union County, Iowa, between 01/01/1950 and 3/31/2012.

Table 4 – 10: Recent Union County Drought History

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	08/01/1995	0000	Drought	N/A	0	0	0	0.5 B
2 Various zones in Iowa	07/20/1999	12:00 PM	Drought	N/A	0	0	0	109.9 M
3 Various zones in Iowa	08/14/2000	12:00 AM	Drought	N/A	0	0	0	150.1 M
4 Various zones in Iowa	09/01/2000	12:00 AM	Drought	N/A	0	0	0	161.0 M
5 Various zones in Iowa	08/01/2001	12:00 AM	Drought	N/A	0	0	0	578.9 M
6 Various zones in Iowa	08/01/2003	12:00 AM	Drought	N/A	0	0	645.2 M	0
TOTALS:					0	0	645.2 M	1.5 B

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage (data not limited to Union Co.)

During the period from 1995 to March 2012, there was $645 million in property damage and $1.5 billion in crop damages resulting from drought periods. The most common trend was the consistency of drought periods during the month of August; out of the 6 periods affecting Union County, 4 of them included the month of August. While some may have been more severe than others, agricultural areas were impacted much more than the metropolitan areas where impacts were indirect.

Drought is a normal part of climate fluctuations. It is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. Climatic variability can bring dry conditions to the region up to years at a time. Research and observations of the El Nino/La Nina climatic events are resulting in more predictable climatic forecasts. A drought would likely affect most of Iowa if not the Midwest as a whole. Because of their dependence on precipitation and water, the agricultural community would be the most adversely effected, but the entire state would likely feel some impact.

Other climatic factors such as high temperatures, prolonged high winds/and low relative humidity can aggravate the severity of a drought. Severity depends on duration, intensity, geographic extent and the demands made by human activities and vegetation of regional water supplies.

The most commonly used indicator of drought and drought severity is the Palmer Drought Severity Index (PDSI) published jointly by NOAA and the United States Department of Agriculture. The PDSI measures the departure of water supply (in terms of precipitation and stored soil moisture) from demand (the amount of water required to recharge soil and keep rivers, lakes and reservoirs at normal levels). The result is a scale from +4 to -4, ranging from an extremely moist spell to extreme drought. By relating the PDSI number to a regional index, one can compile data that reflects long-term wet or dry tendencies.

Regional indicators such as the PSDI are limited in that they respond slowly to deteriorating conditions. On the other hand, observing surface conditions and groundwater measurements may provide only a snapshot of a very small area. Therefore, the use of a variety of drought indicators is essential for effective assessment of drought conditions.

Table 4 – 11: Palmer Drought Severity Classifications

Palmer Classifications	
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

During droughts, crops do not mature, wildlife and livestock are undernourished, land values decrease, and unemployment increases. Traditionally, states have relied on the Federal government to provide drought relief when shortages reach disaster or near-disaster proportions. Forty separate drought relief programs administered by 16 Federal agencies provided nearly $8 billion in relief during the mid-1970 droughts and Federal assistance totaled more than $5 billion in response to the 1987-89 drought. However, Federal assistance covers only a small portion of the economic losses. The average yearly loss to drought in the US is between $6 and $8 million and the total losses attributed to the 1987-89 drought were between $39 and $40 billion.

Table 4 – 12: Drought Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Droughts have affected all jurisdictions in Union County. Effects have been considerable in Union County due to its high concentration of agricultural land. This has resulted in the expensive construction of regional water supplies, which rely upon surface water. Droughts have been a major concern over the impact they have had on the economy and quality of life of all jurisdictions. The cost to develop regional water supplies has been many millions of dollars. Local committee members point to droughts in 1985, 1986, and 1988 as especially severe. More prolonged droughts occurred around 1998 and the early part of the last decade (2001-2006). Southern Iowa suffered from a mild but prolonged drought event that nearly drained all water supplies, even with regional water in place in the last decade. Most or all of Iowa experienced drought conditions throughout 2012 and into 2013. Prolonged hot and dry weather in summer 2012 and limited rain and snow during the spring, fall and winter have caused extreme drought in some areas. Water source lakes and streams were critically low. Heavy rain beginning in March 2013 has lessened the drought severity in most of Iowa at the time of plan completion.	4
Probability	Drought is part of normal climate fluctuations and can last for years at a time. Research and observations of the El Nino/La Nina climate events are resulting in more predictable climate forecasts. From 1895-1995, according to a map prepared by the National Drought Mitigation Center and presented in the State of Iowa Mitigation Plan, all of Iowa had a PDSI of less than –3 (severe drought) 10-14.9% of the time. The planning team indicates	4

	that the "current drought outlook is not favorable" and "we are due again." While not officially declared, a drought is developing during the summer of 2012 in most of Iowa.	
Vulnerability	Being a rural county with mainly surface water supplies, Union is likely to suffer heavily from an extended drought, both directly and indirectly. Agriculture, agribusiness, and consumers (if the drought lasted long enough or impacted a large area) would be impacted. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water. Farmers would be most impacted, but all county residents are susceptible. Schools and hospitals may suffer short water supplies and increased vulnerably populations due to dehydration. Particular groups most directly impacted include seniors, handicapped persons, and diabetics.	Rural: 8 Cities, Schools, Hospitals: 4
Maximum Extent	While not all properties and people will be negatively impacted, the drought would occur countywide and in all jurisdiction at a given time.	9
Severity	a) Health and safety of persons in area: Health can be compromised due to the lack of quality water. While the bottled water industry can mitigate some of these issues temporarily, running water is necessary. Lake sources can shrink and result in the inability to dilute chemicals entering water sources. Wildfires are also increasingly likely. Hospitals indicate high number of people needing treatment for dehydration taxing the facilities. **6** b) Health and safety of response personnel: Limited unless firefighters are fighting a fire or other hazard and run out of water. **3** c) Continuity of operations: This impact would be minimal and not easily assessed. **2** d) Property, facilities, and infrastructure: Extreme dry weather can cause lakes to dry up, pipes to heave, and roads and bridges to sustain damage, especially if the drought causes expansive (or contractive) soils. Again, crops and livestock could be lost. **3** e) Delivery of services: Except for delivery of surface water for humans, pets, and livestock, few services would be impacted. Large industry that requires large volumes of water would not be able to deliver services. **3** f) Environment: Fish populations and vegetation in the lakes and streams could be harmed. Dry-sensitive plants and crops would be harmed. Mass death of vegetation could impact wildlife negatively or cause greater risk of landslides, erosion, and other soil loss hazards. **3** g) Economic and financial: Drought can lead to large and damaging impacts to the agricultural economy. Because of Iowa's reliance on the agricultural economy, the economic and financial impacts would certainly ripple out into other sectors. Rural areas can be especially affected by long-term drought. If restrictions were put on manufacturers that use large amounts of water, the local economy would be severely impacted. **8** h) Regulatory and contractual obligations: Area water suppliers would not be able to meet its obligated water supply production with the drop in lake supplies. Regulations in the agricultural sector can be and are often adjusted to provide some lenience for adverse conditions for livestock and crop loss. **4** i) Reputation: Local jurisdictions can have their reputation damaged if they do not provide source water to residents or respond in a satisfactory manner to provide an alternative supply. **3**	4
Speed of Onset	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.	1
Duration of Event	A drought almost always lasts for weeks before adequate rainfall occurs to alleviate the drought conditions.	9

Rural Union County: 39	City of Cromwell: 35	Creston Schools: 35
City of Afton: 35	City of Lorimor: 35	East Union Schools: 35
City of Arispe: 35	City of Shannon City: 35	Southwestern Community College: 35
City of Creston: 35	City of Thayer: 35	Greater Regional Medical Center: 35

4.3.3: Earthquake

Definition: Any shaking or vibration of the earth caused by the sudden release of energy that may impose a direct threat on life and property.

Description:

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the Earth's surface. This shaking can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods, and fires. The three general classes of earthquakes now recognized

are: tectonic, volcanic, and artificially produced.

In the United States several thousand shocks of varying sizes occur annually. All 50 states and all U.S. territories are vulnerable to earthquakes. Forty-one states or territories are at moderate to high risk. While earthquakes occur most frequently west of the Rocky Mountains, historically the most violent earthquakes have occurred in the central United States. The granddaddy of earthquakes was along the New Madrid Fault in Missouri where a 3-month long series of quakes in 1811-1812 included the three quakes larger than a magnitude of 8. These quakes were felt over 2 million square miles, including all of Iowa.

Charles F. Richter developed the Richter Scale in 1935. It is a logarithmic measurement of the amount of energy released by an earthquake. Earthquakes with a magnitude of at least 4.5 are strong enough to be recorded by sensitive seismographs all over the world.

The Modified Mercalli intensity scale also measures the effects of earthquakes. The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction. Although numerous *intensity scales* have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals I-XII. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place. The maximum observed intensity generally occurs near the epicenter.

The following is an abbreviated description of the 12 levels of Modified Mercalli intensity.

I. Not felt except by a very few under especially favorable conditions.
II. Felt only by a few persons at rest, especially on upper floors of buildings.
III. Felt quite noticeably by persons indoors, especially on upper floors. Many people do not recognize it as an earthquake. Standing cars may rock slightly with vibrations similar to the passing of a truck.
IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.
V. Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum docks may stop.
VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
Vll. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.
IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse, Buildings shifted off foundations.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
Xl. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Seismic Impact Zones are regions with a 90% or greater probability that the acceleration (due to a seismic event) will exceed 0.10 g (or 10% of the Earth's gravitational pull) in 250 years. Algermissen delineated these areas and others (1982, U.S. Geological Survey Open File Report 82-1033) based on probabilistic estimates of the maximum acceleration and velocity in rock. Federal regulations for hazardous waste landfills state that new units and lateral

expansions shall not be located in seismic impact zones, unless it can be demonstrated that the facility is designed to resist the event. Most of Iowa, including Union County, falls within Seismic Zone 1, meaning that that the risk is high for 1% minimum peak horizontal ground acceleration versus gravitational pull.

The best protection during an earthquake is to get under heavy furniture such as a desk, table, or bench. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls. Many of the 120 fatalities from the 1933 Long Beach earthquake occurred when people ran outside of buildings only to be killed by falling debris from collapsing walls. Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

Table 4 – 13: Earthquake Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Only 13 earthquakes with epicenters in Iowa are known in historic times. The first known occurrence was in 1867 near Sidney; the most recent occurrence was in 2004 near Shenandoah; both of these towns are only 100 miles southwest of Union County. A moderate quake in Indiana a few years ago and in Oklahoma in 2011 was felt by some very observant people. The largest Iowa earthquake (Mercalli magnitude VI) occurred near Davenport in eastern Iowa in 1934. Only the most recent of these events was instrumentally recorded. There has been no reported damage in Union County from earthquakes.	1
Probability	Seismologists attempt to forecast earthquake size and frequency based on data from previous events. In the Midwest fault lines are very deep and strong events have been rare. It has been determined that there is a high chance by 2040 for an earthquake that affects the area to Magnitude 4, which would mean no noticeable damage. It is very unlikely that an earthquake will cause notable damage in Union County in a given year.	1
Vulnerability	Union County is in Seismic Zone 1, the second lowest zone in the U.S. Most structures in Iowa are not built to earthquake standards, but because of the relatively low magnitude of the possible quake, property damage would likely be minor foundational damage. The most vulnerable structures are those built on poorly consolidated substrate, especially floodplain materials. The planning team indicates the risks are higher than in other areas with the many older buildings, dams, bridges, and other projects. Older homes with poor foundations and mobile homes are likely to be most impacted, and many brick buildings in downtown areas could suffer very minor damage, but average losses per structure are very limited. Schools and hospitals are better off because they are structurally stronger.	Rural, Twp, Cities: 4 Schools, Hospital: 2
Maximum Extent	Estimated effects of a 6.5 Richter magnitude earthquake along the New Madrid Fault Zone suggest residents in Union County would suffer as much vibration as when a heavy truck passes in front of the home on the street, rattling of dishes, creaking of walls, and swinging of suspended objects. All of the county's land and properties would be impacted, even though most would suffer no damage.	8
Severity	a) Health and safety of persons in area: Ground shaking would be very minor and would have very little if any direct threat to human health and safety, although some buildings and bridges could fail. **2** b) Health and safety of response personnel: Since the power of the quake would be small, it is likely that responders would be in danger while addressing rescues, although damaged bridges and buildings could further collapse during a response. **2** c) Continuity of operations: Continuity of operations would be affected only indirectly if communications were to be affected. Power and water facilities could be damaged and would affect local government. **Rural: 3, Others: 2** d) Property, facilities, and infrastructure: Property, facilities, and infrastructure would suffer only minor damages because most facilities are not built to earthquake standards. Minor cracks in roads and pipes could occur, but these would not cause major secondary impacts. Southern Iowa Rural Water believes water lines, towers, and supplies could fail. **4** e) Delivery of services: Delivery of services such as water, wastewater, electricity, communications, etc. may suffer minor, short-term impacts. Life threatening impacts from these services would not be likely. **2** f) Environment: No direct affect on the environment. If the ground shaking caused leaks or ruptures of containment facilities, there could be some localized environmental damages. **1** g) Economic and financial: Economic and financial impacts would be limited, resulting from disruption of the flow of goods and services. Business disruption would likely be very short if any. **2** h) Regulatory and contractual obligations: Impacts would be limited to debris removal if any were produced. **1** i) Reputation: No foreseeable impacts on the reputation. A timely response to immediate life and safety needs would be the determining factor on the jurisdiction's reputation. **1**	2
Speed of Onset	Earthquake prediction is an inexact science. Even in areas that are well monitored with	9

	instruments, such as California's San Andreas Fault Zone, scientists only very rarely predict earthquakes.	
Duration of Event	An earthquake often lasts only a few seconds to a minute.	1

Rural Union County: 26	City of Cromwell: 24	Creston Schools: 24
City of Afton: 24	City of Lorimor: 24	East Union Schools: 24
City of Arispe: 24	City of Shannon City: 24	Southwestern Community College: 24
City of Creston: 24	City of Thayer: 24	Greater Regional Medical Center: 24

4.3.4: Expansive Soils

Definition: Soils and soft rock that tend to swell or shrink excessively due to changes in moisture content.

Description:

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 nationwide. However, because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention, despite their costly effects.

Expansive soil hazards were not profiled in the original HMP adopted in 2006.

Table 4 – 14: Expansive Soils Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Probability and frequency analyses have not been prepared because of the nature of occurrence of this hazard. This is consistent with other geologic hazards that occur slowly over time. In Union County, high clay soils mean that buildings with weak foundations and basements can be and have been affected by shrinking and swelling soils. Historical events have been isolated and have impacted areas of less than 20 feet in diameter. The planning team notes that foundations of homes and some rural bridges and roads have been damaged. Limited official data is available, but it is not difficult to find basements, foundations, and cracking roads to prove this hazard occurs. Excessive rain and flooding (mostly flash flooding) has exacerbated these issues in some areas. Past incidents are likely well under-reported, since this incident occurs slowly in most cases. Arispe points out that few homes in town have basements. Shortly after construction of the new Creston Elementary/Middle School five years ago, expansive soils destroyed large areas of flooring. Frost boils formed in early spring a few years ago, damaging many roads in the county. Water pipes broke at SWCC in 2011.	Rural: 7 Afton: 4 Creston: 5 Other cities: 1 Creston CSD: 2 East Union CSD: 1 SWCC: 5 GRMC: 1
Probability	Probability and frequency analyses have not been prepared because of the nature of occurrence of this hazard. The probability will depend on size of event, with more likely events affecting individual properties. It is likely that individual properties will be affected every year. Reported events causing major damage may occur every few years somewhere in the county. The ratings for this criterion are for significant events that cause significant damage to public assets are an "outbreak" of incidents in widespread areas of private property.	Rural: 6 Afton: 3 Creston: 5 Other cities: 2 Schools: 1 SWCC: 3 GRMC: 1
Vulnerability	Information on clay soils is limited for most properties, but Union County residents are accustomed to minor incidents resulting in bowing basement walls and cracking foundations. There is very little risk to human life. 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. Most major new construction projects, such as government buildings and roads, involve extensive soil testing. Despite some minor variations by community, the committee believes the overall impact is pretty low overall. Minor road and foundation issues can impact hundreds of people mostly in the way of inconveniences and home repair costs. The planning team indicates that the hazard causes "long-term damage rather than an immediate impact." Electrical facilities and water and sewer lines can impact a larger population. When Creston Schools and other jurisdictions build large buildings, the design must include structural fill to address the expansive nature of the local soils.	3
Maximum Extent	The availability of data on expansive soils varies greatly. In or near metropolitan areas and at dam sites, abundant information on the amount of clay generally is available. However, for large areas of the U.S., little information is reported other than field observations of the physical characteristics of clay. Most occurrences in Union County will be very limited in size and have no widespread significance.	Rural: 1 Cities: 1 Schools: 3 SWCC: 3 GRMC: 3
Severity	a) Health and safety of persons in area: Very little to no impact is projected directly. **1** b) Health and safety of response personnel: No response would be necessary unless a	2

	vehicle hits a frost boil or other damaged road and is wrecked. **1** c) Continuity of operations: Road detours may result, causing inconvenience. Water, sewer, and power facilities may be damaged, causing inconvenience, possible sickness, and possible fires, and other issues. **4** d) Property, facilities, and infrastructure: The most extensive damage from expansive soils occurs to highways and streets. 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. Major lifeline systems are affected, including water and sewer lines and major power lines. Rural Water and the Electric Coop report significant occurrences and impacts. **4** e) Delivery of services: Delivery of services should not be impacted. Life threatening impacts from these services would not be likely. **2** f) Environment: No direct affect on the environment unless a hazardous materials is leaked following pipeline failure or similar damages. **2** g) Economic and financial: Economic and financial impacts would be limited, resulting from disruption of the flow of goods and services. Business disruption would likely be very short if any. Loss of infrastructure could cause greater concerns. **3** h) Regulatory and contractual obligations: The jurisdiction would have to repair the roads and surfaces impacted. **1** i) Reputation: No foreseeable impacts on the reputation of the entity. **1**	
Speed of Onset	Soil issues in Union County, including frost boils and foundation cracking, would occur rather slowly but with little or no warning. We would have some warning that events could occur soon due to prolonged weather patterns, such as excessive rain and winter weather.	2
Duration of Event	An expansive soils incident will typically last from a few minutes to days or even weeks. If not corrected, the event can continue to occur and the damage can grow perpetually.	8

Rural Union County: 29	City of Cromwell: 19	Creston Schools: 21
City of Afton: 23	City of Lorimor: 19	East Union Schools: 20
City of Arispe: 19	City of Shannon City: 19	Southwestern Community College: 26
City of Creston: 26	City of Thayer: 19	Greater Regional Medical Center: 17

4.3.5: Extreme Heat

Definition: Extreme heat event (EHE) conditions are defined by summertime weather that is substantially hotter and/or more humid than average for a location at that time of year. Because how hot it feels depends on the interaction of multiple meteorological variables (e.g., temperature, humidity, wind, cloud cover), EHE criteria typically shift by location and time of year. In other words, Boston, Philadelphia, Miami, Dallas, Chicago, San Diego, and Seattle are likely to have different EHE criteria at any point in the summer to reflect different local standards for unusually hot summertime weather. In addition, these criteria are likely to change for each city over the summer. The county's planning team has determined that a local extreme heat event is one in which there are three consecutive days over 90°F, at least one day over 100°F, or three consecutive days over 100°F heat index.

Description:

A prolonged period of excessive heat and humidity. The heat index is a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by at least 15 degrees. Extreme heat can impose stress on humans and animals. Heatstroke, sunstroke, cramps, exhaustion, and fatigue are possible with prolonged exposure or physical activity due to the body's inability to dissipate the heat. Urban areas are particularly at risk because of air stagnation and large quantities of heat absorbing materials such as streets and buildings. Extreme heat can also result in distortion and failure of structures and surfaces such as roadways and railroad tracks.

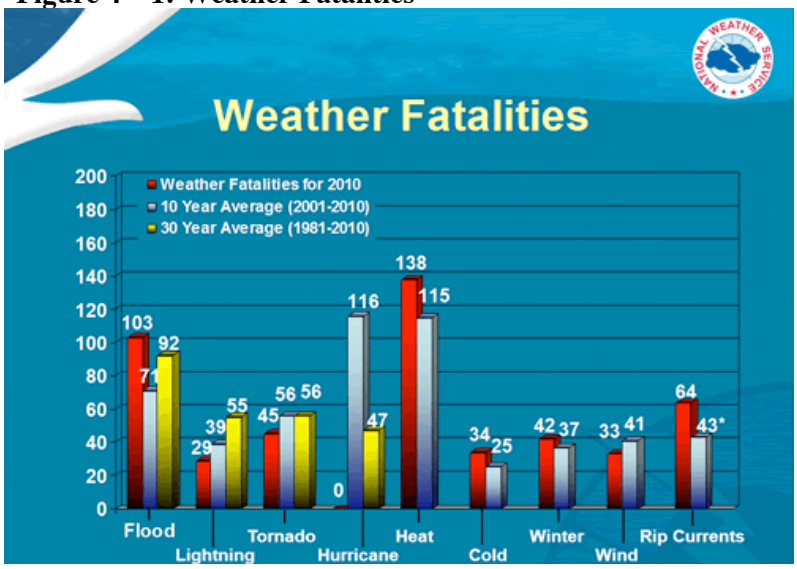
Table 4 – 15: Recent Union County Excessive Heat History

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	07/12/1995	1100	Heat Wave	N/A	3	0	3.8 M	0
2 Zones in Iowa including Union Co.	08/05/2001	10:00 PM	Excessive Heat	N/A	1	0	0	0
3 Union	07/15/2011	6:00 PM	Excessive Heat	N/A	0	0	$135 K	0
TOTALS:					4	0	3.9 M	0

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage (data not limited to Union Co.)

As illustrated to the right, excessive heat is the leading cause of weather fatalities in the nation (through 2009). Many people do not realize how deadly a heat wave can be. In contrast to the visible, destructive, and violent nature of floods, hurricanes, and tornadoes, a heat wave is a silent killer. Heat kills by overloading the human body's capacity to cool itself. In a normal year, about 117 Americans succumb to the bodily stresses of summer heat. In a heat wave in 1980, more than 1,250 people died nationwide.

Figure 4 – 1: Weather Fatalities



Air temperature is not the only factor to consider when assessing the likely effects of a heat wave. High humidity, which often accompanies heat in Iowa, can increase the harmful effects. Relative humidity must also be considered, along with exposure, wind, and activity. The heat index devised by the NWS combines air temperature and relative humidity. Also known as the apparent temperature, the heat index is a measure of how hot it really feels. For example, if the air temperature is 102 degrees and the relative humidity is 55% then it feels like 130 degrees; 28 degrees hotter than the actual ambient temperature. To find the heat index from the figure shown to the right, find the air temperature along the left side of the table and the relative humidity along the top. Where the two intersect is the Heat Index for any given time of day. The new Mean Heat Index is a measure of how hot the temperatures actually feel to a person over the course of a full 24 hours. It differs from the traditional heat index in that it is an average from the hottest and coolest times of each day.

Figure 4 – 2: Heat Index Chart

HEAT INDEX
Apparent Temperature

AIR TEMPERATURE F°	RELATIVE HUMIDITY 40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
110°	136												
108°	130	137											
106°	124	130	137										
104°	119	124	131	137									
102°	114	119	124	130	137								
100°	109	114	118	124	129	136							
98°	105	109	113	117	123	128	134						
96°	101	104	108	112	116	121	126	132					
94°	97	100	102	106	110	114	119	124	129	135			
92°	94	96	99	101	105	108	112	116	121	126	131		
90°	91	93	95	97	100	103	106	109	113	117	122	127	132
88°	88	89	91	93	95	98	100	103	106	110	113	117	121
86°	85	87	88	89	91	93	95	97	100	102	105	108	112
84°	83	84	85	86	88	89	90	92	94	96	98	100	103
82°	81	82	83	84	84	85	86	88	89	90	91	93	95
80°	80	80	81	81	82	82	83	84	84	85	86	86	87

The probability of an event in Union County is highly related to the severity.

Index	*Probability in Union County*	*Severity*
Heat index of 130 degrees F or higher	Very rare (1% chance)	Catastrophic
Heat index of 105 to 129 degrees F	Common (25%+ chance)	Critical
Heat index of 90 to 104 degrees F	Multiple times annually	Limited
Heat index of less than 90 degrees F	Common throughout summer	Negligible

The NWS uses these levels in their weather warning messages to alert the public to the danger of exposure to extended periods of heat, especially when high humidity acts along with the high temperatures to reduce the body's ability to cool itself. Residents of rural areas are at risk due to factors that can include age, outdoor activities, or lack of air conditioning. While heat-related illness and death can occur due to exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. The persistence of a heat wave increases the danger. Excessive heat can lead to illnesses and other stresses on people with prolonged exposure to these conditions. In

addition to the human toll are possible impacts such as electrical infrastructure damage and failure, highway damage, crop damage, water shortages, livestock deaths, fish kills, and lost productivity among outdoor-oriented businesses.

Table 4 – 16: Extreme Heat Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Even though the NCDC has reported only three EHE events, almost every summer there has been at least one EHE as defined by the planning team. Extreme heat has stressed crops, exacerbated droughts, and caused sickness to people and livestock. There are no known human fatalities directly attributed to EHE events in Union County. The week of July 18, 2011 sustained a weeklong excessive heat warning with most of the week seeing 110-degree-plus heat indexes during the day and 90-plus heat indexes at night. The summer of 2012 so far has produced similar events in June and early July, including a few 100-degree days with moderate humidity. The score to the right balances meteorological data with local perception of a true EHE.	8
Probability	Based on historical information, Iowa will likely experience about 26 days a year with temperatures above 90 degrees. There is a very good chance that there will also be a period of 3 consecutive days or more with temperatures in the 90s. It is also likely for the temperature to hit 100 degrees or more once every three years. Heat indices exceed 100 degrees annually.	8
Vulnerability	Extreme heat events are known to be among the greatest cause of natural hazard death and illness to humans and pets. Recent information released by the NOAA Office of Climate, Water, and Weather Services states extreme heat is the number one, non-severe weather related, killer in the United States. Elderly persons, small children, chronic invalids, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to heat reactions. The planning team mentions the high population of elderly people in the county. Healthy individuals working outdoors in the sun and heat are vulnerable. Low-income individuals and inner city dwellers can also be susceptible without access to air-conditioned rooms. While no reported deaths have been attributed directly to extreme heat in Union County, illnesses have occurred. There are few designated locations for residents to go for safety. Some local factories are not air-conditioned yet operate year-round. People participating in sports and recreation are at risk. Schools mitigate this risk by closing during very hot days and are generally not open during the summer.	Schools: 3 SWCC: 4 Others: 6
Maximum Extent	All of Union County would be subjected to the extreme heat.	9
Severity	It is likely that in most summers a moderate severity range is expected, as outlined above. In Union County, catastrophic levels are very unlikely. a) Health and safety of persons in area: Nationally, over the last 30 years, excessive heat accounts for more reported deaths annually than hurricanes, floods, tornadoes, and lightning combined. Heat creeps up on people and they may not know the dangers. **7** b) Health and safety of response personnel: Response personnel could suffer heat stroke and dehydration working in extreme heat conditions. **7** c) Continuity of operations: Operations can be impacted due to heat impacts on workers and utility systems. All electric utility systems and Southern Iowa Rural Water report damages and strains on their capabilities. **5** d) Property, facilities, and infrastructure: Transportation impacts include the loss of lift for aircrafts, softening of asphalt roads, buckling of highways and railways, and stress on automobiles and trucks (increase in mechanical failures). Power lines and facilities can fail. **4** e) Delivery of services: Electric transmission systems are impacted when power lines sag in high temperatures. High demand for electricity also outstrips supply, causing electric companies to have rolling black outs. The demand for water also increases sharply during periods of extreme heat. This can contribute to fire suppression problems for area fire departments. **6** f) Environment: No direct affect on the environment. Livestock and other animals are adversely impacted by extreme heat. High temperatures at the wrong time inhibits crop yields. **2** g) Economic and financial: Economic costs in transportation, agriculture, production, energy, and infrastructure. These direct costs could impact many other economic sectors indirectly. **5** h) Regulatory and contractual obligations: Rural water and electric companies may have trouble providing contracted supplies and meeting sewer discharge regulations. **3** i) Reputation: None if response is adequate and timely. **1**	4
Speed of Onset	As with other weather phenomena, periods of extreme heat are predictable within a few degrees within 3 days or so. Variations in local conditions can affect the actual temperature within a matter of hours or even minutes. The NWS will initiate alert procedures when the heat index is expected to exceed 105 degrees Fahrenheit for at least two consecutive days.	1

Duration of Event	An extreme heat event typically lasts for the afternoon and evening of a given day and can be all day long for a few days or even a week before cooler air arrives to an area.	7

Rural Union County: 43	City of Cromwell: 43	Creston Schools: 40
City of Afton: 43	City of Lorimor: 43	East Union Schools: 40
City of Arispe: 43	City of Shannon City: 43	Southwestern Community College: 42
City of Creston: 43	City of Thayer: 43	Greater Regional Medical Center: 43

4.3.6: Flash Flood

Definition: A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Description:

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. 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 roll 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.

Flash flooding can also be caused by inadequate or improper drainage systems including storm sewers, culverts, and drainage ditches. These systems are usually designed to carry up to a specific amount of water (design capacity). When heavy rainfall causes the design capacity of the systems to be exceeded, water will begin to back up and fill low-lying areas near system inlets and along open ditches. This is most common in urban areas. As land is converted from fields or woodlands to roads and parking lots, it looses its ability to absorb rainfall. Urbanization increases runoff two to six times over what would occur on natural terrain.

According to the National Climactic Data Center, there have been 22 flash flooding events in Union County in modern history (6 from 1993 to 2006 and 18 from 2006 to early 2012), with nearly $1.8 million in reported property damages and $400,000 in crop losses. The county's planning team believes that flash flooding is actually much more common and destructive. Sometimes one location is chosen for the incident but the incident could occur in various individual properties throughout and near a jurisdiction. Dozens of smaller (more localized) events happen in the county during any wet year.

Table 4 - 17: Recent Union County Flash Flood History (2006-2012)

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Rural	08/23/2007	2000	Flash Flood		0	0	100 K	25 K
Rural	08/23/2007	2330	Flash Flood		0	0	25 K	10 K
Lorimor	08/24/2007	0	Flash Flood		0	0	75 K	50 K
Rural	08/24/2007	350	Flash Flood		0	0	50 K	25 K
Creston	06/04/2008	2143	Flash Flood		0	0	100 K	0
Lorimor	06/08/2008	1625	Flash Flood		0	0	50K	0
Creston Arpt	07/24/2008	1250	Flash Flood		0	0	50 K	100 K
Rural	05/25/2010	1635	Flash Flood		0	0	10 K	0
Rural	05/25/2010	1706	Flash Flood		0	0	15 K	0
Creston	06/05/2010	250	Flash Flood		0	0	100 K	0
Creston Arpt	06/05/2010	545	Flash Flood		0	0	10 K	0
Cromwell	09/19/2010	39	Flash Flood		0	0	250 K	25 K
Creston Arpt	05/11/2011	1659	Flash Flood		0	0	250 K	10 K
Creston	05/11/2011	1715	Flash Flood		0	0	10 K	0
Union	06/25/2011	713	Flash Flood		0	0	25 K	0
Union	06/25/2011	955	Flash Flood		0	0	10 K	0
Union	06/25/2011	955	Flash Flood		0	0	10 K	0
Union	06/26/2011	1625	Flash Flood		0	0	10 K	0
TOTALS					0	0	$1.15 M	$245 K

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage

Table 4 - 18: Flash Flooding Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Floods are the most common and widespread of all-natural disasters except fire. In Iowa, as much as 21" of rain has fallen in a 24-hour period. Extreme rain events in 2008, 2009, 2010, and 2011 have occurred in Union County. The main problem resulting from these rains was flash flooding – both urban and small stream events. Culverts, bridges, roads, and other infrastructure have been damaged in the rural areas. Towns with older storm sewer systems have been overwhelmed, and small un-served towns cannot control water. Many of the bridge closings reported in Union County in recent years have been due to small stream rather than large river flood events. In 2008, Afton sustained street flooding damage to roads and received FEMA/State aid of $3,884.88 for a total project cost of $4,058.92. Afton still has minor flash flooding during normal heavy rains because it is difficult to keep ditches and culverts clean and functional. In 2008, Creston's Hurley Creek experienced flash flooding along with much of the north central and northeast part of the town. Sewer backups were common and dozens of homes had severe basement flooding that resulted in FEMA response. Creston also suffered similar problems, although not to the scale requiring FEMA assistance, in 2009, 2010, and 2011. Storm water systems and wastewater collection systems are limited and deteriorated in Creston. Northeast Creston on Townline Street by Bunn-O-Matic Corp has been subjected to severe flooding in recent years; a main cause is too limited collection and treatment systems along with excessive rainwater coming off cropland in the area. This issue is being mitigated at this time by storm collection improvements and a detention basin on the edge of the field. Cromwell received FEMA funding in 2010 for flash flood-damaged streets. In 2008 and 2010, Union County Secondary Roads Department identified significant problems with rural roads and bridges due to flash flooding. Total loss during those years was $2,745,000. In June 2011, a 5" rainfall in the Green Valley Lake watershed raised the water 7 feet in 24 hours and flooded roads. FEMA provided funding to the Union County Conservation Board in recent years due to flooding and high waters that damaged fishing jetties, roads, overflow areas, and culverts at Various county parks. Flash flooding has also greatly impacted cropland. East Union Schools experienced flooding in 2010 and 2011 during a building construction project. Creston Schools suffered flooding after an April 2012 tornado destroyed windows that allowed rain into the building. The same tornado caused similar damage at SWCC and GRMC. SWCC's student center lower level and gym have suffered repeated flooding events over several years (three times over three years). In 2008 the student center was closed for three months and underwent $120,000 in FEMA/State funded repairs. This facility is an emergency shelter, so this problem needs mitigated better. Older events have resulted in FEMA funding in Union County, including $77,000 for public infrastructure to the County in 2001. A heavy rain even in late June 2011 flooded Highway 25 north of Creston and several streets in Creston for a half an hour in several locations. Well contamination is an identified problem with local flash flooding events. Union County Conservation reported that FEMA funding has been invested two replace two culverts at Thayer Lake park just west of Thayer circa 2005 and to repair an access road at Groesbeck Wildlife Area also circa 2005.	Rural: 7 Afton: 4 Arispe: 2 Creston: 6 Cromwell: 2 Lorimor: 2 Shannon City: 2 Thayer: 2 Schools: 3 SWCC: 5 GRMC: 5
Probability	As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. As more development occurs in the watersheds, the amount of runoff produced also increases. Unless measures are taken to reduce the amount of runoff (or slow its movement), flash floods will continue to occur and possibly increase. Often, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff in certain areas. Rural areas may have more events because of the amount of area on which they can occur, but developed areas are more likely to have flash flooding even in normal rain events. Some recent mitigation efforts in Creston, Afton, schools, SWCC, and rural areas should reduce future damaging events. Measures include landscaping around buildings, doorway and window improvements, expansion of culverts, natural waterway improvements (such as riprap, earthmoving, terraces, riparian buffers), detention basin and pond construction, and storm water control system upgrades.	Rural: 6 Afton: 3 Arispe: 2 Creston: 5 Cromwell: 2 Lorimor: 2 Shannon City: 2 Thayer: 2 Schools: 2 SWCC: 4 GRMC: 4
Vulnerability	Particularly at risk are those in low-lying areas; close to dry creek beds or drainage ditches; near water; or downstream from a dam, levee, or storage basin. People and property in areas with insufficient storm sewers and other drainage infrastructure can also be put at risk because the drains cannot rid the area of the runoff quickly enough. Nearly half of all flash flood fatalities are auto-related. Motorists often try to traverse water-covered roads and bridges and are swept away by the current. Six inches of swiftly moving water can knock persons off their feet and only two feet of water can float a full-sized automobile. Recreational vehicles and mobile homes located in low-lying areas can also be swept away by the water. The planning team indicates that the topography and rainfall trends make notable areas susceptible to flash flooding events. Larger towns with paved streets with curb and gutter may have more water control but the amount of paved surfaces is a	Rural: 4 Afton: 5 Arispe: 4 Creston: 6 Cromwell: 4 Lorimor: 4 Shannon City: 4 Thayer: 4 Schools: 4 SWCC: 7

	problem. Small towns have gravel roads or paved roads with no curb and gutter. Often ditches are unmaintained. Older sewer pipes and drains also pose a problem in all areas of the county, causing basement sewer flooding. Although the risks vary by jurisdiction, it is estimated 20 to 25% of any population is truly vulnerable to losses in a single event, maybe slightly less in rural areas.	GRMC: 3
Maximum Extent	Areas in a floodplain, downstream from a dam or levee, or in low-lying areas can certainly be impacted. People and property located in areas with narrow stream channels, saturated soil, or on land with large amounts of impermeable surfaces are likely to be impacted in the event of a significant rainfall. Unlike areas impacted by a river/stream flood, flash floods can impact areas a good distance from the stream itself. Flash flood prone areas are not particularly those areas adjacent to rivers and streams. Streets can become swift moving rivers, and basements can become deathtraps because flash floods can fill them with water in minutes. Rural areas, due to their expanse, would be less impacted. Cities and schools would have a greater percentage of land impacted by excessive rain events.	Rural: 3 Afton: 4 Arispe: 4 Creston: 4 Cromwell: 4 Lorimor: 4 Shannon City: 4 Thayer: 4 Schools: 5 SWCC: 5 GRMC: 5
Severity	a) Health and safety of persons in area: Flash floods are the #2 weather-related killer in the United States. There have been 3 deaths and 9 injuries in Iowa related to flash flooding between 1998 and 2006. **6** b) Health and safety of response personnel: Rescuers are at significant risk when attempting to work in swift moving floodwaters associated with flash flooding. Special training in swift water rescue exists, but few local personnel are trained. **5** c) Continuity of operations: Continuity of operations can be affected because of facilities directly affected, transportation limitations, and government services delays. **4** d) Property, facilities, and infrastructure: Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around and degrading its structural integrity. Because flash flood water is off premises quickly, damages related to standing water are often limited, but the current associated with flash floods causes abrasive type damages such as erosion and undercutting. Roads, culverts, and bridges in Union County have been heavily damaged. The rural area and Creston have greater infrastructure damage issues. **Rural and Creston: 7, others: 4** e) Delivery of services: Flash floods can quickly inundate areas thought to be safe. 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 are common impacts from flash flooding. **5** f) Environment: Destruction of homes, illnesses, transportation accidents, and contamination of water supplies are very possible. Materials swept away by floodwaters can contaminate and leave a lasting impact on the environment. **5** g) Economic and financial: Most impacts are indirect due to disruption of business and damage to infrastructure on which industry and services rely. Damage to Rural, Knoxville and Pella economies may be higher. **Rural and Creston: 5, others: 4** h) Regulatory and contractual obligations: None directly. **1** i) Reputation: Flash floods can be damaging to the reputation of the community if proper notification and warning are not given. Often times the victim will blame development or other changes in the community as the cause of the flooding on their property. **3**	Rural: 5 Creston: 5 Others: 4
Speed of Onset	Flash floods are somewhat unpredictable, but there are factors related to speed of onset: soil type, soil covering/surfacing, topography, wetness of soil before the event, and direction of the water's or storm's origination. Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Warnings may not always be possible for these sudden events. Predictability of flash floods depends primarily on the data available on the causal rain. Individual basins react differently to precipitation events. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. Knowledge of the watershed characteristics, modeling, monitoring, and warning systems increase the predictability of flash floods. Depending on the location in the watershed, warning times can be increased. However, estimations for flash flood events are difficult at best.	8
Duration of Event	Flash floods are usually brief but can last several hours, usually not more than 6 hours.	5

Rural Union County: 38	City of Cromwell: 29	Creston Schools: 31
City of Afton: 33	City of Lorimor: 29	East Union Schools: 31
City of Arispe: 29	City of Shannon City: 29	Southwestern Community College: 38
City of Creston: 39	City of Thayer: 29	Greater Regional Medical Center: 34

4.3.7: Grass and Wildland Fire

Definition: An uncontrolled fire that threatens life and property in either a rural or wooded area.

Description:
Grass and wildland fires can occur when conditions are favorable such as during periods of drought when natural vegetation would be drier and subject to combustibility. In Iowa, landslides and wildfires often happen in similar circumstances. Both tend to occur in forest or sloping grassland areas. For wildfires, Iowa is in "Ag Land" and Model R. These are both "light fuel" according to the US Forestry Service. No specific information for the state on critical fire days was found. Based on climate information obtained, it would be suggested that 2 to 7 days per year would be a good level for southern Iowa. In 2 to 7 days/year fire weather frequency and light fuel, the state has a moderate hazard, no matter the slope of the area surveyed. Only in the more densely forested areas with steeper than 40% slopes is the hazard high in Iowa.

Conditions that may exacerbate or mitigate the effects of wildfires:
1. Climatic conditions
2. Topography
3. Geography—fuels, hazardous materials areas, open construction areas
4. Flammable materials on exteriors of structures
5. Narrow roadways
6. Inadequate hydrants
7. Combustible landscaping
8. Development on the interface with the wildland area (adjacent to forests and row crops)

Table 4 – 19: Grass and Wildland Fire Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	The NCDC reports no wildfires in Union County from 1950 through August 2011. According to the National Interagency Fire Center there have been 1,244 wildfires spanning 30,370 acres and 1,274 prescribed fires spanning 8,951 acres from 2002-May 31, 2010 in Iowa. Most of these have been handled with local fire department capabilities; however, some have required extensive response from outside of local fire departments via mutual aid compacts. Wildfires have occurred in rural Union County, with recent minor incidents within the corporate limits of Creston and Afton (2010). All local fire departments have been involved in numerous small grass and wildland fires, most under 5 acres; up to 4,000 acres (10 homes) has been deemed possible. Union County averages approximately 40 wildland fires per year, but none of them reach levels of state or federal response. Only 10% of the time do fires exceed local capabilities. Over five years ago, one bridge was damaged by a grass fire in remote southern Union County. There have been no known fatalities due to grass or wildland fires in the county.	Rural: 7 Afton: 2 Creston: 2 All others: 1
Probability	There is nearly 100% chance that there will be a grass fire in each county in the state each year; however, the chance of a wildfire that requires more than day-to-day capabilities to handle is much less. Based on State Fire Marshal and National Interagency Fire Center, there is a very low probability of significant wildland fires impacting thousands of acres. Union County planning team members indicate wildland fires are increasingly common, mostly with growth of CRP acres and rural acreages, many of which are in wildland areas. Management of large areas of public land at Twelve Mile, Three Mile, and Green Valley Lake Parks and other areas can result in additional fires. Controlled burns can get out of hand as part of wildlife management. Wildland and grass fires can impact SWCC and both public schools, which are located adjacent to fields and wildland areas. GRMC is not susceptible.	Rural: 7 All others: 1
Vulnerability	While wildfires have proven to be most destructive in the Western States, they have become an increasingly frequent and damaging phenomenon nationwide. People choosing to live in wild-land settings are more vulnerable to wildfires, and the value of exposed property is increasing at a faster rate than population. Iowa is less vulnerable to large-scale wildland fire because of the large percentage of land that is developed. Grass fires are often more easily contained and extinguished before there is damage to people or developed property, although farms, rural developments, and campgrounds are at risk. Fires often burn large portions of field crops in the fall when the crops are dry and the harvesting equipment overheats or throws sparks. This can be quite costly to the farmer in terms of lost production. Forest fires and cropland fires present a greater threat to firefighters than the general public.	Rural: 4 Creston: 2 Other cities: 3 Schools: 3 SWCC: 3
Maximum Extent	Most grass fires are contained to highway right-of-way and rail right-of-way ditches and are less than a few acres in size. High winds can turn a small flame into a multi-acre grassfire within a matter of minutes. The extent is dependent upon conditions such as land use/land cover, moisture, and wind. Local fires rarely exceed 20 acres but can exceed a few thousand acres in the right locations during dry seasons.	Rural: 2 Cities: 3 Schools: 4 SWCC: 3

Severity	a) Health and safety of persons in area: Injuries and deaths from fires and from smoke inhalation are possible. Generally, people can escape the fire area. **3** b) Health and safety of response personnel: Injuries and deaths from fighting the fire most often occur by natural causes such as heart attack or stroke. Rapidly advancing fires in windy conditions can overtake a firefighter. Other weather conditions can also exacerbate risks due to exposure. **6** c) Continuity of operations: Most operations would unlikely be disrupted. **2** d) Property, facilities, and infrastructure: Property damage is usually limited to grass, small trees, etc. Occasionally a house or outbuilding can be damaged or destroyed. **4** e) Delivery of services: Insignificant impacts. **1** f) Environment: Environmental impacts of grass and wild-land fires do not deviate much from the burning of the grasses, crops, or other low land cover. **3** g) Economic and financial: The loss of crops could potentially lead to economic hardships within a community in the event of a widespread fire. Typically if the farmer has insurance, his losses are limited. **4** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Grass fires occur frequently and have little impact on reputation. **1**	3
Speed of Onset	As mentioned above, most grassfires occur without warning and travel at a moderate rate. This situation depends upon conditions at the time such as moisture, wind, and land cover.	9
Duration of Event	Grass and wildland fires that are likely in Iowa would not be to the size or magnitude of those in Western states, which can last for days or weeks. Usually, a fire can be extinguished in 6 hours.	5

Rural Union County: 37	City of Cromwell: 25	Creston Schools: 26
City of Afton: 26	City of Lorimor: 25	East Union Schools: 26
City of Arispe: 25	City of Shannon City: 25	Southwestern Community College: 25
City of Creston: 25	City of Thayer: 25	Greater Regional Medical Center: ---

4.3.8: Hailstorm

Definition: An outgrowth of a severe thunderstorm in which balls or irregularly shaped lumps of ice greater than 1.0 inch in diameter fall with rain.

Description:
Hail is produced by many strong thunderstorms. Strong rising currents of air within a storm carry water droplets to a height where freezing occurs. Ice particles grow in size until they are too heavy to be supported by the updraft. 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.

According to the National Climactic Data Center, there have been 61 hailstorm events in Union County from 1950 through March 2012 (there is gap in reporting from October 2005 through early 2006), resulting in no deaths and injuries but in nearly $2 million in damages ($1.1 million in property damage and $300,000 in crop losses).

Table 4 – 20: Recent Union County Hailstorm History (2006-2012)

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Afton	05/06/2007	320	Hail	1.75 in.	0	0	100 k	0
Arispe	05/06/2007	325	Hail	2.00 in.	0	0	100 k	0
Afton	05/06/2007	330	Hail	2.75 in.	0	0	750 k	0
Creston	07/23/2007	302	Hail	0.88 in.	0	0	0	10 k
Lorimor	04/25/2008	220	Hail	0.88 in.	0	0	1 k	0
Creston	06/04/2008	1757	Hail	0.88 in.	0	0	3 k	0
Creston	06/04/2008	1757	Hail	0.75 in.	0	0	0	0
Lorimor	06/04/2008	1845	Hail	1.00 in.	0	0	3 k	1 k
Creston	06/04/2008	2018	Hail	1.00 in.	0	0	3 k	0
Cromwell	06/04/2008	2026	Hail	1.75 in.	0	0	5 k	5 k
Creston	06/04/2008	2026	Hail	1.00 in.	0	0	5 k	0
Creston	06/04/2008	2040	Hail	1.75 in.	0	0	5 k	5 k
Lorimor	06/04/2008	2110	Hail	1.00 in.	0	0	3 k	5 k
Lorimor	06/04/2008	2119	Hail	2.75 in.	0	0	15 k	5 k
Lorimor	06/05/2008	2110	Hail	0.88 in.	0	0	1 k	5 k
Afton	04/24/2009	2147	Hail	1.00 in.	0	0	1 k	0
Cromwell	05/25/2010	1617	Hail	1.00 in.	0	0	5 k	15 k
Arispe	06/01/2010	1545	Hail	1.75 in.	0	0	10 k	10 k
Arispe	06/18/2010	1720	Hail	0.88 in.	0	0	0	5 k

Afton	06/18/2010	1725	Hail	1.00 in.	0	0	1 k	5 k
Arispe	06/18/2010	1735	Hail	0.88 in.	0	0	0	2 k
Arispe	03/22/2011	1830	Hail	0.75 in.	0	0	0	0
Cromwell	05/11/2011	1646	Hail	1.00 in.	0	0	1 k	0
Creston	05/11/2011	1655	Hail	1.00 in.	0	0	5 k	0
Arispe	05/29/2011	745	Hail	1.00 in.	0	0	1 k	5 k
Union	06/13/2011	2205	Hail	0.75 in.	0	0	0	5 k
Union	06/19/2011	2133	Hail	1.50 in.	0	0	5 k	10 k
Union	06/19/2011	2135	Hail	1.00 in.	0	0	2 k	5 k
Union	06/26/2011	1555	Hail	1.00 in.	0	0	1 k	10 k
Union	06/26/2011	2105	Hail	1.00 in.	0	0	1 k	10 k
Totals:					0	0	$1.027 M	$118 k

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage

Table 4 – 21: Hailstorm Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	According to the NCDC, there have been 61 hailstorms in Union County, affecting various jurisdictions. All jurisdictions have been affected by more than one of these events. The rural area has been affected the most due to the amount of land in rural areas that can be impacted. Hundreds of residential roofs have been destroyed by hail in various parts of the county. All jurisdictions have been affected, with some areas sustaining more damage. Creston, Lorimor, and Afton were hit by large hail events in 2008. A large hailstorm hit Afton and rural areas around it in 2007. In Afton alone FEMA paid $6,957.24 toward $7,905.92 in submitted costs due to the May 2007 hailstorm that destroyed roofs, windows, and siding and damaged vehicles. In northern Creston in June 2008 the town received several minutes of hail exceeding 2" in diameter. Creston Schools suffered severe losses and had to replace windows and roofs; many school vehicles were damaged. This same storm damaged rural areas, including Green Valley State Park. Many roofs were destroyed and there was a FEMA declaration due to the hail, tornadoes, and flooding in the area. The town of Cromwell reports a hailstorm in 2009 that damaged city buildings; insurance and FEMA funding repaired damages. Afton was also damaged by hail in 2010, as was SWCC. Parts of rural Union County were significantly damaged by hail in 2011. All schools, SWCC, and GRMC have been hit by large hail in the past four years.	Rural: 8 Afton: 5 Creston: 7 Cromwell: 4 Lorimor: 4 Other cities: 3 Schools: 3 SWCC: 3 GRMC: 2
Probability	Data on probability and frequency of occurrence of hailstorms is limited, but research indicates that any given point in Iowa can expect on average two to three hailstorms in a year. An individual county is likely to have an event every year to two years. Jurisdictions in the county will receive damage from some of those events. Creston, which occupies the most area, will be more likely to be impacted than other areas.	Rural: 7 Afton: 3 Creston: 6 Other cities: 2 Schools: 2 SWCC: 2 GRMC: 2
Vulnerability	Agricultural crops such as corn and beans are particularly vulnerable to hailstorms stripping the plant of its leaves. Hail can also do considerable damage to vehicles and buildings. Hail only rarely results in loss of life directly, although injuries are not uncommon. People outside away from buildings are most vulnerable to injury, such as those at parks and campgrounds or those out on a lake.	Rural: 6 Cities: 5 Schools: 3 SWCC: 3 GRMC: 1
Maximum Extent	The land area affected by individual hail events is not much smaller that that of parent thunderstorm, an average of 15 miles in diameter around the center of the storm. The largest and most damaging hail usually covers a relatively small part of the hail path.	Rural: 4 Creston: 6 Other cities: 8 Schools: 9 SWCC: 9 GRMC: 9
Severity	a) Health and safety of persons in area: 123 injuries and 4 deaths are attributed to hail in Iowa since 1980 (through 2009). Exposure to hail larger than a nickel can be very dangerous and possibly life threatening. **5** b) Health and safety of response personnel: The same as the risk to others without shelter from the hail. **5** c) Continuity of operations: Operations should not be affected to any significant degree, unless utilities are damaged by hailstones. **3** d) Property, facilities, and infrastructure: Damage to property, facilities, and infrastructure is usually limited to broken windows, damaged siding, damaged roofs, and vehicle damage. Recent heavy losses in Union County were higher than damages by most other hazards but were mostly insured. **6** e) Delivery of services: Delivery of services should not be affected to any significant degree. There may be minor disruptions, but they would likely come from high winds and	4

	lightning (usually associated with hailstorms). **3** f) Environment: Hail can strip plants of their vegetation in very little time. If this occurs at a critical time in the life cycle of plants, it could have fatal consequences. **3** g) Economic and financial: Hailstorms cause nearly $1 billion dollars annually in property and crop damage in the United States. The peak hail activity coincides with the Midwest's peak agricultural season. Financial impacts resulting from damage to property is in the millions of dollars every year, most of which is covered by crop and hazard insurance. Damage to homes, vehicles, and electrical facilities could be very costly also. **7** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Timely and adequate response to the event is the key. **1**	
Speed of Onset	Forecasting hailstorms, as with their parent thunderstorms, is becoming quite accurate due to the advancement in Doppler Radar and other technologies operated by the NWS and many televisions weather departments. Warnings in the 20 to 30 minute range are usually available prior to the occurrence of the storm.	8
Duration of Event	Hailstorms typically last only a few minutes and always less than 1 hour over a given area.	2

Rural Union County: 39	City of Cromwell: 33	Creston Schools: 31
City of Afton: 35	City of Lorimor: 33	East Union Schools: 31
City of Arispe: 32	City of Shannon City: 32	Southwestern Community College: 31
City of Creston: 38	City of Thayer: 32	Greater Regional Medical Center: 28

4.3.9: Landslide

Definition: A downward and outward movement of slope-forming materials reacting under the force of gravity.

Definition:
Landslides occur when susceptible rock, earth or debris moves down slope under the force of gravity and water. Landslides may be very small or very large, and can move at slow to very high speeds. New landslides can be a result of rainstorms, fires, earthquakes, and various human activities that modify slope and drainage. In Iowa, landslides and wildfires often happen in similar circumstances. Both tend to occur in forest or sloping grassland areas. Soil types also impact landslides. They include several types: 1) mudflows (any flow saturated with water), 2) slurry, 3) rock slides, 4) mudslides, and 5) earth flows.

These of any notable size are very rare in southern Iowa. Few recognizable landslides can be mapped in the area due to lack of reporting. Most slides in the region are small and located in stream flows or gravel pits where no damage to human property is noted. Other locations are along roads and railroads where there are cuts in hills and fill installed.

Conditions that may exacerbate or mitigate the effects of landslides:
1. Unstable slopes
2. Earthquakes and volcanoes
3. Vibrations
4. Increase of load—snow, etc.
5. Hydrologic factors—rain, water tables, ground cover
6. Human activity
7. Removal of lateral and underlying support—erosion, previous slides, road cuts, quarries
8. Increase of lateral pressures—high clay soils, tree roots

Topography maps show steep slopes, such as those over 60%, which are most likely to be at risk of landslides. Landslide susceptibility maps are created by combining topography, geology, and past event information into a map of possible events. These maps can be used to delineate hazard maps that tell where they happened in the past, where they could happen in the future, and the scope of the hazard in terms of damages and impacts. No landslide vulnerability map is available for Union County. Various related maps, such as topography and/or shaded relief maps, in *Chapter 2*, provide a glimpse of where landslides can occur in the natural environment.

Table 4 – 22: Landslide Ranking Assessment

Evaluation Criteria	Description	Score
Historical	A natural phenomenon, small-scale landslides have occurred in slide-prone areas of Iowa.	3

Occurrence	There have been numerous small-scale landslide events in Iowa, none resulting in injury or death. The geographic extent of the historic events has been limited to less than a city block in size and has "run out" over the stretch of less than 100 yards. Only rural Union County reports possible landslides: along streams and along steep cuts in the natural landscape such as for roads and pipelines. No other jurisdictions have legitimate landslide areas.	
Probability	All of Union County is in the "low susceptibility" zone, meaning that future probability of major naturally occurring events is almost none. It is much more likely that small but damaging landslides will occur in Union County due to human construction and earthmoving activities that create artificial high slopes. Such include road grades, large building construction, and bridge embankments. In rural areas, the railroad cuts steep banks in the landscape. In some steep shoreline areas streams, landslides are very possible.	3
Vulnerability	Those occupying structures overlooking river valleys and steep ravines are most vulnerable. These constitute a very small number of homes and commercially occupied structures in the state. No human occupied buildings or properties are known to be at risk.	1
Maximum Extent	The geographic extent of the historic events in Iowa has been limited to less than a city block in size and has "run out" over the stretch of less than 100 yards. The maximum extent is very limited because of Iowa's gently rolling hills as opposed to steeper slopes. All known events in Union County have been very small (100 SF or less).	1
Severity	a) Health and safety of persons in area: Injuries and deaths are very unlikely except in the case of undetected slope failure warning signs in structures overlooking steep slopes. **2** b) Health and safety of response personnel: Limited if any. **1** c) Continuity of operations: Operations would unlikely be disrupted. **1** d) Property, facilities, and infrastructure: Property would be limited to a very small percentage of structures. Infrastructure damages would be more significant. Utilities such as pipelines, cables, power poles, etc. are often vulnerable. **2** e) Delivery of services: Delivery of services would be limited to only those services whose infrastructure was impacted. For example, there may be minor power outages or water disruptions if a landslide shifts or destroys underground utilities. **2** f) Environment: Usually a naturally occurring event. In Iowa, these would be on a very localized scale. Slides may alter stream flow and direction until stream seeks a new channel. **1** g) Economic and financial: Landslides have damaged homes, disrupted electricity, water service, communications, and transportation routes. Economic impacts would be secondarily associated with landslides. **2** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Occurrences would be very rare and would not have significant impact on the reputation of the jurisdiction. If response was poorly done or the hazard was not readily recognized as the cause of an infrastructure failure, the reputation could be hurt. **1**	1
Speed of Onset	Landslides are often involved in or triggered by other natural hazards. Landslides and flooding are often related because precipitation, runoff, and ground saturation combine to destabilize soil and rock. For this reason, landslides can be detected if high potential landslide areas are monitored.	9
Duration of Event	Landslides of the likely magnitude in Union County will likely last less than a minute.	1

Rural Union County: 19	City of Cromwell: ---	Creston Schools: ---
City of Afton: ---	City of Lorimor: ---	East Union Schools: ---
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: ---
City of Creston: ---	City of Thayer: ---	Greater Regional Medical Center: ---

4.3.10: River Flood

Definition: 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.

Description:

River flooding is usually the result of heavy or prolonged rainfall or snowmelt occurring in upstream inland watersheds. Melting snow can combine with rain in the winter and early spring; severe thunderstorms can bring heavy rain in the spring or summer. Intense rainfall over a short period of time, or an ice or debris jam can also cause a river or stream to overflow. River floodwaters can occur quickly and move rapidly, as in a flash flood, or waters can rise slowly over a period of hours or even a few days as they often do where the land is gently sloping or flat. The National Flood Insurance Program (NFIP) defines flooding as a partial or complete inundation of normally dry land areas from:

1. The overland flood of a lake, river, stream, ditch, etc.
2. The unusual and rapid accumulation or runoff of stream waters.
3. Mudflows or the sudden collapse of shoreline land.

Floods are the most common and widespread of all natural disasters, except fire. Most communities can experience some kind of flooding after spring rains, heavy thunderstorms, winter snow 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 a car. Floods rise at varying rates but generally develop over a period of days. Flooding is a natural and expected phenomenon, usually restricted to specific streams, rivers or watershed areas.

In Iowa, it is estimated that flooding causes annual damages exceeding $534 million. The extent of damage caused by floods is determined by many factors including depth, frequency, velocity, rate of rise, duration and the potential presence of ice and debris. These factors also determine which mitigation methods will work best.

Depth is the primary factor in evaluating the potential for flood damage. Every floodplain is unique in terms of the different levels of flooding that can be expected.

- Very shallow flooding, usually defined as a depth of 1 foot or less, is not life threatening, but can still cause considerable amounts of damage to a building.
- Shallow flooding of 1 to 3 feet in depth can result in significant amounts of damage both to structures and their contents.
- Moderate flooding, depths of 3 to 6 feet, can destroy buildings and threaten lives due to the large flood forces involved.
- Deep flooding, depths exceeding 6 feet, are the most destructive and dangerous.

Frequency, or how often the flooding occurs, is usually the second factor considered. All floodplains are subject to floods of differing depths, with the lower depths occurring more frequently than higher levels. Although historical flood depths provide some indication of the level of risk, there is no certain method to predict future flood levels. A method of estimating flood frequencies has been developed to determine the statistical probability of specific flood levels. For example, the flood that has a 1-percent (1 in 100) probability of being equaled or exceeded in any year is referred to as the 100-year flood event. However, this does not mean that a 100-year event is one that happens every 100 years or that once a 100-year event happens it will not occur again for another 100 years. This is only a statistical tool used to estimate the risk of certain flood levels. The 100-year flood is known as the base flood elevation or BFE. Once a BFE has been established, it is published on a Flood Insurance Rate Map (FIRM). These maps delineate areas of a specific community that are subject to the base flood.

Velocity is the speed at which floodwaters move. Slow moving floodwaters are usually defined as those having a velocity of less than three feet per second and they usually do not present substantial problems. Fast moving floodwaters, those moving over five feet per second, can quickly erode or scour the soil leading to foundation failure or even moving the house off its foundation. Historical flood event information is often the best way to determine potential flood velocities, although it is possible to hydraulically calculate theoretical velocities.

The speed floodwaters rise, or *Rate of Rise*, is the primary factor in determining the amount of warning time. In steep topography or when large amounts of rainfall occur within a short period of time, flash floods can occur. In low, flat areas the warning time can be several hours or even days. The rate of rise is also important because of the effects of hydrostatic pressure. For example, if the water rises quickly, water may not be able to flow into the building fast enough for the pressure inside to rise as quickly as the level outside. When the internal and external pressures (pressure of the water inside the building and the water outside the building) are significantly different, it could cause serious structural damage and even collapse.

The *duration* of the flood is how long it lasts. Often duration is related to rate of rise and rate of fall. Usually water that rises and falls rapidly will recede more rapidly and water that rises and falls slowly will recede more slowly. How long the structural members, interior finishes, service equipment, and building contents are affected by floodwaters is related to how much damage will occur. Duration also determines how long buildings remain uninhabitable.

Ice and/or debris can often pose a greater danger than the floodwater itself. For example ice floes, caused by ice breakup, can often strike a building causing serious damage or the ice may form around a flooded building causing uplift and structural damage. Floodwaters can carry all types of debris, including trees, portions of flood damaged buildings, storage tanks, mobile homes, as well as dirt and other substances such as oil, gasoline, sewage and chemicals. At low velocities the debris can cause damage and pose a health and safety threat; at higher velocities it can destroy structures, including buildings and bridges.

There have been 29 reported river flood events, of which 27 were reported before 2006. The total losses due to floods since 1950 total $125 million in property losses and $48 million in crop losses. Note that the damage levels are not limited to Union County, as the NCDC aggregated damages to a widespread flood into one total.

Table 4 – 23: Recent Union County River Flood History (2006-2012)

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Creston	06/05/2010	1000	Flood		0	0	100 K	0
Spaulding	06/12/2010	1200	Flood		0	0	0	20 M
TOTALS:					0	0	$100 K	$ 20 M

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage (totals not limited to Union Co.)

A recent serious flooding event in May and June of 2008 resulted in 86 of the State's 99 counties included in Governor's disaster declarations, and 84 being declared as presidentially declared (including Union Co.). The event resulted in 18 fatalities and 106 injuries, the evacuation of approximately 38,000 Iowans and impacting 21,000 housing units. Some of these losses occurred in Union County.

The National Flood Insurance Program (NFIP) Repetitive Loss Properties (RLP) report identifies properties vulnerable to multiple flood losses. To date there is one repetitive loss property, which is located along Hurley Creek in Creston. A total of over $8,400 has been paid toward this property.

Printed FIRM maps have been created for some jurisdictions of the county. These maps are in *Chapter 2*. Most of the jurisdictions in the county once had FHBMs that have since been converted to FIRMs. Flooding is possible in several jurisdictions, but only three are mapped. Mapping is being undertaken now by the Iowa Flood Center, www.iowafloodcenter.org/maps/.

NOTE: There is a difference between being unmapped and having no SFHA. Unmapped: If a community is unmapped, there has been no formal effort to determine if or where flood risk areas may be located. The community has no flood map. The "unmapped" community requires a level "a" ordinance. No SFHA: If a community was studied and mapped, and it was found that there were no SFHAs within that jurisdiction, FEMA has determined the community has no special flood hazard areas. (Rescinded FHBMs fall within this category.) The NSFHA community does not require an ordinance. (*Sources: Iowa Flood Center; IHSEMD Regulation "Staircase")*

FEMA has identified Special Flood Hazard Areas in three (3) incorporated cities. Lorimor was once mapped but the map has been rescinded. Since 2005, all these jurisdictions have been participating in the National Flood Insurance Program (NFIP). The following tables summarize participation and policy and claims data for Union County.

Table 4 – 24: Union County Jurisdictions' Participation in the NFIP

CID	Community Name	Initial FHBM* Identified	Initial FIRM** Identified	Current Effective Map Date	Regular Program Entry Date	Sanction Date
190264#	City of Creston	6/28/74	4/4/83	4/4/83	4/4/83	---
190519	City of Cromwell	6/25/76	5/1/11	6/25/76	8/15/05 (E)	---
190603#	City of Shannon City	8/13/76	5/1/11	8/13/76	8/15/05 (E)	---

Source: FEMA Community Status Book Report, http://www.fema.gov/cis/IA.pdf
**Flood Hazard Boundary Map*
***Flood Insurance Rate Map*
****Original FIRM by letter (E) entry into emergency program*

Table 4 – 25: Union County Jurisdictions' NFIP Policies and Claims

Community	Insurance Zone A			Insurance Zone B, C, & X		
	Policies In Force	# of CPL*	$ of CPL*	Policies In Force	# of CPL*	$ of CPL*
City of Creston	22	8	$114,617	0	0	$0
City of Cromwell	0	0	$0	0	0	$0
City of Shannon City	0	0	$0	0	0	$0

Source: FEMA Community Information Service (CIS), 2010

All jurisdictions are non-delegated communities, which means a State floodplain permit must be issued prior to the community issuing the local permit. Iowa floodplain regulations establish higher standards than the minimum NFIP standards. One example of higher standards is that all new and substantially improved construction must be elevated one foot above base flood elevation. Additional DNR standards have been established for development in the floodway.

Since FEMA has not established base flood elevations or delineated a floodway in Union, they are established by DNR. The applicant is responsible for providing technical data to the Department sufficient to determine the base flood elevation and delineate floodways.

Required mitigation actions to implement the "Maintain and improve performance of jurisdiction's participation in NFIP" alternative are as follows:

- Continue to enforce the floodplain ordinance. This includes monitoring development in the floodplain and ensuring all development is permitted by the community and the State and ensuring permit applicants have received the required State permit prior to issuing a local permit.
- Continue to review and update the floodplain ordinance. To avoid being sanctioned, the community must amend the ordinance whenever minimum State or NFIP standards are revised and when revised maps are issued.
- Expand public information/education initiatives related to flooding. This includes educating the community about floodplain ordinance requirements, mandatory purchase requirements, and insurance availability. Educating the public about the ordinance requirements and the benefits of complying with those requirements (protecting people and property and making insurance available) helps make certain they are aware of and comply with the ordinance and facilitates county enforcement efforts.

Although the State of Iowa's criteria for new floodplain development is similar to the minimum NFIP criteria in most respects, there are some important differences, for example:

- The lowest floor of new structures must be elevated an additional 1.0 foot above the 100-year (base) flood.
- Iowa does not allow new residential structures in the floodway.
- Residential structures must have wheeled vehicular access during the 100-year flood.
- The substantial improvement threshold is reached with an additional 25% **or** more of flood area.
- All post-FIRM (Flood Insurance Rage Map) additions are considered cumulative improvements in the determination of increase in flood area.

(Sources: FEMA Region VII and IDNR)

Table 4 – 26: River Flooding Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	The Floods of 1993 and 2008 are still fresh in the minds of Iowans. Flooding has been a regular and frequent hazard in Iowa. Iowa has been involved in 35 or more Presidential Declarations of a major disaster related to flooding since 1953. Many of these have impacted Union County. Minor or moderate flooding is nearly an annual event in Union County, including 2008, 2009, 2010, and 2011. Major flooding, however, has been rare within the county. The largest waterway, Grand/Thompson River in the eastern half of the county, has done considerable damage to bridges, culverts, and farm fields. Smaller streams, none of which have been mapped by FEMA, have flooded and impacted adjacent properties, culverts, and bridges. Creston's Hurley Creek has flooded and impacted back yards of residential properties. Cromwell's north edge and Shannon City's east edge have been flooded with no notable impact on human assets. Creston Schools Early Childhood Center is located in the Hurley Creek FHA and has been damaged by flooding twice in the past six years. Creston Schools has also lent busses to	Rural: 6 Creston: 4 Cromwell: 2 Shannon City: 2 Creston Schools: 4

	Corning Schools (neighboring Adams County) when their busses were lost in flooding in 2008. Several jurisdictions are identified as having no waterways susceptible to river flooding (although flash flooding can occur): Afton, Arispe, Lorimor, Thayer, East Union Schools, SWCC, and GRMC.	
Probability	Major flooding requiring Federal response is not likely in the next five years in the county. The streams and rivers of the county drain relatively small areas of central and southwest Iowa and are exposed to heavy rains all the time. The future probability, according to the planning team, will vary greatly by vulnerable jurisdiction. With current data, true estimations of probability are difficult at best. It is very likely that a flood impacting at least the "100-year" flood area will occur impacting most of the jurisdictions in the next ten years. River floods are not possible on school, college, and hospital properties or in Afton, Arispe, Lorimor, and Thayer.	Rural: 5 Creston: 3 Cromwell: 1 Shannon City: 1 Creston Schools: 4
Vulnerability	The vulnerability from river flooding is quite delineated to the 1%-chance level. Much work in the area of flood hazard mapping has allowed many communities to restrict development in hazardous areas. However, many properties, including those with homes, are located in mapped flood hazard areas. Using the County's GIS, the following are delineated: Creston: 35 residential properties (mostly backyards and fringes where buildings are not located) but including some homes, 500 to 1,000 LF of streets and roads, part of the Creston sewer plant, one church property, and 50 acres of agricultural land. Cromwell and Shannon City flood hazards impact a few backyards and agricultural and undeveloped areas. County roads could be impacted by flooding if culverts are unable to handle the flowing water. FEMA has identified 102 persons living in 34 single-family structures and 12 other structures within flood hazard areas in Creston. FEMA has identified 17 persons living in the flood hazard area in Shannon City. None are found in Cromwell's SFHA. The rural areas are not mapped at this time, but local planners estimate 2% of the county's land could be impacted by flooding, almost entirely agricultural areas, bridges, and culverts. No homes are known to be in areas that have flooded in the past five years. The planning team is concerned that flooding may cut access to homes in some rural areas in the event of emergency. The NFIP participating Cities have issued regulations to prohibit future development in flood areas. One repetitive loss properties is located in Creston. Infrastructure, such as bridges and roads, rather than private development, is more likely to be lost in a "100-year" flood. However, this infrastructure impacts people and vulnerable populations outside of the flood hazard area.	Rural: 5 Creston: 4 Cromwell: 3 Shannon City: 3 Creston Schools: 3
Maximum Extent	FEMA has delineated the probable extent of the "100-year" flood hazard areas in some of Union County. These FIRMs show properties affected by the floods that have at least a 1% chance of occurring in any particular year. Generally, these areas are in the floodplain or adjacent areas. Much of these areas are parkland, agricultural areas, or conservation land, but residential and commercial areas may be impacted by river flooding as well. Farmland is the most likely area to be impacted. A much larger part of any jurisdiction would be impacted by a "500-year" flood event. However, overall river flooding will only impact about 5% of the property in each jurisdiction in most cases, perhaps a little more in Shannon City. Rural areas are becoming less susceptible due to flood mitigation measures in watersheds, such as basins, terracing, grassed waterways, and large water source lakes. However, major flooding could possibly cause water source dam failure (although the risk is very remote).	Rural: 3 Creston: 3 Cromwell: 3 Shannon City: 5 Creston Schools: 3
Severity	a) Health and safety of persons in area: Flooding impacts include potential loss of life. River flooding has less risk than flash flooding because of the slower onset of the river flood. Large floods with large areas of deep water are unlikely. **3** b) Health and safety of response personnel: Responding to river flooding often includes sandbagging and working in floodwaters. Response personnel should have current tetanus and hepatitis shots. Rescuing victims often requires rescue from boat. Wearing personal protective gear such as life vests at all times can prevent most injuries related to river flooding. **3** c) Continuity of operations: Operations could be disrupted from direct impacts if facilities are in the floodplain and indirectly from loss of critical services (such as electricity) to maintain operations. Back up power and other services can eliminate the impact to operations. Water and wastewater treatment plants are often located in floodplains because they must either take or deposit water into a waterway. River flooding on a wide scale can affect water source lakes in Union and surrounding counties, and can affect nearly the entire county's water supply. Many roads and bridges can be covered and travel can be very difficult. **5** d) Property, facilities, and infrastructure: Personal property can be extensively damaged	4

	and destroyed by swift moving water. Facilities and infrastructure can be scoured around and degrading its structural integrity. In some jurisdictions, sewer plants can be flooded and rendered unusable. However, outside of public infrastructure, damage to private property is likely to be limited in Union County. **5** e) Delivery of services: Damage and disruption of communications, transportation, electric service, and community services are likely in severe cases. Water treatment and wastewater treatment facilities are often located in or near the floodplain and are at high risk of flooding and eventually being taken offline. **6** f) Environment: Hazards of fire, health and transportation accidents, and contamination of water supplies are likely affects of flooding situations as well. Floodwaters can leave pollutants on surfaces and can overtake hazardous materials storage systems, thus spreading chemicals wherever the waters flow. **5** g) Economic and financial: Crop and livestock losses and interruption of businesses either from direct flooding or loss of the delivery of critical services can have damaging impacts on the local economy. Economic impacts can be felt with only a couple days of disruption but week-long flooding is very unlikely. **5** h) Regulatory and contractual obligations: None known. **1** i) Reputation: The jurisdiction should pay careful attention to disclosing flood risk in the community. Participation in the National Flood Insurance Program and providing accurate and up to date flood insurance rate maps will head off most allegations of poor service by the jurisdiction by the citizens. **3**	
Speed of Onset	Gages along streams and rain gages throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days depending on the basin characteristics and the position of the particular reach of the stream. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the NOAA Weather Radio. People in the paths of river floods may have time to take appropriate actions to limit harm to themselves and their property. Most flooding of any large scale will have been forming upstream to the north and west and even east of Union County and so warning would be at least hours to days.	3
Duration of Event	River floods can last for days to even one week in a given area of a river. Most flooding in Union County will be of a shorter duration.	8

Rural Union County: 34	City of Cromwell: 24	Creston Schools: 29
City of Afton: ---	City of Lorimor: ---	East Union Schools: ---
City of Arispe: ---	City of Shannon City: 26	Southwestern Community College: ---
City of Creston: 29	City of Thayer: ---	Greater Regional Medical Center: ---

4.3.11: Severe Winter Storm

Definition: Severe winter weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold.

Description:

Winter storms are common during the winter months of October through April. The various types of extreme winter weather cause considerable damage and can last for several days. Heavy snows cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife. Blizzard conditions are winter storms which last at least three hours with sustained wind speeds of 35 mph or more, reduced visibility of 1/4 mile or less, and whiteout conditions. Heavy snows of more than 6 inches in a 12-hour period or freezing rain greater than 1/4 inch accumulation causing hazardous conditions in the community can slow or stop the flow of vital supplies as well as disrupt emergency and medical services. Loose snow begins to drift when the wind speed reaches 9 to 10 mph. The potential for some drifting is substantially higher in open country than in urban areas where buildings, trees, and other features obstruct the wind. Ice storms result in fallen trees, broken tree limbs, downed power lines and utility poles, fallen communications towers, and impassable transportation routes. Severe ice storms have caused total electric power losses over large areas of Iowa, resulting in people becoming stranded at home with no heat, and rendered assistance unavailable to those in need due to impassable roads. The leading cause of death is automobile accidents. Frigid temperatures and wind chills are dangerous to people, particularly the elderly and the very young. Dangers include frostbite or hypothermia. Deaths also occur as a result of hypothermia and heart attacks due to over exertion. Water pipes, livestock, fish and wildlife, and pets are also at risk from extreme cold and severe winter weather.

Businesses may experience severe financial loss because of reduced productivity during unscheduled downtime and customers' inability to reach the facility. Accumulation of ice can cause damage to power lines and disruption of service and ice can pose hazards to motorists and pedestrians. Extremely cold weather may cause water mains to freeze. Agricultural interests are also impacted. Both crops and livestock are vulnerable to extreme temperatures. Primary concerns include the potential loss of heat, power, and telephone service and a shortage of supplies if storm conditions continue for more than a day. Further, products cannot get to market and employees may be unable to get to work due to icy conditions, unplowed roadways or facility damage.

The National Weather Service bases winter weather warnings on stages of severity, as follows:

- Blizzard Warning: the most dangerous of all winter weather is occurring or imminent. A blizzard is defined as a combination of winds 35 mph or greater with snow or blowing snow reducing visibility to less than 1/4 mile for three or more hours. In blizzards, whiteout conditions, deep snowdrifts, and frigid wind chills form a life-threatening partnership. You should seek refuge immediately.
- Winter Storm Warning: severe winter weather is occurring or imminent. You should already be prepared and should take protective actions immediately. This warning is issued when 6 inches of snow are expected in 24 hours at lower elevations (below 7500 feet). Travel can become difficult or impossible, especially for vehicles without four-wheel drive.
- High Wind Warning: hazardous winds are occurring or will soon occur across a significant area. For elevations below 7500 feet, sustained winds of 40 mph or greater or gusts to 60 mph or more are expected. Travel can be dangerous, especially for high profile vehicles.
- Wind Chill Warning: wind chill is the combined effect of cold temperatures and wind in chilling the body. A warning is issued when wind chills of minus 40 degrees F or colder with winds of at least 10 mph are occurring or imminent. Frostbite can occur in seconds, and hypothermia within minutes. The effects of temperature and wind chill increase the severity of a winter storm. Wind blowing across exposed skin drives down the skin temperature and eventually the internal body temperature. Exposure to low wind chills can be life threatening to humans and animals.

Figure 4 – 3: Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

The current Wind Chill Temperature Index took effect in 2001, replacing the original index devised in 1945. To find the Wind Chill Temperature Index from the chart, find the air temperature along the top of the table and the wind speed along the left side. The point where the two intersect is the wind chill temperature.

The annual probability of an event in Union County is highly related to the severity.

Winter Event	*Probability in Union County*	*Severity*
Heavy Snow	Highly Likely	Limited
Ice Event	Likely	Moderate to High
Extreme Cold	Highly Likely	Moderate
Blizzard	Likely	Moderate to High

The NCDC has reported 42 snow and ice events between 1993 and 2006. The losses included 6 fatalities, $40.599 million in property losses and $65 million in crop losses (not all within Union County). Most of the losses were

due to storms in 2000/01. The NCDC reported 11 extreme cold and wind chill events resulting in 1 fatality, $1.75 million in property damage, and $281 million in crop damage. The most damaging events were not extreme cold as we think of it but rather were unusual cold events during crop growing seasons.

Table 4 – 27: Recent Union County Severe Winter Storm and Extreme Wind Chill History (2006-2012)

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
UNION	03/01/2007	400	Blizzard		0	0	100 K	0 K
UNION	12/09/2009	100	Blizzard		0	0	50 K	0 K
UNION	01/25/2010	1400	Blizzard		0	0	75 K	0 K
UNION	12/11/2010	1400	Blizzard		0	0	75 K	0 K
UNION	02/01/2011	1700	Blizzard		0	0	25 K	0 K
UNION	10/10/2009	200	Frost/Freeze		0	0	0 K	2.5 M
UNION	04/11/2012	0	Frost/Freeze		0	0	0 K	1.5 M
UNION	01/20/2007	1700	Heavy Snow		0	0	0 K	0 K
UNION	01/16/2008	1500	Heavy Snow		0	0	0 K	0 K
UNION	02/13/2009	1000	Heavy Snow		0	0	0 K	0 K
UNION	12/07/2009	2300	Heavy Snow		0	0	10 K	0 K
UNION	03/19/2010	1630	Heavy Snow		0	0	0 K	0 K
UNION	11/09/2011	230	Heavy Snow		0	0	200 K	0 K
UNION	02/04/2012	300	Heavy Snow		0	0	0 K	0 K
UNION	12/01/2007	600	Ice Storm		0	0	50 K	0 K
UNION	12/10/2007	2200	Ice Storm		0	0	100 K	0 K
UNION	12/18/2008	1830	Ice Storm		0	0	5 K	0 K
UNION	12/27/2008	600	Ice Storm		0	0	5 K	0 K
UNION	01/20/2010	100	Ice Storm		0	0	100 K	0 K
UNION	02/12/2007	2230	Winter Storm		0	0	0 K	0 K
UNION	02/24/2007	300	Winter Storm		0	0	250 K	0 K
UNION	02/05/2008	1000	Winter Storm		0	0	10 K	0 K
UNION	12/24/2009	1800	Winter Storm		0	0	50 K	0 K
TOTALS:					0	0	$880 K	$4 M

Source: National Climactic Data Center, 7/2012 (data available through 3/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage (totals not limited to Union Co.)

There have been 76 recorded severe snow, ice, and wind chill events affecting the county, causing hundreds of millions in damages and the direct loss of 7 lives from 1993 through March 2012. Like river flooding, most of the damage and all of the deaths included in these estimates occurred outside of Union County. However, damages, especially to early and late season crops, are very high even in Union County.

Table 4 – 28: Severe Winter Storm Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Since 1993, Iowa has had 1,221 recorded winter storms; including, heavy snow, ice storm, blizzards or extreme wind-chill events. In Iowa's history, there are many accounts where large numbers of deaths are due to the cold and blizzards. While the populace is not as vulnerable as the early settlers were, there are recent accounts of multiple deaths from snowstorms and extreme cold around the state. Between 1993 and March of 2010, there have been at least 25 injuries and 12 deaths directly due to winter weather in Iowa. From 1953-2010, seven Presidential Declarations of Major Disaster have been declared in Iowa that were related to severe winter storms, with the first disaster in December of 1991, and the latest occurring in March of 2010. In March 1998 a governor's declaration resulted in the National Guard being dispatched to the area. Heavy snow and ice has caused or contributed to many other injuries, deaths, and property losses. The planning team reports recent events in 2007, 2009, 2010, and 2011. Not just are there property losses, but local businesses report lost productivity due to employees not making it to work, power grid issues, and transportation of items to and from the places of business. Schools report loss of power and school days and roads made impassable. SWCC reports that recent heavy snow events have tripled the school's road clearing budget. Perhaps the worst winter storm in recent memory was the December 2007 ice storm that knocked out power for hours in all parts of the county and days in many rural areas. This storm destroyed thousands of trees, and caused millions of dollars in power line losses in	9

	the county. All areas were impacted and many homes were without power for days. The City of Afton received $28,124.43 from State/FEMA toward $33,798 in damages due to ice on the city' electric system and roads and for tree and brush cleanup. Green Valley State Park had damage from this storm that resulted in approximately $15,000 in FEMA funding power failure in the park. Union County Conservation received $3,588 from FEMA for tree removal. Many other jurisdictions suffered losses also. Many rural electric cooperatives and other providers are now undertaking FEMA mitigation projects to strengthen power lines as result. Local power supplies had to be supplemented but the demand was not adequately met. Another major event was the 17-inch snowfall that covered the county in December 2009. The winter of 2009-10 was one of the top snow-makers in Iowa's recorded history, with over 70" of snow in this area. The State of Iowa declared a disaster area and authorized up to $5,000 in state individual assistance for damages due to ice and snow in early 2010. SWCC lost power to the Student Center, which serves as a emergency warming shelter. A very heavy, wet six-inch snow with high winds in November 2011 damaged trees and power lines in Creston and northern Union County. Poles supporting high voltage lines crossing the area had to be replaced. While this storm was not a true severe winter storm, it proves that any winter weather can be damaging to property.	
Probability	Winter storms regularly move easterly and use both the southward plunge of arctic cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow and sometimes blizzard conditions in Iowa and other parts of the Midwest. The cold temperatures, strong winds, and heavy precipitation are the ingredients of winter storms. Union County can usually expect 2 or 3 winter storms a season. Almost all winters can we expect one severe winter storm with high winds, heavy snows, and/or crippling ice and wind chills. A snow of 10 inches or more occurs about half of the winters. A severe ice storm occurs about every three to five years.	7
Vulnerability	Due to the large number of low-income and elderly people in Union County, as well as limited resources and sheltering, all areas of the county are vulnerable. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents. The leading cause of death during winter storms is transportation accidents. About 70% of winter-related deaths occur in automobiles and about 25% are people caught out in the storm. The majority of these are males over 40 years of age. Emergency services such as police, fire, and ambulance are unable to respond due to road conditions. Emergency needs of remote or isolated residents for food or fuel and for livestock care are unable to be met. People, pets, and livestock are also susceptible to frostbite and hypothermia during winter storms. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are the elderly or very young. Schools often close during extreme cold or heavy snow conditions to protect the safety of children and bus drivers. Citizens' use of kerosene heaters and other alternative forms of heating may create other hazards such as structural fires and carbon monoxide poisoning. Elderly and others can slip and fall and can die due to exposure. Because schools and SWCC are closed in severe storm situations, the vulnerability is slightly less. GRMC is somewhat insulated because the hospital can function in severe weather, although employees and responders may not be able to travel. Rural roads require tons of rock to meet demand after the winter thaw.	Schools: 6 SWCC: 6 GRMC: 6 All others: 8
Maximum Extent	Winter storms are quite vast and would likely impact multiple counties. Certain areas may experience local variations in storm intensity and quantity of snow or ice.	9
Severity	a) Health and safety of persons in area: The dozens of deaths and injuries previously reported are only those as a direct result of severe winter weather. This does not include the automobile accidents and the casualties associated with them during and after winter storms. It does not give a full account of those that suffer minor injury or death from natural causes after being exposed. Cold temperature impacts on agriculture are frequently discussed in terms of frost and freeze impacts early or late in growing seasons and unprotected livestock. The committee is very concerned over the impact of severe winter storms due to the lack of backup generators in key housing facilities that rely on reliable heating sources. **7** b) Health and safety of response personnel: Response personnel are exposed to cold temperatures and traffic accidents when responding to the victims' needs. **7** c) Continuity of operations: Operations can be limited or halted when critical services are not available. Staff may not be able to make it to the place of work thus, limiting the continuity of operations. **6** d) Property, facilities, and infrastructure: Immobilized transportation (including emergency vehicles), downed trees and electrical wires, building and communication tower collapse, and bodily injury/death are just a few of the impacts of a severe winter storm. Vehicle	6

	batteries and diesel engines are stressed and the fuel often gels in extreme cold weather. This impacts transportation, trucking, and rail traffic. In recent ice storms, rural electric providers sustained many millions of dollars in damage to lines and equipment, some of it in Union County. **6** e) Delivery of services: Fire during winter storms presents a great danger because water supplies may freeze and firefighting equipment may not function effectively, or personnel and equipment may be unable to get to the fire. If power is out, interiors of homes become very cold and lead to pipes freezing and possibly bursting. Rivers and lakes freeze and subsequent ice jams threaten bridges and can close major highways. Ice jams can also create flooding problems when temperatures begin to rise. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages. Buried water pipes can burst causing massive ice problems and loss of water and subsequent evacuations during sub-zero temperatures. **8** f) Environment: Winter storms are a natural occurrence and there would be no direct significant impact on the environment. **1** g) Economic and financial: The cost of snow removal, repairing damage, and loss of business can have large economic impacts on the community. The State estimates $76,159,000 in property damage, and $346,900,000 in lost crops due to heavy snow, ice storm, or extreme wind-chill events statewide from 1993 through 2006. **7** h) Regulatory and contractual obligations: Enforced snow ordinances allow the jurisdiction to more effectively open transportation routes. Delivery and adequate supplies of salt, sand, and saline are important inputs to the snow removal process. These contracts should be in place. Removal of debris and reinstatement of energy are vital to safety of the public as well. Agreements should be in place with the power company to ensure power is restored in an effective and timely manner following the storm. **5** i) Reputation: Effective and timely response to the snowstorm is key maintaining a good reputation. Streets clear of snow and ice are important factors to the mobile public. **3**	
Speed of Onset	The NWS has developed effective weather advisories that are promptly and widely distributed. Radio, TV, and Weather 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. Notifications made by the NWS include winter storm watch, winter storm warning, blizzard warning, winter weather advisory, and a frost/freeze advisory.	2
Duration of Event	Severe winter storms can last up to 2 days.	7

Rural Union County: 48	City of Cromwell: 48	Creston Schools: 46
City of Afton: 48	City of Lorimor: 48	East Union Schools: 46
City of Arispe: 48	City of Shannon City: 48	Southwestern Community College: 46
City of Creston: 48	City of Thayer: 48	Greater Regional Medical Center: 46

4.3.12: Sinkhole

Definition: The loss of surface elevation due to the removal of subsurface support.

Description: Sinkholes range from broad, regional lowering of the land surface to localized collapse. The primary causes of most subsidence are human activities: Underground mining of coal, groundwater or petroleum withdraw, and drainage of organic soils. Sinkholes can also be due to erosion of limestone of the subsurface. Land subsidence occurs slowly and continuously over time or on occasion abruptly, as in the sudden formation of sinkholes. Sinkholes can aggravate flooding potential. The collapse of an abandoned mine may destroy buildings, roads and utilities.

The State of Iowa Mitigation Planning Team does not place sinkholes as a major priority for placing funding and assistance, calling it a localized hazard.

Table 4 – 29: Sinkhole Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Through 2010, there have been no sinkholes reported to the IDNR in Union County. The planning team and other sources indicate no past issues with sinkholes. There are no appreciable underground mines in the county; any past minor sinkholes (not formally reported) have been due to excavation for infrastructure, such as deteriorating water pipelines, buried tanks, poorly compacted roads, etc.	1
Probability	Old wells have been properly capped in recent years. The planning team states that sinkholes are rare but can occur almost anywhere. All jurisdictions can be affected by sinkholes. Sinkholes risk areas posing high enough risk that must be mitigated are unlikely	Rural: 3 Cities: 2 Schools: 1

	to occur.	GRMC: 1
Vulnerability	Sinkholes can aggravate flooding potential, collapses such as the sudden formation of sinkholes or the collapse of an abandoned mine may destroy buildings, roads and utilities. Users of these facilities in a localized area can be impacted. Schools and hospitals are affected more because they have a higher population in a small area.	Rural: 1 Cities: 2 Schools: 3 GRMC: 3
Maximum Extent	Damage consists primarily of direct structural damage and property loss and depreciation of land values, but also includes business and personal losses that accrue during periods of repair. Losses in Union County are likely to be limited to less than 50 SF of surface area.	1
Severity	a) Health and safety of persons in area: Generally, land subsidence poses a greater risk to property than to life. **1** b) Health and safety of response personnel: Not affected unless a pipeline is exposed that could explode, ignite, or spew out gases during rescue or response operations. **1** c) Continuity of operations: Depends on the area damaged and the facilities and infrastructure involved. **1** d) Property, facilities, and infrastructure: Damage to property, facilities and infrastructure would only occur if the event undermined foundations. **2** e) Delivery of services: Likely not affected **1** f) Environment: Sinkholes are a result of a dynamic environment. **1** g) Economic and financial: Depends on the affected area. **2** h) Regulatory and contractual obligations: Not affected. **1** i) Reputation: Not affected. **1**	1
Speed of Onset	Regional lowering occurs gradually over time, while the collapse of abandoned mines, wells, and buried utilities can occur suddenly.	8
Duration of Event	Sinkholes are likely to occur rather quickly but could take several hours to complete.	3

Rural Union County: 18	City of Cromwell: 18	Creston Schools: 18
City of Afton: 18	City of Lorimor: 18	East Union Schools: 18
City of Arispe: 18	City of Shannon City: 18	Southwestern Community College: 18
City of Creston: 18	City of Thayer: 18	Greater Regional Medical Center: 18

4.3.13: Thunderstorm and Lightning

Definition: Atmospheric imbalance and turbulence that may result in thunder, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 58 mph resulting in tornadoes, or surface hail of at least 1 inch in diameter, and lightning. The NWS considers a thunderstorm severe if it produces hail at least 1-inch in diameter, wind 58 mph or higher, or tornadoes.

Description:

Atmospheric imbalance and turbulence caused by: (1) the rapid rising of unstable warm air into the atmosphere, (2) a sufficient amount of moisture to form clouds and produce rain, and (3) the collision of separate weather fronts (warm and cold) creating an upward lift of air currents. When the water rises to between 15,000 and 25,000 feet above sea level, it begins a chemical process to turn the water into ice. This process creates a build up of positive and negative charges that produce a buildup of electricity that releases towards the earth in 50-yard sections called ladders that are searching for a source of conduction. When a suitable source is located, the connection is made creating a circuit. When the circuit is complete, the charge is then transferred from the cloud where it was formed, to the site in the ground where the circuit was made. A lightning bolt can approach a temperature of 50,000 degrees Fahrenheit at the site of impact in a split second. This rapid heating, expansion, and cooling of air near the lightning bolts create thunder. Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. Most thunderstorms produce only thunder, lightning, and rain. Severe storms however, can produce tornadoes, high straight-line winds, microbursts, hailstorms, and flooding. High straight-line winds are often mistaken for tornadoes. Lightning occurs with all thunderstorms even if the buildup of electricity isn't strong enough to send a bolt to the ground.

Table 4 – 30: Recent Union County Severe Thunderstorm, Thunderstorm Wind, and Lightning History

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Spaulding	06/04/2008	2040	Heavy Rain		0	0	0K	0K
Creston Arpt	07/24/2008	30	Heavy Rain		0	0	0K	0K
Creston	07/24/2008	30	Heavy Rain		0	0	0K	0K
Creston Arpt	07/24/2008	30	Heavy Rain		0	0	0K	0K
Creston	07/24/2008	30	Heavy Rain		0	0	0K	0K
Creston Arpt	07/24/2008	30	Heavy Rain		0	0	0K	0K
Lorimor	07/28/2008	200	Heavy Rain		0	0	0K	0K
Lorimor	07/04/2009	0	Heavy Rain		0	0	0K	0K

Creston	07/04/2009	0	Heavy Rain		0	0	5K	0K
Spaulding	05/25/2010	1500	Heavy Rain		0	0	0K	0K
Creston	08/16/2011	300	Heavy Rain		0	0	0K	0K
Lorimor	04/15/2012	600	Heavy Rain		0	0	0K	0K
Creston	07/04/2009	300	Lightning		0	0	5K	0K
Creston	05/11/2011	1720	Lightning		0	0	40K	0K
Creston Arpt	08/07/2007	1748	Thunderstorm Wind	53 kts.	0	0	2K	10K
Creston	08/07/2007	1748	Thunderstorm Wind	53 kts.	0	0	5K	0K
Creston	08/12/2007	1808	Thunderstorm Wind	50 kts.	0	0	2K	0K
Afton	08/12/2007	1818	Thunderstorm Wind	50 kts.	0	0	2K	0K
Creston	08/20/2007	2047	Thunderstorm Wind	53 kts.	0	0	3K	0K
Creston	09/06/2007	2303	Thunderstorm Wind	61 kts.	0	0	5K	0K
Creston	05/24/2008	427	Thunderstorm Wind	53 kts.	0	0	0K	0K
Creston	05/25/2008	2003	Thunderstorm Wind	52 kts.	0	0	15K	0K
Afton	05/25/2008	2003	Thunderstorm Wind	55 kts.	0	0	3K	0K
Creston	05/30/2008	38	Thunderstorm Wind	50 kts.	0	0	3K	0K
Creston	05/30/2008	41	Thunderstorm Wind	50 kts.	0	0	3K	0K
Creston Arpt	05/30/2008	43	Thunderstorm Wind	50 kts.	0	0	0K	0K
Creston	05/30/2008	47	Thunderstorm Wind	56 kts.	0	0	0K	0K
Creston	05/30/2008	300	Thunderstorm Wind	52 kts.	0	0	3K	0K
Lorimor	05/30/2008	312	Thunderstorm Wind	50 kts.	0	0	2K	0K
Lorimor	05/30/2008	330	Thunderstorm Wind	52 kts.	0	0	10K	0K
Creston Arpt	06/04/2008	1812	Thunderstorm Wind	62 kts.	0	0	1K	0K
Cromwell	06/04/2008	2026	Thunderstorm Wind	61 kts.	0	0	2K	0K
Creston	06/04/2008	2047	Thunderstorm Wind	50 kts.	0	0	0K	0K
Creston Arpt	06/04/2008	2047	Thunderstorm Wind	50 kts.	0	0	0K	0K
Lorimor	06/08/2008	1525	Thunderstorm Wind	52 kts.	0	0	0K	0K
Creston	06/15/2008	916	Thunderstorm Wind	51 kts.	0	0	0K	0K
Afton	06/27/2008	1805	Thunderstorm Wind	56 kts.	0	0	10K	0K
Creston	09/29/2008	56	Thunderstorm Wind	50 kts.	0	0	0K	0K
Creston	04/24/2009	2149	Thunderstorm Wind	52 kts.	0	0	0K	0K
Creston	06/23/2009	1720	Thunderstorm Wind	52 kts.	0	0	5K	0K
Afton	08/09/2009	1753	Thunderstorm Wind	89 kts.	0	0	500K	50K
Afton	08/09/2009	1753	Thunderstorm Wind	64 kts.	0	0	25K	10K
Creston Arpt	06/22/2010	338	Thunderstorm Wind	52 kts.	0	0	2K	0K
Creston	06/22/2010	351	Thunderstorm Wind	61 kts.	0	0	15K	0K
Creston	08/06/2011	2131	Thunderstorm Wind	62 kts.	0	0	50K	25K
Creston	08/06/2011	2133	Thunderstorm Wind	52 kts.	0	0	10K	0K
Afton	08/06/2011	2139	Thunderstorm Wind	50 kts.	0	0	0K	0K
Creston	08/06/2011	2140	Thunderstorm Wind	58 kts.	0	0	0K	0K
Creston	04/14/2012	1804	Thunderstorm Wind	69 kts.	0	0	250K	0K
TOTALS:					0	0	$975 K	$96 K

Source: National Climactic Data Center, 7/2012 (data available through 4/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage

The 91 recorded events through early 2006 clearly illustrate that severe thunderstorms are common in Union County. One death and 8 reported injuries and over $45.76 million in property losses and $431,000 in crop losses in the county attest to the destruction due directly to thunderstorms. Four (4) lighting events before 2006 caused $162,000 in property damage. Since 2006, there have been 49 severe thunderstorm events reported within the county. Including previous data, the hazard has caused a total of $46.7 million in property losses and $527,000 in crop losses with 1 death and 8 injuries. Note that, while events are reported by a given community, most of the events covered large portions of the county.

One look at the statewide thunderstorm and wind event map in the State of Iowa HMP shows that Union County has modestly less reported events than the average county. The counties with the most events are much more urban or are more densely populated rural areas than Union County; it is therefore believed that the number of events is under-reported in rural counties. This may be due to the fact that the damage to crops, wildland areas, and a limited number of outbuildings is less notable when compared to denser residential and commercial developments in a very localized area. Iowa is among the top states in the nation in lightning-related fatalities and the annual property damages sustained by lightning.

Table 4 - 31: Severe Thunderstorm Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Between 1955 and March of 2010, at least 10,090 severe thunderstorm, high wind, or lightning events have impacted Iowa. The NCDC has reported 134 events in Union County alone. Because thunderstorms may occur singularly, in clusters, or in lines, it is possible that several thunderstorms may affect the area in the course of a few hours. One system may spawn multiple events. A number of these thunderstorms have caused other hazards such as flash flooding, river flooding, and tornadoes. There have been 30 Presidential Declarations of Major Disaster since 1953 due to severe thunderstorms. Power lines and poles have been destroyed by thunderstorm winds in Union County. The most recent damaging event (not counting the winds associated with the thunderstorm that brought a tornado in April 2012, was in August 2011; this storm could be counted as a windstorm. In that storm, a suspected microburst caused extensive tree, power line, and crop damage throughout Creston and in a path from the Creston area to northeast of Lorimor. SWCC reports that lightning strikes cause computer problems on campus annually. The severe storms in June 2008 caused extensive thunderstorm wind damage to Creston Schools roofs and athletic facility lights. Over $600,000 was needed to fix the damage.	Rural: 9 Cities: 8 Schools: 7 SWCC: 8 GRMC: 7
Probability	Thunderstorms are an annual event in all jurisdictions of the county. Severe thunderstorms occur nearly every year in all jurisdictions. Iowa experiences between 30 and 50 thunderstorm days per year on average. A given county will have 35 thunder events per year, and lightning strikes an average of 5.4 times per square mile per year. According to NOAA the annual chance of an individual being struck by lightning is 1:600,000. With Iowa's location in the interior of the U.S., there is a very high likelihood that this trend will continue.	Rural: 9 Cities: 8 Schools: 7 SWCC: 8 GRMC: 7
Vulnerability	During a storm, those in unprotected areas, mobile homes, or automobiles are at risk. Sudden strong winds often accompany a severe thunderstorm and may blow down trees across roads and power lines. Lightning presents the greatest immediate danger to people and livestock during a thunderstorm. It is the second most frequent weather-related killer in the U.S. with nearly 100 deaths and 500 injuries each year. (Flash floods are the number one cause of weather related deaths in the U.S.) Livestock and people who are outdoors, especially under a tree or other natural lightning rods, in or on water, or on or near hilltops are at risk from lightning. Hail can be very dangerous to people, pets, and livestock if shelter is not available. Cascading events, such as tornadoes, power loss, and flooding, can also cause significant loss. The planning team noted that lightning has knocked out power and key facilities for many hours. TV, computer, refrigeration, and power line losses cause hardship for the low-income elderly population. Generally schools and the hospitals have lower population vulnerability because of sturdy modern design and in many cases lightning protections in place. Note that numerous thunderstorms that are not classified as severe cause minor damage in the county.	Rural: 7 Cities: 7 Schools: 5 SWCC: 5 GRMC: 5
Maximum Extent	Severe thunderstorms can be quite expansive with areas of localized severe conditions. Most severe thunderstorm cells are 5 to 25 miles wide with a larger area of heavy rain and strong winds around the main cell. Most non-severe thunderstorms have a lifespan of 20 to 30 minutes, while severe thunderstorms last longer than 30 minutes to even 70 minutes, which is long enough to cover the entire county. Because Union is a small county, some severe thunderstorms affect the entire county. The severe sections of a given thunderstorm impacts a smaller area on average, but can still cause widespread hardship in any jurisdiction.	Rural: 7 Cities: 9 Schools: 9 SWCC: 9 GRMC: 9
Severity	a) Health and safety of persons in area: Thunderstorms and lightning can cause death, serious injury, and substantial property damage. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures. Thunderstorms can also bring large hail that can damage homes and businesses, break glass, destroy vehicles, and cause bodily injury to people, pets, and livestock. **5** b) Health and safety of response personnel: Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. Work on ladders and other apparatus during lightning can expose responders to higher risk situations. **5** c) Continuity of operations: Continuity of operations would be affected through indirect impacts such as loss of critical services. **4** d) Property, facilities, and infrastructure: High winds can damage trees, homes (especially mobile homes), and businesses and can knock vehicles off of the road. Power lines and related electrical facilities are lost to lightning and high winds. Straight-line winds are responsible for most thunderstorm damage. **6** e) Delivery of services: One or more severe thunderstorms occurring over a short period (especially on saturated ground) can lead to flooding and cause extensive power and communication outages as well as agricultural damage. **4** f) Environment: High winds can damage trees, but this is a naturally occurring hazard and the environment proves to be resilient following these and other natural hazards. **3**	4

	g) Economic and financial: Windstorms and lightning occur rapidly and can damage any exposed assets. The aftermath may cause moderate economic impacts, but most will be related to cascading hazards such as flooding. **5** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Timely and adequate response will stave off any negative reputation that the jurisdiction could be exposed to. Clean up procedures should be established including a debris removal and disposal plan. **3**	
Speed of Onset	Some thunderstorms can be seen approaching, while others hit without warning, as they develop rather quickly in warm unstable air not necessarily associated with a frontal boundary. The NWS issues severe thunderstorm watches and warnings as well as statements about severe weather and localized storms. These messages are broadcast over NOAA Weather Radios and area TV and radio stations. Advances in weather prediction and surveillance have increased warning times. The resolutions of radar and Doppler radar have increased the accuracy of storm location and direction. Weather forecasting and severe weather warnings issued by the NWS usually provide residents and visitors alike adequate time to prepare. Isolated problems arise when warnings are ignored.	7
Duration of Event	Individual thunderstorm and lightning events generally last up to one hour, although a string or line of severe storms can last a few hours.	3

Rural Union County: 46	City of Cromwell: 46	Creston Schools: 42
City of Afton: 46	City of Lorimor: 46	East Union Schools: 42
City of Arispe: 46	City of Shannon City: 46	Southwestern Community College: 44
City of Creston: 46	City of Thayer: 46	Greater Regional Medical Center: 42

4.3.14: Tornado

Definition: A violent, destructive, rotating column of air taking the shape of a funnel-shaped cloud that progresses in a narrow, erratic path. Rotating wind speeds can exceed 300 mph and travel across the ground at average speeds of 25 to 30 mph.

Description:
A tornado is a violent whirling wind characteristically accompanied by a funnel shaped cloud extending down from a cumulonimbus cloud. A tornado can be a few yards to about a mile wide where it touches the ground. An average tornado, however, is a few hundred yards wide. It can move over land for distances ranging from short hops to many miles, causing great damage wherever it descends. The funnel is made visible by the dust sucked up and by condensation of water droplets in the center of the funnel. *Figure 4 - 4* on the following page shows possible damage. A comparison of each scale is in the following table along with the probability versus severity matrix.

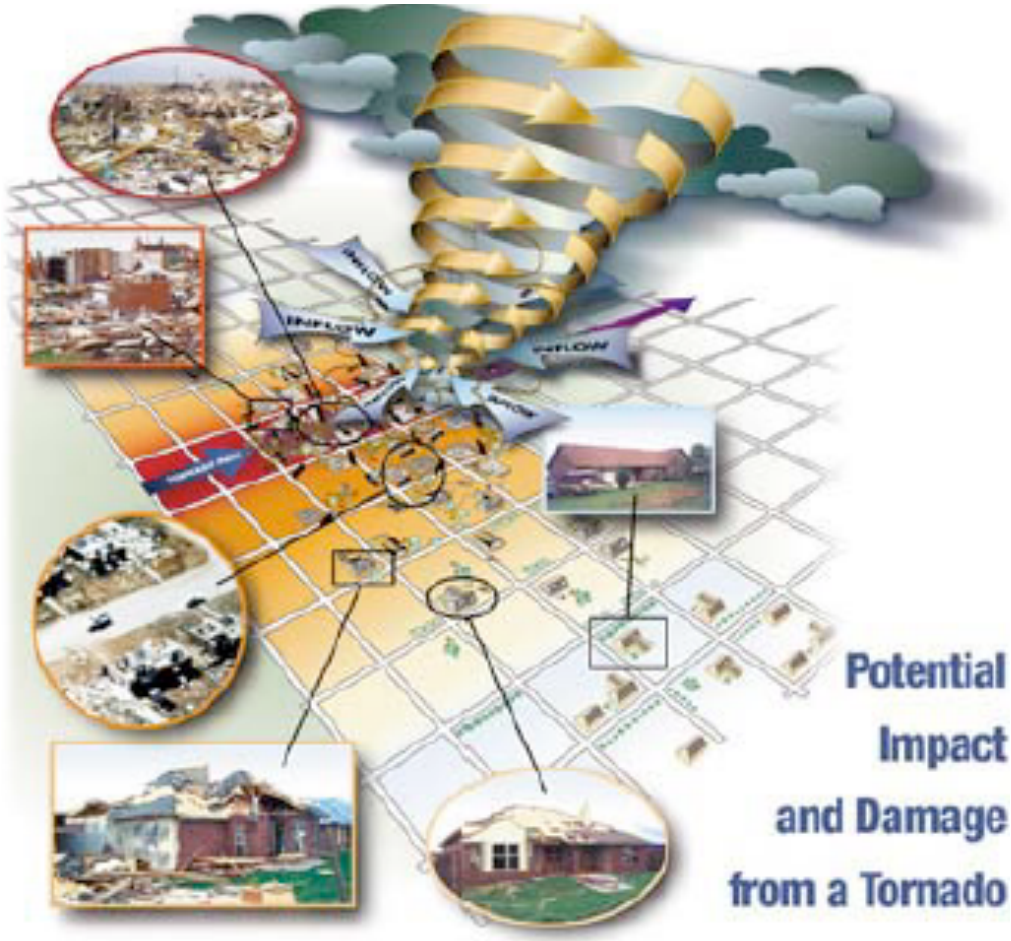
Table 4 - 32: Tornado Comparison Chart and Probability Versus Severity Matrix

Enhanced Fujita Scale	3-Second Gust (mph)	Traditional Fujita Scale	3-Second Gust (mph)	Annual Probability of Event	Severity of Impact
EF0	65-85	F0	45-78	Highly Likely	Negligible
EF1	86-110	F1	79-117	Highly Likely	Limited
EF2	111-135	F2	118-161	Likely	Moderate
EF3	136-165	F3	162-209	Highly Possible	Critical
EF4	166-200	F4	210-261	Possible	Catastrophic
EF5	Over 200	F5	262-317	Unlikely	Catastrophic

Source: www.fema.gov

Each year nationally approximately 1,000 tornadoes are spawned by severe thunderstorms. Although most tornadoes remain aloft, those that touch ground are forces of destruction. Tornadoes have been known to lift and move huge objects, destroy or move whole buildings long distances, and siphon large volumes from bodies of water. Tornadoes generate a tremendous amount of debris, which often becomes airborne shrapnel that causes additional damage. Tornadoes are almost always accompanied by heavy precipitation.

Figure 4 – 4: Potential Damage from a Tornado



The rating scale used to rate tornado intensity is called the Fujita Scale. This scale is based on the estimated top wind speeds and the damages that result from the tornado. Recently, FEMA adopted the Enhanced Fujita Scale. Larger tornados are less common but are much more severe.

Tornadoes follow the path of least resistance. People living in valleys and in manufactured or mobile homes are most exposed to damage from tornadoes. Even if anchored, mobile homes and some permanent, site-built structures do not withstand tornado wind speeds.

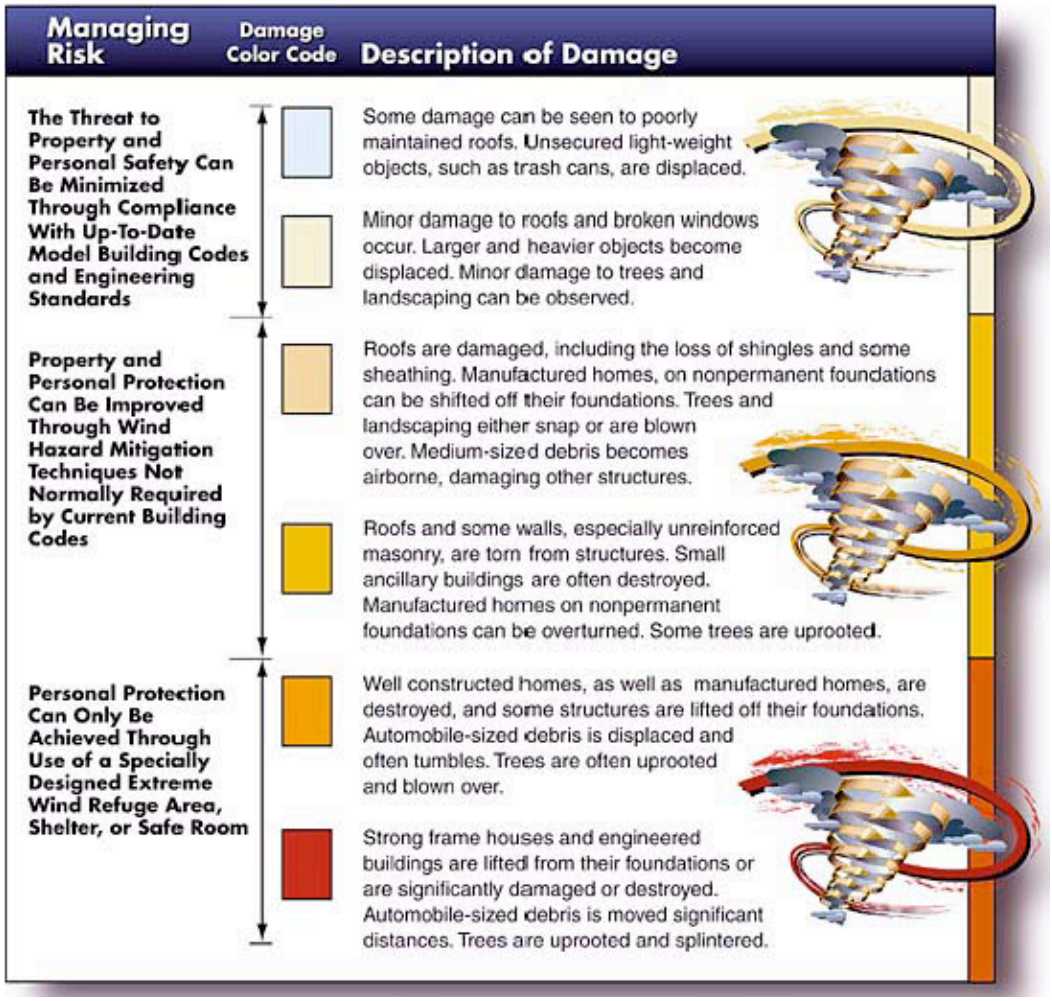
Table 4 – 33: Recent Union County Tornado History

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Afton	06/04/2008	1831	Funnel Cloud		0	0	0	0
Afton	06/04/2008	1831	Funnel Cloud		0	0	0	0
Talmage	06/04/2008	2101	Funnel Cloud		0	0	0	0
Creston	03/22/2011	1711	Funnel Cloud		0	0	0	0
Lorimor	03/22/2011	1736	Funnel Cloud		0	0	0	0
Kent	05/11/2011	1608	Funnel Cloud		0	0	0	0
Spaulding	08/05/2011	1427	Funnel Cloud		0	0	0	0
Thayer	05/06/2007	345	Tornado	EF0	0	0	75 K	0
Creston Arpt	06/04/2008	1804	Tornado	EF0	0	0	0	0
Kent	06/04/2008	2018	Tornado	EF0	0	0	5 K	0
Creston Arpt	06/04/2008	2037	Tornado	EF1	0	0	50 K	5 K
Afton	06/04/2008	2058	Tornado	EF1	0	0	0	0
Creston	06/05/2008	2024	Tornado	EF1	0	0	25 K	2 K
Cromwell	03/22/2011	1716	Tornado	EF0	0	0	0	0
Cromwell	04/14/2012	1753	Tornado	EF2	0	2	5 M	0
TOTALS:					0	2	$5.155 M	$7 K

Source: National Climactic Data Center, 7/2012 (data available through 4/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage

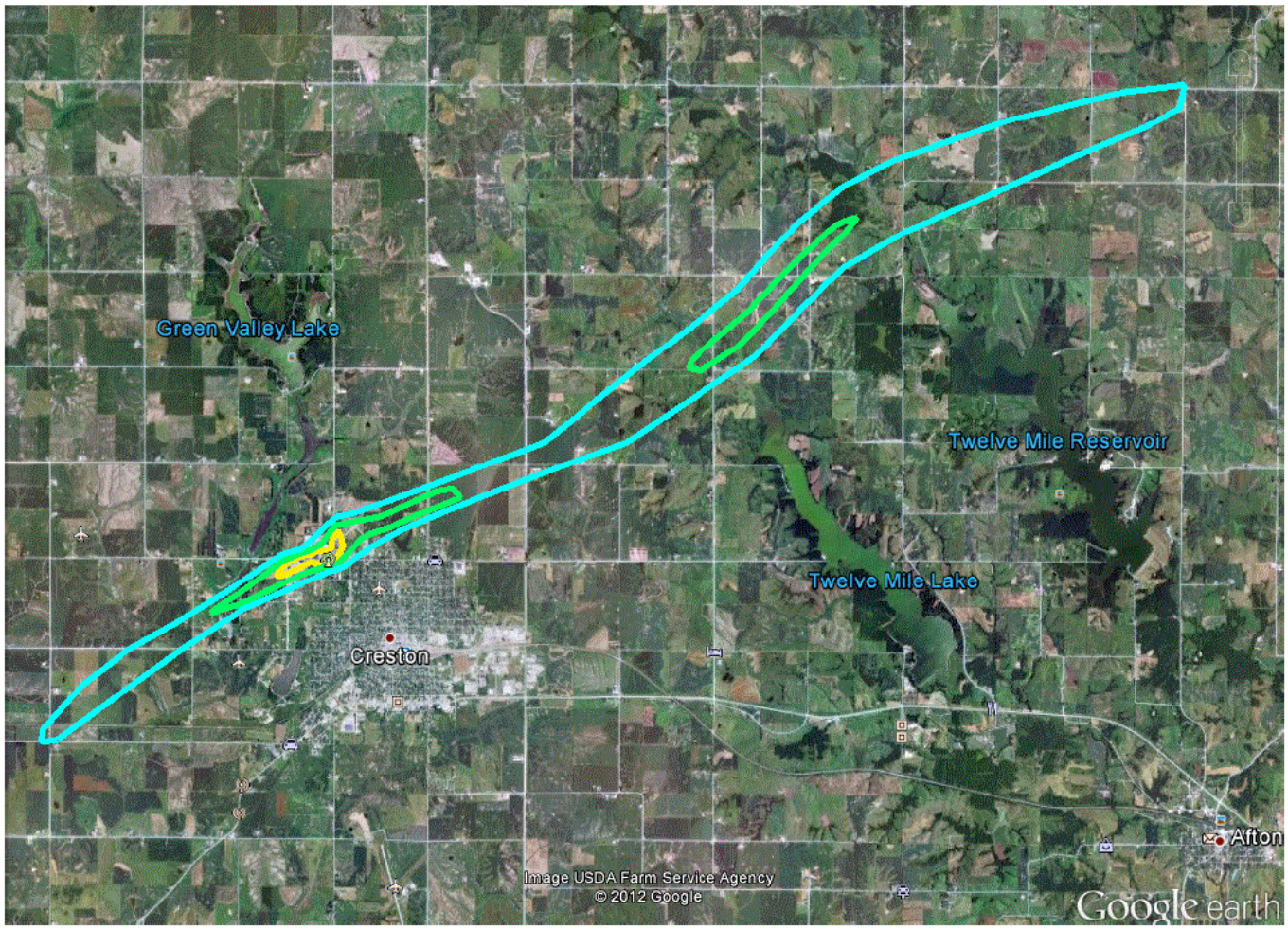
Through early 2006, Union County experienced 19 tornadoes, according to the NCDC; of these, 9 were F0, 3 were F1, 4 were F2, 1 was F3, and 2 were F4. In these 19 tornadoes, total losses were $30.3 million in property damage, $25,000 in crop damage, 3 injuries, and no fatalities. The above table shows tornado events since 2006. Including those, the total reported tornado count to date, including confirmed funnel clouds, is 34. Total losses include $35.5 million in property loss, $32,000 in crop loss, and 5 injuries. Amazingly, there have been no fatalities as a direct result. More information on individual events is found in the profile table for this hazard.

Figure 4 – 5: Tornado Risk Management



A very significant tornado in the history of Union County occurred April 14, 2012, starting just east of Cromwell, passing through Creston, and ending north of Afton. This tornado is described in the following table in greater detail. However, the following map is provided, which shows the damage path of the tornado.

Figure 4 – 6: April 2012 Union County Tornado Damage Path



Preliminary path of the Creston tornado. Overall path length was 14 miles. The light blue contour denotes EF0 damage, green denotes EF1 damage, and yellow represents EF2 damage.

Source: National Weather Service of Des Moines (See Appendix D for entire report)

Table 4 – 34: Tornado Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	In the U.S., Iowa is ranked third in the number of tornadoes per 10,000 square miles. From 1950-2010, Iowa averaged 47 twisters per year. In Iowa most tornadoes occur in the spring and summer months, but twisters can and have occurred in every month of the year. Several Presidential Declarations have been declared for Union County due to tornado events. The NCDC has reported 34 tornadoes in the county with millions of dollars in losses and several injuries. The most destructive of all tornados occurred in 1989, when an F4 struck a wide path through the county. Several homes were destroyed, power lines were down, and the economic patterns were severely disrupted for days when an F4 went through the Twelve Mile Lake area in 1999, crossing US 34. Also in the 1990s a tornado crossed the western part of Green Valley Park and damaged trees. A small F0 tornado went through uptown Creston, the veterans ballfield, the US 34 business corridor, and highly populated areas of southern Creston in 2003, causing a locally reported $155,000 in damages. Had this been a larger tornado, catastrophic losses would have occurred. A memorial day tornado (year unknown during 1990s) damaged the west side of Green Valley Park and rural residences. No major disaster declarations have been made due to tornadoes *solely* in the county. However, local leaders report damages over $1 million each of the following years due to tornados: 1995, 1997, 1998, 2000, 2008, and 2012. Most of the losses were outbuildings and	Rural: 8 Afton: 3 Creston: 5 Creston Schools: 2 SWCC: 2 GRMC: 2 Others: 2

	farm homes. No loss of life is reported. Tornadoes in 2008 and 2010 passed near Cromwell, Creston, and Afton, causing damage to numerous farms. The April 14, 2012 tornado had very significant impacts because, unlike other larger tornadoes that hit rural areas only, it severely damaged Creston. *Appendix D* includes an official report for this tornado, which damaged several jurisdictions participating in this plan: Creston, Creston Schools, SWCC, and Greater Regional Medical Center. The most notable damage was to the hospital, where all patients had to be evacuated due to the damage. A triage unit had to be set up in the parking area and then at SWCC, which itself suffered damage to dorms and instructional buildings. Approximately 250 people were displaced due to the loss of student housing, area apartment buildings and condos, and over a dozen destroyed homes and town houses. Further, key assets in the area were damaged (YMCA, numerous farms, several businesses) or destroyed (the AEA). Creston Schools will spend $3 million to repair buildings. Power line failure caused traffic detours throughout Creston for the next 72 hours. Responders, medical personnel, and utility crews worked around the clock during that time. It was a miracle that there were no fatalities because, while the storm was bad and there was a tornado watch, no warning was issued until the tornado had passed. Further, some of the homes that were hit were manufactured homes with no basements. Because most of the damages were insured, the uninsured losses were not high enough to generate a Presidential declaration. However, many renters and students living in the area had uninsured losses. A major discussion in the community since that time has been the need for the promotion of renter's insurance. As an aside, several boats from Summit Lake were thrown three miles east into a cornfield just north of Creston. Creston Schools and SWCC were closed for a few days due to damage (debris and flooding of the buildings after windows and roof sections were destroyed. The hospital was closed for weeks. Approximately one mile of Phase 3 power lines were damaged, costing Alliant Energy $580,000 to repair. As of August 2012 only a small percentage of the repairs have been made. When scoring, the planning team considered the number of sightings and near misses along with actual direct hits in the jurisdiction. Events have not damaged Arispe, Cromwell, Shannon City, Thayer, and East Union Schools.	
Probability	May and June are peak Iowa tornado months. NOAA projects that Union County is in an area that will experience 25-30 EF2 or larger tornadoes in the next 100 years. In the future, the chances of tornadoes do not increase notably, but more developed areas are likely to be affected. Developed areas occupy a small but slowly growing portion of Union County and stand a likely chance of having a damaging tornado occur in the next ten years. Because of the large expanse of rural Union County, it has the greatest chance of experiencing a tornado. Larger towns have a larger chance of experiencing the effects compared to the smaller towns. An event for this purpose is an actual sighting or damage within and very near to the jurisdiction that has a direct impact on the jurisdiction.	Rural: 7 Afton: 2 Creston: 3 Others: 1
Vulnerability	Those most at risk from tornadoes include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements, and people in vehicles. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to escape the path of destruction. Because most Iowa tornadoes occur from 4 to 9 PM, especially EF3 and larger tornadoes, when people are commuting or recreating outside, Union County, with its large commuter population and extensive recreational areas, faces greater risk. People who may not understand watches and warnings due to language barriers are also at risk. Because of the concentration of homes in a city, the percentage of the population at risk is higher. Using the size and typical path of an EF2 tornado as an example, the percentage of the people directly impacted is low, especially in rural areas of the county. Small towns are likely to have a higher percentage of the town's population impacted by an EF2. Single assets, like schools, could receive significant impacts unless they are constructed to FEMA 361 standards. At this time, Creston and East Union Schools are or have built tornado safe rooms, so the population is better protected, although other parts of the campus in each case can be damaged. The recent Creston tornado showed that the current construction of buildings can withstand an EF2 tornado, but there was moderate structural damage and buildings were flooded. People are always at risk if they are not in a FEMA 361 structure.	Rural: 5 Cities: 8 Schools: 8 SWCC: 8 GRMC: 8
Maximum Extent	Generally the destructive path of a tornado is only a couple hundred feet in width, but stronger tornadoes can leave a path of devastation up to a mile wide. Normally a tornado will stay on the ground for no more than 20 minutes; however, one tornado can touch ground several times in different areas. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider area. Damages will be greater as a percentage of area in the towns because a single tornado can be as wide as a small community. A typical EF2 tornado will	Rural: 3 Creston: 6 Other Cities: 7 Schools: 9 SWCC: 8 GRMC: 9

	impact a moderate portion of any jurisdiction but a larger portion of a small asset like a school campus.	
Severity	In this section, the committee considers a risk due to a typical EF2 tornado. Of course, the risks are higher for a larger tornado. a) Health and safety of persons in area: Injury or death related to tornadoes most often occurs when buildings collapse; people are hit by flying objects or are caught trying to escape the tornado in a vehicle. From 1950-2006, Iowa has had 2007 injuries related to tornadoes and 67 deaths over the same time period. There were 12 deaths and 561 injuries from 1980-2006. **8** b) Health and safety of response personnel: Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. Usually responders will not be caught in the initial tornado but could be caught in follow-up tornadoes. **6** c) Continuity of operations: Tornadoes can destroy government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend to work-related issues. **7** d) Property, facilities, and infrastructure: Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. **8** e) Delivery of services: Tornadoes can impact many critical services, mainly electrical power. Buried services are not as vulnerable, but can be affected by their system components that are above ground. **6** f) Environment: Tornadoes are naturally occurring phenomena. Damages to the environment could result from spills and other contaminants from the built environment. **3** g) Economic and financial: Whole towns have been destroyed. Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power, gas, or water. **7** h) Regulatory and contractual obligations: Debris removal is a vital service that is often too vast for the jurisdiction to do without contractual assistance. These plans should be in place and monitored. **3** i) Reputation: Adequate warning is key to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner. **4**	6
Speed of Onset	Tornadoes strike with an incredible velocity. Wind speeds may exceed 300 miles per hour and the storm can travel across the ground at more than 70 mph. These winds turn harmless objects into deadly missiles in a matter of seconds. The advancement in weather forecasting has allowed watches to be delivered to those in the path of these storms up to hours in advance. The best lead-time for a specific severe storm and tornado is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground due to blowing dust or driving rain and hail.	8
Duration of Event	Tornado events last up to 1 hour, with the passing of a supercell or line of storms containing multiple tornadoes taking up to 2 hours on rare occasions.	3

Rural Union County: 40	City of Cromwell: 35	Creston Schools: 37
City of Afton: 37	City of Lorimor: 35	East Union Schools: 36
City of Arispe: 35	City of Shannon City: 35	Southwestern Community College: 36
City of Creston: 39	City of Thayer: 35	Greater Regional Medical Center: 37

4.3.15: Windstorm

Definition: Extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very strong pressure gradients.

Description:
Wind events, which produce wind speeds in excess of 64 knots, can produce extensive property damage, injuries, and/or death. These events can range from a few hundred feet in extent up to several tens of miles wide and several hundred miles long. All of Iowa is located in Wind Zone IV, which includes winds up to 250 MPH.

Surface Weather Observations - METAR always have wind speeds recorded in knots. The conversion table below will provide a quick conversion for winds from calm to 99 knots. The converted values are all rounded to the nearest integer. The formula for exact conversion is 1 Knot=1.15155 MPH.

Table 4 - 35: Knots to MPH Conversion Chart

Knots	0	1	2	3	4	5	6	7	8	9
	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH
0	0	1	2	3	5	6	7	8	9	10
10	12	13	14	15	16	17	18	20	21	22
20	23	24	25	26	28	29	30	31	32	33
30	35	36	37	381	39	40	41	43	44	45
40	46	47	48	49	51	52	53	54	55	56
50	58	59	60	61	62	63	64	66	67	68
60	69	70	71	72	74	75	76	77	78	79
70	81	82	83	84	85	86	87	89	90	91
80	92	93	94	96	97	98	99	100	101	102
90	104	105	106	107	108	109	110	112	113	114

The Land Beaufort Scale was originally developed in 1805 by Sir Francis Beaufort as a system for estimating wind strength without the use of instruments. It is currently still in use for this same purpose as well as to tie together various components of weather (wind strength, sea-state, observable effects) into a unified picture.

Table 4 – 36: Wind Strength Scale

Force	Speed		Land Conditions
	knots	mph	
0	<1	<1	Calm, smoke rises vertically
1	1-3	1-3	Light air, direction of wind shown by smoke drift only
2	4-6	4-7	Light breeze, wind felt on face, leaves rustle, vanes moved by wind
3	7-10	8-12	Gentle breeze, leaves, and small twigs in. constant motion, wind extends light flag
4	11-16	13-18	Moderate breeze, raises dust, loose paper, small branches move
5	17-21	19-24	Fresh breeze, small trees in leaf begin to sway
6	22-27	25-31	Strong breeze, large branches in motion, umbrellas used with difficulty
7	28-33	32-38	Near gale, whole trees in motion, inconvenience felt walking against the wind
8	34-40	39-46	Gale, breaks twigs off trees, impedes progress
9	41-47	47-54	Strong gale, slight structural damage occurs
10	48-55	55-63	Storm, trees uprooted, considerable damage occurs
11	56-63	64-73	Violent storm, widespread damage
12	64+	74	Hurricane, extreme destruction

Table 4 – 37: Recent Union County Windstorm History

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Union County	10/26/2008	1100	High Wind	51 kts	0	0	$25 K	$25 K
TOTALS:					0	0	$25 K	$25 K

Source: National Climactic Data Center, 7/2012 (data available through 4/2012)
Mag: Magnitude; Dth: Deaths; Inj: Injuries; PrD: Property Damage; CrD: Crop Damage (totals not limited to Union Co.)

Again, like winter storms and river floods, it is difficult to determine from the NCDC data how much of the high wind damage is located in Union County, due to the large area such wind events often cover. Most data before 2006 was not well aggregated to differentiate traditional thunderstorms with other high wind events. Total storm events through that time included 83 high wind events impacting Union County. Recorded losses since 1993 were $48.183 million in property loss, $431,000 in crop losses, 1 fatality, and 11 injuries. The NCDC only reports one high wind event since 2006, which occurred in 2008. Other wind damage occurred during thunderstorms and were considered in the thunderstorm assessment.

Table 4 – 38: Windstorm Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Large-scale extreme wind phenomena are experienced over every region of the United States. Historically, high wind events are associated with severe thunderstorms and blizzards. It is often difficult to separate windstorms and tornado damage when winds get above 64 knots (73 mph). Windstorms affect every county in Iowa, and have occurred every few years on average in any given location. Unlike tornadoes, high wind areas can be tens of miles wide and impact the entire county in a given event. The total number of high wind events not directly part of a	Rural: 9 Cities: 8 Others: 7

	thunderstorm in recent history is difficult to estimate. However, some thunderstorms had exceptional damage due to wind gusts associated with microbursts, derechos, and squalls. In August 2011 a thunderstorm with modest rain brought very high winds over much of Union County, from Creston to Lorimor and also in some other surrounding counties. At Green Valley State Park, trees, buildings, and campers were damaged. In spring 2011 winds blew down signs on the SWCC campus. Various wind events have destroyed power grids supplying local industries and buildings at the East Union Schools campus. These and other high winds have caused damage to trees, campgrounds, power lines, homes, communications equipment, and public buildings. Union County Conservation reports that FEMA funding has been received in the past seven years to replace shingles on the Three Mile Lodge and the ranger's residence at Three Mile Lake Recreation Area.	
Probability	Based on historical averages, Iowa would expect to have about 15 to 20 wind events each year in which wind speeds exceed 64 knots. Union County is very likely to have at least one windstorm in a given year.	9
Vulnerability	Those most at risk from windstorms include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements, as are those in vehicles. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to seek shelter or escape the path of destruction. People who may not understand watches and warnings due to language barriers are also at risk. Winds can pick up rapidly even on sunny days and clear nights, when the public is not expecting it. An estimated 30% of the population is at direct risk by being outdoors or traveling when high winds hit.	Rural: 6 Cities: 6 Others: 3
Maximum Extent	Unlike tornadoes, windstorms may have a destructive path that is tens of miles wide and several hundred miles long. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider area. Wind can proceed a storm when people are not prepared for it.	Rural: 7 Cities: 8 Others: 9
Severity	a) Health and safety of persons in area: Injury or death related to windstorms most often occur from building failure, people struck by flying objects, or caught trying to escape a windstorm in a vehicle. High winds can blown trucks and cars off highways. **6** b) Health and safety of response personnel: Response personnel are exposed to the same risk as the public when caught in storms without shelter. They may be more prepared than the average person and alert that the event is approaching. **5** c) Continuity of operations: Windstorms can damage government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend to work-related issues. Power lines and emergency equipment can be blown down and lost. **5** d) Property, facilities, and infrastructure: Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction of well-constructed structures, infrastructure, and trees. **5** e) Delivery of services: Windstorms can affect many critical services, especially electrical power. Buried services are not as vulnerable, but can be affected by their system components that are above ground. **4** f) Environment: Windstorms are naturally occurring phenomena. Damages to the environment could result from hazardous materials spills and other contaminants from the built environment. **2** g) Economic and financial: Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power. Crop damage is often associated with windstorms; laying down crops, breaking stalks, and twisting plants, reducing the yield and making it difficult to harvest. **6** h) Regulatory and contractual obligations: Debris removal is a vital service that is often too vast for the jurisdiction to do without contractual assistance. These plans should be in place and monitored. **3** i) Reputation: Adequate warning is key to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner. **3**	4
Speed of Onset	The NWS has developed a windstorm warning system similar to other events such as tornado, winter storm, and thunderstorm watches that are issued when conditions are favorable for high winds to develop and they come 12 to 24 hours in advance. Advisories are issued when existing or imminent high winds cover part or all of the area and pose a mere inconvenience. High wind warnings are issued when existing or imminent high winds cover part or all of the forecast area and pose a threat to life and property. Wind speeds may approach 120 MPH and the storm can travel across the ground at more than 50 mph. These winds can uproot trees and structures and turn harmless objects into deadly missiles, all in a matter of seconds. The advancement in weather forecasting has allowed watches to be delivered to those in the path of these storms up to hours in advance. The best warning lead-time for a specific severe storm is about 30 minutes. However, in Iowa, many	6

	wind events are associated with strong air pressure gradients, which means that winds can pick up with no warning (not a cloud in the sky) and can change speed and direction rather rapidly.	
Duration of Event	Windstorms typically last from a few minutes to a few hours, with daylong events occurring occasionally.	7

Rural Union County: 48	City of Cromwell: 48	Creston Schools: 45
City of Afton: 48	City of Lorimor: 48	East Union Schools: 45
City of Arispe: 48	City of Shannon City: 48	Southwestern Community College: 45
City of Creston: 48	City of Thayer: 48	Greater Regional Medical Center: 45

4.4: Human-caused and Combination Hazards

The following 24 human-caused and combination hazards are profiled in alphabetical order.

4.4.1: Air Transportation Incident

Definition: Any incident involving a military, commercial, or private aircraft.

Description:
Air transportation is playing a more prominent role in transportation as a whole. Airplanes, helicopters, and other modes of air transportation are used to transport passengers for business and recreation as well as millions of tons of cargo. A variety of circumstances can result in an air transportation incident. Mechanical failure, pilot error, enemy attack, terrorism, weather conditions, and on-board fire can 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 aircraft can also occur while the aircraft is on the ground.

Air transportation facilities are mapped in **Chapter 2.** Union County has only one public airport, the paved general services airport two miles south of Creston.

Table 4 – 39: Air Transportation Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Since 1960, there have been 1,999 air transportation incidents/accidents in Iowa (National Transportation Safety Board). Of these incidents/accidents, 237 were fatal to at least one (1) person, totaling 530 fatalities. The vast majority of fatalities are from large airline crashes, but the vast majority of crashes, including those in rural Union County, have been small planes, including two in the past ten years. There are no known fatalities or serious injuries from small plane crashes in Union County.	Rural: 2 Others: 1
Probability	The greater the number of landings and takeoffs, the greater the probability of a crash or accident. More and more people are utilizing air travel now than in the past. The trend of increasing numbers of people flying is likely to continue as will the crowdedness of airports and the skies above Iowa. Creston airport handles dozens to hundreds of takeoffs and landings per year; while increasing, the probability is small in a given year that an incident will occur.	Rural: 2 Others: 1
Vulnerability	People aboard airplanes are the most vulnerable. Statistics from the National Transportation Safety Board and the airline industry show that the majority (over 75%) of airplane crashes and accidents occur during the takeoff or landing phases of a flight. As a result, developed areas adjacent to the airports and in airport flight paths are particularly vulnerable to this hazard. Creston Airport is surrounded entirely by agriculture and low-volume secondary roads. For areas away from the airport, a smaller percentage of the population would be directly in the area of impact. However, because of the concentration of populations in smaller areas, especially for schools, the percentage of persons in the impact area of an incident would be higher even though the probability of an incident is actually less than the immediate area around an airport. During the Balloon Days weekend in September, the airport and skies around Creston are filled with 40 to 50 balloons. While there have been no major incidents, the risk is higher during that weekend.	Rural: 2 Creston: 3 Others: 2
Maximum Extent	As mentioned above, most accidents occur during takeoffs and landings. Accordingly, the spatial extent of the majority of incidents would occur on airport grounds or adjacent areas. Compared to many other hazards, an air transportation accident would occupy a relatively small area. The extent to which the impacts would be felt would depend on the materials involved. For example, if a cargo plane transporting volatile or hazardous substances were involved in an accident, the area of concern would be significantly larger than the area for an accident involving a small personal aircraft carrying stable materials. The most severe of accidents would likely affect only a few city blocks. In any case, only a small part of most jurisdictions would be affected.	Rural: 2 Cities: 3 Others: 5

Severity	The level of severity would depend on the type of aircraft involved, the type of cargo being transported, and the area on the ground on which the accident occurred. Because of the limited number of response personnel in Union County, a crash of a major airliner would very quickly exceed local capabilities. a) Health and safety of persons in area: The lives and health of the pilot, crew, passengers, and the population on the ground would be at risk. There are very few injuries and fatalities when compared to the number of people involved in travel as a whole, but if there is an accident, it is very likely that injuries will be serious or fatal. **8** b) Health and safety of response personnel: Response personnel would likely be exposed to fire hazards and other hazards associated with crashes such as sharp objects, glass, and confined spaces. **6** c) Continuity of operations: No impact unless the crash affects a critical facility. However, local first response agencies would be greatly stretched with a major crash. **5** d) Property, facilities, and infrastructure: Significant damage can also occur to property on the ground. Often buildings, fences, utility lines, and trees are damaged or destroyed in the event of a plane crash. The cargo aboard a plane that has crashed can also sustain damage or destruction. This too can be extremely costly. **6** e) Delivery of services: No impact unless the crash affects a critical facility or economic asset. However, the risk is high in a large crash that could tie up response capabilities. **6** f) Environment: Hazardous materials may be on board or result from spilled fuel and fire. **5** g) Economic and financial: Damage would be much localized. Damage to the aircraft itself is costly to the owner in terms of direct value lost and amount lost because the airplane is now out of commission. The area impacted could be isolated for weeks or months, thus hindering economic activity in the area. **5** h) Regulatory and contractual obligations: Major crashes will mobilize the FAA and other regulatory agencies and may bring about changes in laws and regulations and impact the manufacturing contracts for new planes. **3** i) Reputation: Reputation is based on effective and timely response. **3**	5
Speed of Onset	The amount of warning time prior to an aircraft accident could vary from tens of minutes to a matter of seconds. Crew aboard a troubled aircraft can radio to ground crew to prepare for the incident, but little can be done to lessen the direct effects of the impact. Rarely is there adequate time to do more than position on-site response personnel and alert mass casualty care providers of the possible event.	9
Duration of Event	Air transportation incidents usually take only a few seconds to a minute to occur, although the cascading events and/or response effort can take hours to days.	3

Rural Union County: 25	City of Cromwell: 24	Creston Schools: 26
City of Afton: 24	City of Lorimor: 24	East Union Schools: 26
City of Arispe: 24	City of Shannon City: 24	Southwestern Community College: 26
City of Creston: 25	City of Thayer: 24	Greater Regional Medical Center: 26

4.4.2: Animal/Crop/Plant Disease

Definition: An outbreak of disease that can be transmitted from animal to animal and to plants. The disease outbreak will likely have a significant economic implications or public health impact. The crop/plant pest infestation will likely have severe economic implications, cause significant crop production losses, or significant environmental damage. The crop/plant pests may also have implications for public health.

Description:

The introduction of some high consequence diseases may severely limit or eliminate our ability to move, slaughter, and export animals and animal products. The outbreak will have widespread economic and societal implications for our state. Response and recovery to infectious animal disease outbreaks will be lengthy, and many producers may never be able to return to business. There will be many indirect effects on our economy. Rumors of an infectious animal disease outbreak could cause significant damage to the markets; as was evidenced in an incident in Kansas in 2003 where the mere rumor of a Foot and Mouth Disease outbreak cause the markets to plummet. The same happened to pork sales in 2009 after an H1NI flu outbreak was labeled as “swine flu.”

Crop/plant pest infestations can cause widespread crop/plant loss and severe economic hardship on farmers, landowners, and related businesses. Once infestation occurs, the pest may become endemic causing repeated losses in subsequent growing years. Loss of production will affect all related industries, such as fuel, food, synthetics, processors, etc.

According to the USDA Risk Management Agency, millions of dollars in crop losses have occurred in Iowa. The

greatest causes include drought, excessive rain, decline in commodity prices, hail, floods, and windstorms.

More information on common and emerging animal, crop, and plant diseases in Iowa, as well as impact maps, can be found at the websites of the following organizations, USDA (www.usda.gov), Iowa Dept. of Public Health (www.idph.state.ia.us), Iowa Dept. of Natural Resources (www.iowadnr.com).

Table 4 – 40: Animal/Crop/Plant Disease Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Every year the Iowa Department of Agriculture and Land Stewardship (IDALS) conducts numerous animal disease investigations. IDALS, under the direction of the state plant regulatory official works with Iowa's universities and industries to conduct regular crop and plant pest surveillance. More and more pests are being introduced in Iowa that affect livestock, wildlife, plants, and crops. Some of these have had isolated impact. Economic impact has been the most significant. Minor outbreaks of widespread diseases have been reported in rural areas, including West Nile Virus, Foot and Mouth Disease, aphids, emerald ash borer, chronic wasting disease and others. No catastrophic losses have been reported within this county. Planning team members report a few incidents have occurred in rural areas. In fact, the planning team has not reported any incident details.	Rural: 3 Others: 1
Probability	In the evaluation of the probability of a serious animal/plant/crop disease incident was that an event has a low probability of occurrence in any given year. Disease/pests are present in many other areas of the country/world. Many disease/pests are easily transmitted; therefore, the probability of introduction is high. Iowa leads the nation in production of pork, soybeans, eggs, and corn and is among the leading beef production states. With the millions of animals and animal products that move across our state yearly, probability is moderate at least. Union County has numerous cattle farms and hog confinements. Numerous hazards or likely to occur over time but it is difficult to estimate how soon. It is also difficult to ascertain the impact that Interstate traffic may have on transporting and introducing such hazards. Monitoring is currently underway in Union County for gypsy moths and emerald ash borers. Dutch elm disease and soybean rust are also very possible.	Rural: 4 Others: 1
Vulnerability	The movement of people, animals, animal products, wildlife, plants, crops and potential disease/pest vectors could all cause the introduction of diseases/pests. Diseases/pests could also be introduced naturally, for example by hurricanes or jet streams. Emerging disease is also a threat, such as West Nile Virus, new more virulent influenza strains, etc. Because many diseases/pests are not present in Iowa, our populations of animals, crops, and plants have no immunity and are highly susceptible. Modern farming and animal practices mitigate major widespread losses. While schools and hospitals could be vulnerable, damaging incidents are not identified as occurring on their properties.	4
Maximum Extent	The impact will vary by disease/pest and the type of animal/crop/plant infected/infested. Because of the major transportation routes for food products and grain and the large part of the county in agriculture, much of the county can be affected. No parts of the county are entirely immune from animal and plant disease. Extent is made much larger due to the concern over safety over local food supplies, which hinders the local economy.	4
Severity	The severity will vary by disease/pest. The types of animals, crops, or plants affected will also significantly influence the severity. a) Health and safety of persons in area: If humans come into direct contact or consume the animal and plant products, illness and death are possible. **4** b) Health and safety of response personnel: Not likely to be affected, but inspectors and those handling diseased animals and plants can be infected. **3** c) Continuity of operations: Should not be impacted in a major scale. **3** d) Property, facilities, and infrastructure: Likely not affected. **1** e) Delivery of services: Most would not be affected, but the delivery of food to stores and medicines/health care could be impacted if the diseases cause widespread illness requiring specialized antibiotics. **4** f) Environment: Diseases can penetrate the air and water supplies in a localized area. **4** g) Economic and financial: If extensive crops and livestock are lost or the reputation of the food being produced is ruined, the economic impact would be severe. Should the disease/ pest have public health implications, the economic and social impact may be even greater. **8** h) Regulatory and contractual obligations: Not likely to be affected. **1** i) Reputation: Depends on the quality and appropriateness of the response. If panic results, it would be more notable. For example, the nationwide salmonella poisoning scare in 2008 caused a major impact to the sales of tomatoes when it was later found to be caused by something else. The August 2010 egg contamination in northern Iowa has caused the recall of nearly a half billion eggs and has hurt sales of Iowa eggs nationally. **5**	4
Speed of Onset	If the diseases / pests are highly infectious (many animals that are infected with disease can be transmitting disease before they show clinical signs), by the time they are discovered,	1

	they will likely have spread across the state or nation. This will put us at a severe disadvantage during response and recovery.	
Duration of Event	Animal and plant diseases often can last weeks or months before they are discovered, addressed, or a remedy is found.	9

Rural Union County: 29	City of Cromwell: 24	Creston Schools: 24
City of Afton: 24	City of Lorimor: 24	East Union Schools: 24
City of Arispe: 24	City of Shannon City: 24	Southwestern Community College: 24
City of Creston: 24	City of Thayer: 24	Greater Regional Medical Center: 24

4.4.3: Communications Failure

Definition: The widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, or long-term interruption of electronic broadcast services.

Description:

Emergency 911, 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. Business and industry rely heavily on various communication media as well. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term. If switching stations are affected, outage could be more widespread.

Table 4 – 41: Communications Failure Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	No widespread communications failures have occurred in Iowa. Local incidents due to weather conditions, equipment failure, excavation incidents, and traffic accidents have been reported, but outages have usually been resolved in a timely manner. Infrastructure is aging in the county, and minor events have occurred in several, mostly rural locations. A few ice and windstorms have cost communications lines and systems for hours to days over the past five years in parts of Union County. Also, some response agencies lack adequate modern communications and have trouble communicating at certain times. Of greatest concern is that all emergency communications are transmitted through the Union County Sheriff's Office, meaning that failures of the central system impact all response efforts. Rural areas have experienced the most E-911 incidents because of the lack of wired systems and distance to wireless facilities. Phone and emergency communications have failed, most recently in 2009 and 2010. The 2007 ice storm also caused failure for a few days in locations. Many phone and cell phone users were out of service for over a day after the April 2012 Creston tornado, even though no cell towers were destroyed. Most other historical events, which happen a few times a year, according to planning team members, have been brief and have impacted only segments of the population.	Rural: 5 Creston: 3 Lorimor: 1 Shannon City: 1 Creston CSD: 1 East Union CSD: 1 Others: 2
Probability	Widespread communications failures are likely to be brief at best due to the extensive redundancy of systems. Local communications failures are likely not to affect large parts of the county. Generally, emergency communications are affected, but this problem is being mitigated to some degree with new equipment being purchased meeting national and state standards and with a new communications plan. While mitigation is occurring on rural and some city utility lines (strengthening or burial), and new cell towers are being built, some jurisdictions lack funding for the new mandated narrow banding, which will make emergency communications very difficult in future hazard events. There is one central communication center and tower, with no backups. Some fire departments do not have repeaters or base centers. As a regional center, Union County provides key services over a wide area, and future events in the region can impact local and regional services.	Rural: 6 Cities: 4 Others: 3
Vulnerability	Citizens of the community would be impacted only indirectly. Much of the county's population could be impacted for up to 2 days, but with so many means to communicate today, the real impact is negligible for daily needs. Phone and data transmission could be impacted temporarily. Various firms provide communications services, so the loss of one service will be very localized. Should underground fiber systems become damaged, the E911 service as well as contact with agencies outside the service areas may be impossible. Other avenues of communication such as cellular phones may also be affected. Radio communications would not be adversely affected by fiber loss but could be impacted if repeaters and towers are incapacitated. Rural facilities and assets are uniquely vulnerable in the event of fires and other emergencies. Cell tower damage would make communications with physicians and other responders very difficult. Poor people who cannot afford services or rural people that have limited reception would be most vulnerable.	Rural: 5 Cities: 3 Others: 2

Maximum Extent	Most communications failures would be limited to localized areas. In the event of a widespread communications failure, only portions of the county would likely be impacted, but long-term or emergency disruption is highly unlikely due to the support of other jurisdictions and secondary communication devices. The southeastern part of the county is the weakest in terms of reception through wireless devises due to topography. The increasing number of cell towers and improvement of fiber lines is reducing the areas where losses would be notable.	Rural: 3 Cities: 6 Others: 7
Severity	a) Health and safety of persons in area: A communications failure would not directly result in injuries or fatalities. If 911 systems were to fail due to phone communication disruption, secondary impacts could occur by the inability of citizens to alert responders of their needs. **2** b) Health and safety of response personnel: If health and safety personnel cannot communicate with other personnel, they are at risk when responding; for example, if a firefighter is in a building and cannot call for assistance. **4** c) Continuity of operations: Can be affected when service interruptions are prolonged. **4** d) Property, facilities, and infrastructure: communications failures are often the result of infrastructure failures. Critical facilities, such as technical water plants, and infrastructure can fail and have subsequent damage due to the loss of communications between system components. Buildings would rarely be impacted directly. **3** e) Delivery of services: Service providers can be slowed by the lack of access to communications. **5** f) Environment: None directly. Failed communications could result in malfunctioning systems and potential does exist for facilities to discharge hazardous materials into the environment. **2** g) Economic and financial: Financial losses would be incurred due to the direct damage to electronic equipment and the communication system infrastructure. Most economic impacts would be felt on those sectors dependent upon the communication system. This could result in multi-sector far reaching impacts due to business disruption. With modern day electronic funds and data transfers, economic and financial losses in the public and private sectors could be enormous. **6** h) Regulatory and contractual obligations: Obligations of service providers to customers. **2** i) Reputation: Widespread communication failures could moderately harm the reputation of the jurisdiction. If 911 systems and inter-agency and intra-agency are affected, the reputation damage could be more serious. Data transmission failure could also affect public trust. **5**	4
Speed of Onset	A communications failure would likely occur with little or no warning. It is usually impossible to predict a communications failure. Some communications may be shut down for a short while for improvements or maintenance. These disruptions are usually made during periods of low demand and those who rely on them are given previous notice that the system will be out of service.	9
Duration of Event	Communications failures are typically only a few seconds or minutes long but a full failure can last for a day or more before alternative communications can be provided. Most will be relatively short in duration due to alternative means of communicating.	5

Rural Union County: 37	City of Cromwell: 33	Creston Schools: 31
City of Afton: 33	City of Lorimor: 32	East Union Schools: 31
City of Arispe: 33	City of Shannon City: 32	Southwestern Community College: 32
City of Creston: 34	City of Thayer: 32	Greater Regional Medical Center: 32

4.4.4: Enemy Attack

Definition: An intentional attack on the community by an enemy force, which would cause massive destruction and extensive casualties. An all-out war would affect the entire population. Some areas would experience direct weapons' effects: blast, heat, and nuclear radiation; others would experience indirect weapons' effects: primarily radioactive fallout.

Description:
The federal government monitors the international political and military activities of other nations and would notify the State of Iowa of escalating military threats. There are many smaller military installations in Iowa; most are Iowa National Guard assets spread throughout the state comprised of various military units and functions.

Table 4 – 42: Enemy Attack Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	There have been no enemy attacks on or in Iowa in modern times. The only history of enemy attack dates back to the days of settlement and the Civil War in the 1800s. There was a threat reported to Wellman Dynamics just outside of Creston in 2001.	1
Probability	The probability of a successful attack that will affect Union County in any direct way will be very low. While weapons of mass destruction exist in various parts of the world, Union County would not be a primary target. The Federal government monitors global political situations and	1

	provides security from international attacks.	
Vulnerability	The targets of attacks on critical infrastructure would likely include both facilities in the economy and those in the government. These critical infrastructures include information and communication systems; electrical power systems; gas and oil production, storage, and transportation systems; banking and finance organizations; transportation and distribution systems; water supply systems; and emergency and government services. Nearly every citizen, business, and organization depends on these for normal operation as well as safety and security. If not affected directly, the entire community would be vulnerable through indirect impacts.	4
Maximum Extent	While the entire state would likely be affected in some way, areas near government buildings, military complexes, transportation, communication, and fuel facilities would experience the largest impacts. A full-scale attack in the foreseeable future is not likely; however, a limited attack could take place that could potentially threaten target areas. Given the tremendous destructive capability of even one nuclear weapon, the devastation that could occur would be far worse than anything ever experienced in this country. Union County's remote location at least 50 miles from any possible noted targets would make direct affects unlikely.	4
Severity	a) Health and safety of persons in area: Severity of impact would depend on the type of weapons deployed and the scale of the attack. Nuclear, chemical, biological, or conventional weapons have various types of impacts. In a full attack on the state, there could be mass casualties and fatalities. Lives not threatened by the primary attack would be in jeopardy from many various post-attack threats such as sickness, starvation, and exposure to the elements. **9** b) Health and safety of response personnel: Response personnel would be affected similarly as the general public and may be at more risk as they are responding. **8** c) Continuity of operations: If attack is local, it could result in permanent disruption of operations. If indirect, the impact could be none or minor. **7** d) Property, facilities, and infrastructure: In a full attack on the state, there could be catastrophic property and infrastructure damage. **9** e) Delivery of services: Varies based on scale and location of attack. Transportation and good and services could be ruined. Rationing may be necessary. **8** f) Environment: In a full attack on the state, there could be radiological, chemical, or biological contamination of the air, soil, water, and food supply. **8** g) Economic and financial: A full-scale attack could be extremely costly, not only monetarily, but also economically. **9** h) Regulatory and contractual obligations: Many obligations could be impaired. **6** i) Reputation: It is likely the local community would not be held responsible. **1**	7
Speed of Onset	As mentioned above, the Federal government monitors worldwide political and military activity. The citizens and states of the U.S. would be put on heightened alert during periods of intense political or military conflict. With Iowa's position in the interior of the U.S., there would likely be significant warning of an impending enemy attack. However, the planning team was concerned about technological attacks where warning could be minimal as advances in technology allows for faster missiles, etc. Proximity to targets in Polk County may shorten the speed of onset of a surprise attack.	6
Duration of Event	An enemy attack on a given asset or jurisdiction in the middle of the United States would likely be brief and not concentrated, such as a single missile.	6

Rural Union County: 29	City of Cromwell: 29	Creston Schools: 29
City of Afton: 29	City of Lorimor: 29	East Union Schools: 29
City of Arispe: 29	City of Shannon City: 29	Southwestern Community College: 29
City of Creston: 29	City of Thayer: 29	Greater Regional Medical Center: 29

4.4.5: Energy Failure

Definition: An extended interruption of electric, petroleum or natural gas service, which could create a potential health problem for the population and possibly mass panic.

Description:
International events could potentially affect supplies of energy-producing products, while local conditions could affect distribution of electricity, petroleum or natural gas. The magnitude and frequency of energy shortages are associated with international markets. Local and state events such as ice storms can disrupt transportation and distribution systems. If disruptions are long lasting, public shelters may need to be activated to provide shelter from either extreme cold or extreme heat. Stockpiles of energy products eliminate short disruptions, but can also increase the level of risk to the safety of people and property in proximity to the storage site.

Table 4 – 43: Energy Failure Ranking Assessment

Evaluation Criteria	Description	Score
Historical	The county and several of cities have natural gas and other pipelines, overhead power	Rural: 8

Occurrence	lines, and buried cables that supply power and energy to the county and critical assets in the county. All areas of the county have experienced short-term and most areas have experienced long-term failures. Short-term failures are common and may include loss of power to a neighborhood for a few minutes. The 2007 ice storm produced a prolonged power failure, where many rural residents were without electricity for several days and even city residents were without power for hours to a day or more. Afton sustained $24,407.52 in FEMA covered power line and pole damages. Afton also had power failures in 2009 and 2010. SWCC reported a major outage in 2009, which impacted its facility used as a warming center. SWCC reports it has at least a few power failures per year due to weather events of various kinds. Rural Union County had failures to high-voltage power lines across the northern half of the county due to heavy snow in November 2011. The 2012 tornado caused power outages in Creston and parts of rural Union County for hours to two days until lines and poles could be repaired or replaced. Creston High School had no power for 24 hours; the Elementary/Middle School had no power for 72 hours. Virtually all other recalled incidents have been brief (no more than a few hours). Due to the age of facilities and high proportion of lines that are above ground, most areas have random short-term outages even in normal weather conditions. The scoring considers more significant or widespread events. Other damages from some natural hazards on electrical facilities are reported in the proper hazard profiles.	Afton: 5 Creston: 6 Cromwell: 8 Lorimor: 4 Other Cities: 5 Schools: 3 SWCC: 4 GRMC: 3
Probability	The State of Iowa has three strategies to limit the likelihood of an energy shortage: 1) through voluntary and mandatory demand reduction mechanisms; 2) the substitution of alternative energy sources when possible; 3) and state government programs to curtail excessive use, energy supply and demand can be kept in check. The federal government has a strategic petroleum reserve to supplement the fuel supply during energy emergencies. Shortages, especially electrical shortages, can be unpredictable with immediate effects. Natural events, human destruction, price escalation, and national security energy emergencies can cause unavoidable energy shortages. However, local or regional weather-related disruptions are still highly possible. Further, most critical assets lack fixed power generators, although more are adding them due to the lessons learned from recent events. Widespread incidents are less likely in the future, but local areas are still at considerable risk.	Rural: 8 Creston: 6 Other cities: 5 Schools: 4 SWCC: 4 GRMC: 4
Vulnerability	Because Iowa is almost entirely dependent on out-of-state resources for energy, Iowans must purchase oil, coal, and natural gas from outside sources. World and regional fuel disruptions are felt in Iowa. It is likely that increasing prices will occur as market mechanisms are used to manage supply disruptions. This will greatly affect the low-income population because of their lower purchasing power. Agricultural, industrial, and transportation sectors are also vulnerable to supply, consumption, and price fluctuations. In Iowa, petroleum represents 97% of transportation fuel. Individual consumers such as commuters are also vulnerable. Many electrical systems are backed up and redundant systems prevail, making long-term vulnerability unlikely. Nursing homes, medical facilities, shelters, and assisted living facilities are especially vulnerable, due to the need to provide care to frail and sick individuals. Some facilities have backup generators to mitigate some of the risk. Due to the distances involved, rural electric cooperative (REC) service areas are more vulnerable.	Rural: 8 Creston: 6 Other cities: 7 Schools: 4 SWCC: 4 GRMC: 4
Maximum Extent	The effects of an energy shortage could be felt throughout the state if there is a loss of supply sources. Because the distribution systems are very developed, local shortages can quickly be covered by secondary sources in most cases. Failures caused by weather events, however, can tax utility repair crews that must address local and regional damages. Most incidents will damage one power system or substation and impact a small part of the county or city. Smaller towns and individual buildings could see total loss until generators or other sources are provided.	Rural: 6 Creston: 7 Other cities: 8 Schools: 9 SWCC: 9 GRMC: 9
Severity	a) Health and safety of persons in area: Injuries and fatalities would not be directly caused by an energy shortage. Injuries and fatalities could occur if energy was not available for heating during extreme cold periods or for cooling during extreme heat or if people relied upon power to supply equipment such as life support and breathing equipment. **4** b) Health and safety of response personnel: None directly. However, communications and response equipment can fail. **3** c) Continuity of operations: Hospitals, shelters, emergency response vehicles and facilities, and other critical facilities would have priority during energy shortages. **5** d) Property, facilities, and infrastructure: No direct damages. **2** e) Delivery of services: Effects could range from minor heating and air conditioning disruptions to transportation limitations all the way to civil unrest due to the high demand, low supply, and subsequent high price. **5** f) Environment: None directly. **1** g) Economic and financial: Rotating blackouts, voluntary conservation measures, and	4

	possibly mandatory restrictions could be used to limit the severity of an energy shortage. Business disruption and increased cost of business would have far-reaching financial implications across many sectors of the economy. **6** h) Regulatory and contractual obligations: None known. However, contracts can be violated if a supplier cannot provide contracted energy. **3** i) Reputation: Reputation could be harmed if the reason for the shortage or failure could have been avoided by good planning. If caused by natural events, there would be no significant impact unless the response to the outage was poor. **4**	
Speed of Onset	The Iowa Department of Natural Resources Energy Bureau monitors domestic and international energy situations and has developed a plan to deal with an energy crisis. Signs that an energy shortage may be developing can be recognized even months in advance, but energy shortages/emergencies can rise suddenly and unexpectedly. Weather events and human error can cause immediate power loss with no warning.	9
Duration of Event	Energy failures are typically only a few seconds or minutes long but a full failure can last for a day or more before alternative power supplies can be provided.	8

Rural Union County: 51	City of Cromwell: 49	Creston Schools: 41
City of Afton: 46	City of Lorimor: 45	East Union Schools: 41
City of Arispe: 46	City of Shannon City: 46	Southwestern Community College: 42
City of Creston: 46	City of Thayer: 46	Greater Regional Medical Center: 41

4.4.6: Fixed Hazardous Materials Incident

Definition: Accidental release of chemical substances or mixtures that presents danger to the public health or safety during production or handling at a fixed facility.

Description: 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. Under the Emergency Planning and Right to Know Act of 1986, the US Department of Transportation (USDOT) identified 308 specific hazardous chemicals from 20 chemical categories. USEPA sorts HAZMAT into the following categories:

- Toxic agents (irritants, asphyxiates, anesthetics and narcotics, sensitizers)
- Other types of toxic agents (hepatoxic and nephratoxic agents, carcinogens, mutagens)
- Hazardous wastes
- Hazardous substances
- Toxic pollutants
- Extremely hazardous substances.

This Act requires that companies report releases of designated hazardous chemicals to USEPA, even if releases do not result in human exposure. Types of releases are:

- Air emissions of gases or particles from a pressure relief valve, smokestack, ruptured reaction vessel, broken pipe or other equipment at a chemical plant or other fixed-site facility; from broken, loose-fitting, or punctured equipment, containers, or cylinders on transportation vehicles; and from solid or liquid discharges onto ground or into water
- Discharges into bodies of water from damaged ships, barges, underwater pipelines, and trucks or railroad cars that fall into the water
- Discharges as outflows from sewer or drain outfills, runoff from spills on land, runoff from water used to control fires, or contaminated groundwater
- Discharges onto land
- Solid waste disposal in onsite landfills
- Injection of wastes into underground wells
- Transfers of wastewater to public sewage plants
- Transfers of wastes to offsite facilities for treatment or storage.

Natural hazards can cause HAZMAT releases at fixed sites. When a HAZMAT event occurs during a natural disaster, access to facilities may be restricted, water lines for fire suppression may be broken, and response personnel and resources may be limited. Hazardous materials incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact.

HAZMAT releases pose short- and long-term toxological threats to humans and to terrestrial and aquatic plants and wildlife. Toxic materials affect people through one of three processes: a) inhalation, b) ingestion, and c) skin contract.

Title III of the Super-fund Amendments and Reauthorization Act (SARA) of 1986 requires that each community establish a Local Emergency Planning Committee (LEPC) to be responsible for developing an emergency plan for preparing for and responding to chemical emergencies in that community. The plan is reviewed by the State Emergency Response Commission (SERC) and publicized throughout the community. It must include the following:

- An identification of local facilities and transportation routes where hazardous material are present
- The procedures for immediate response in case of an accident (this must include a community-wide evacuation plan)
- A plan for notifying the community that an incident has occurred
- The names of response coordinators at local facilities
- A plan for conducting exercises to test the plan

To identify the extent of the hazard in a particular community, planning personnel must determine: a) what types of HAZMAT are stored, handled, processed, or transported, and b) where and how those functions are performed.

The best and most effective means to determine risks of fixed events is to consider the locations of EPA regulated facilities and the areas around them. The following table is a list.

Table 4 – 44: Environmental Protection Agency (EPA) Regulated Fixed Facilities, as of January 2012

Jurisdiction	Name	Address/location	EPA Type
Afton	Afton Care Development Inc	805 W Pearl	Waste, Land
	Agriland Fs Inc-Afton	2398 Old Hwy 34	Air
	Farmers Coop Co. - Afton Branch	196 East Railroad Street	Air
Creston	American Concrete Products	506 E Montgomery	Air, toxics, waste, land
	Bunn-O-Matic Corp	900 East Townline Street	Air
	Burlington Northern Santa Fe Railway Co	Adams & Pine Sts	Waste, land
	Chs Oilseed Processing	1310 E. Howard	Air, toxics, land, waste
	Crest Haven Care Centre	1000 E Howard	Waste, land
	Creston Feed & Grain	606 W. Jefferson	Air
	Creston High School	601 W Townline	Waste, land
	Creston Motor Co	410 W Adams St	Waste, land
	Creston News Advertiser	503 W Adams St	Waste, land
	Creston Sanitation Inc	710 E Monroe	Waste, land
	Creston Usar Center	705 E Taylor St	Waste, land
	Farley's & Sathers Candy Co Inc	500 Industrial Parkway	Air, toxics
	Farmers Coop Co	501 Union St	Waste, land
	Gavilon Grain, LLC - Creston - Osage St.	300 Osage St	Air
	Greater Community Hospital - Creston	1700 W Townline St	Air
	Harry's Custom Signs	707 New York Ave	Land, waste
	Heartland Tire & Auto Center	529 Sumner Ave	Land, waste
	Hi Crest Inc	707 Vine St	Land, waste
	IES Util Inc Creston	Union At S Cherry St	Land, waste
	Iowa Dept Of Transportation	405 S Chestnut St	Land, waste
	Iowa Dept Of Transportation	704 E Page	Land, waste
	IP&L Co - Creston Operating	208 W Taylor	Land, waste
	Larson Auto	804 S Mulberry St	Land, waste
	Petznicks	204 N ELM ST	Land, waste
	Purolator Inc	900 E Townline Rd	Air
	Rhine Radiator & Body Repair	301 E Montgomery	Land, waste
	Southwestern Community College	1501 W. Townline St	Land, waste
	Stalker Chevrolet-Cadillac	601 S Sumner	Land, waste
	S. Iowa Regional Housing Authority	219 N. Pine St.	Land, waste
	UPS	254 E UNION ST	Land, waste
	Vanmark Equipment Llc	300 Industrial Parkway	Land, waste, air
	Walmart Supercenter 1435	806 Laurel St	Land, waste
Rural	Whitson Oil Co	208 Russell St	Land, waste

	Afton City Of Stp	2/3 Mile South Of Highway 169	Water
	Bunn-O-Matic Corp - Afton	1924 High School Drive	Air, land, waste
	City Of Creston-Wtp-3 Mile Water Pump	Station - 2301 160th Ave	Air
	East Union Middle-High School	1916 High School Dr	Waste, land
	Refrigeration Fabrication Inc-Former Sit	Afton Industrial Park	Waste, land
	Union County Sanitary Landfill	1772 S Lark St	Air
	Arispe, City Of Stp	Dutcher & Nuthatch	Water
	Aaron Frey	1687 185th St	Waste, land
	Central Iowa Power Coop - Summit Lake	1632 Rea Rd	Air, water
	City Of Creston-12 Mile Water Treatment	Plant - 1730 Lark Ave	Air
	Fansteel Wellman Dynamics	1746 Commerce Rd	Air, toxics, waste, land, water
	Gits Manufacturing Inc	1739 Commerce Road	Air, toxics, land, waste
	Green Valley Chemical Corp	1284 Cherry Street Road	Air, toxics, land, waste, water
	Midwest Carbonics Inc	Cherry St, 3 Mi N Of Townline	Waste, land
	Prairie Regional Collection Ctr	1774 Lark Ave	Waste, land
	Union County Maintenance Shop	1701 Commerce Rd	Land, waste
	Hawkeye Generating, Llc	Adair-Union St	Air
	Western Area Power Admin Creston Substa.	Highway 17 (Rea Rd)	Land, waste
	Lone Star Welding & Transmission	2237 Adams Union Ave	Land, waste
	Three Mile Lake Campground-STP	1391 190th Street	Water
	Lorimor City Of STP	503 Main Street	Water
	Scci - Thayer Quarry	2118 Willow Road	Water
	Thayer City Of STP	1391 190th Street	Water
	Cromwell STP (Southern Iowa Rural Water)	180th St & Monroe St	Waste

Source: EPA EnviroMapper Website, www.epa.gov/emefdata, 8/2012

There are 39 reports in the 5-plus years from January 2007 to May 2012 that have been reported to the IDNR. Five of the reports of events lacked enough information to put them in the following table.

Table 4 – 45: HAZMAT Events in Union County Reported to the Iowa DNR from 2007-2012

	Type/Mode			Substance		
Location	Fixed *	Transportation	Other	Agricultural	Petroleum and fuel	Other
Afton	1			1		
Creston	7	1	4	3	3	6
Rural	2	3	16	15	3	3
Totals	10	4	20	19	6	9

Source: Iowa Department of Natural Resources Environmental Services Division, https://programs.iowadnr.gov/hazardousspills/Introductory.aspx, 8/2012

** Fixed does not necessarily mean the EPA fixed facilities. It can mean any incident reported on a fixed site, as opposed to transportation or other.*

Based on the report information provided, it appears that approximately 75% of the incidents being at fixed facilities or non-transportation locations such as agricultural fields, some of which may not be on the EPA list. The "other" categories include some inconclusive reports or other materials as to the type/mode or substance. Many reporting EPA facilities may have had incidents within their buildings and have not reported to the IDNR because they have teams to address the hazard and the hazard did not impact air, water, or soil outside of the building.

Table 4 – 46: Fixed Hazardous Materials Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	During the period 2000-2010, fixed facilities experienced 4,972 incidents according to the Iowa Department Natural Resources (DNR), which was 57.6% of total releases. A high impact occurrence is one defined as an environmental emergency by the Environmental Protection Agency. An environmental emergency is a sudden threat to the public health or the well being of the environment, arising from the release or potential release of oil, radioactive materials or hazardous chemicals into the air, land, or water. Locally there have been very few incidences that would meet this definition, even though there have been dozens of reports of events in the county, as shown in the above table. At least one fixed incident has been reported in rural Union County (in industries located outside of city limits), Afton, and Creston in the past 5 years. The planning team also points to events in Afton in 2008 (no details provided. Major manufacturers, such as Wellman Dynamics, Trolli Candy Company, and Midwest Carbonics, all in or near to Creston, have sustained notable incidents within buildings. Past events have been contained and cleaned within	Rural: 4 Afton: 2 Creston: 8 Others: 1

	local response capabilities in most cases. No major events causing loss of life have been brought forward. No major evacuations have been caused by recent events. They have involved mostly agricultural materials, including stolen anhydrous ammonia, and petroleum. Local gas stations, agricultural facilities, and manufacturing plants are common sites, as well as rural highways. Likely many of the incidents in the DNR list attributed to cities actually occurred in rural areas near the listed cities. It is likely that many events are not even reported and are not much of a hazard because losses are so minor.	
Probability	There are 4,057 sites in Iowa (152 sites in Union County) that because of the volume or toxicity of the materials on site are designated as Tier II facilities under the Superfund Amendments and Reauthorization Act. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic activities. While protection methods are improving, the probability is likely to increase over time on some jurisdictions. Union County has numerous agricultural and energy facilities, including bulk plants, LP tanks, and anhydrous ammonia tanks. Fuel leaks (including LP tanks in small towns) can happen in most or all jurisdictions, whether or not they are Tier II facilities. Several manufacturers handle hazardous materials. Fixed HAZMAT events from Tier II sites are possible in or affecting the following jurisdictions Afton, Creston, Rural Union County, East Union Schools, Creston Schools, SWCC, and GRMC. Small towns with nearby wastewater lagoons can be impacted in very modest and indirect levels through sewer backups and odors from the lagoon areas. Lagoons are well outside of the small cities. A good educational and collection program has resulted in the reduction of risk of household hazardous materials incidents (most of which would occur in residential properties).	Rural: 4 Afton: 2 Creston: 7 Others: 1
Vulnerability	A hazardous materials accident can occur anywhere a hazardous chemical, gas, or solid is found. People, pets, livestock, and vegetation in close proximity to 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. However, for fixed HAZMAT purposes, risk is most pronounced at reporting facilities, even though they can occur at any "fixed" site. Reporting facilities are located in several towns and near population areas. People work in facilities that house chemicals. Direct impacts will occur within a 1000-foot radius of a facility. Union County currently lacks qualified teams and contracts with proper response services. Few firefighters and other first responders are qualified to lead.	Rural: 3 Afton: 4 Creston: 5 Schools: 6 SWCC: 6 GRMC: 7
Maximum Extent	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 as large as 5 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. For direct impact, the planning committee assumes 1000 feet radius of the fixed facility. This would be a small part of the rural area but a larger part of each directly impacted city or individual building, campus, or property.	Rural: 1 Afton: 5 Creston: 5 Schools: 7 SWCC: 5 GRMC: 7
Severity	a) Health and safety of persons in area: The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Some chemicals may cause painful and damaging burns to skin if they come in direct contact with your body. Within fixed facilities and in close proximity of outdoor incidents the risks are very high. **7** b) Health and safety of response personnel: Specialized training is needed to respond to these types of incidents. If inadequately trained personnel attempt to respond, the impacts could be the same as those for the general public exposed to the toxic materials. Proper training and equipment greatly reduce the risk to responders. **5** c) Continuity of operations: None directly unless the incident occurs on or near critical facilities or services. **4** d) Property, facilities, and infrastructure: Physical damage is usually limited to the immediate property involved. Proper decontamination is needed before the facilities go back in service. **3** e) Delivery of services: Contaminated water resources may be unsafe and unusable,	4

	depending on the amount of contaminant. **4** f) Environment: Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops. The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over many years. **5** g) Economic and financial: Loss of livestock and crops, industrial fires and shutdowns, and evacuations may lead to economic hardships within the community. **5** h) Regulatory and contractual obligations: None known, but EPA and related environmental violations can cause regulatory impacts to the jurisdiction. **4** i) Reputation: Safe and timely response will greatly limit any damage to the jurisdiction's reputation. Proper warning and public information before, during, and after the incident can also limit reputation damage. **3**	
Speed of Onset	When managed properly under 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. Hazardous materials 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 to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Radios are used to disseminate emergency messages about hazardous materials incidents.	9
Duration of Event	Fixed hazardous materials events may take several hours to clean up or even contain, depending on the size of release and type of chemical or substance. The process of evacuations can delay containment.	5

Rural Union County: 30	City of Cromwell: ---	Creston Schools: 33
City of Afton: 31	City of Lorimor: ---	East Union Schools: 33
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: 31
City of Creston: 43	City of Thayer: ---	Greater Regional Medical Center: 34

4.4.7: Fixed Radiological Incident

Definition: An incident resulting in a release of radiological material at a fixed facility to include power plants, hospitals, laboratories and the like.

Description:
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 reactors in the United States were developed in the mid-1960s and are designed to withstand aircraft attack. Therefore, they should withstand most natural hazards even though they may not have been specifically designed for those forces.

Per correspondence with the State of Iowa, it has been determined that the county has no licenses for use of radioactive materials, likely due to the small amounts used; therefore, it is impossible to identify those structures and map them that can pose a real hazard. Minor incidents with medical equipments can occur and affect the areas within Greater Regional Medical Center and some other small medical facilities and surrounding areas in Creston.

Table 4 – 47: Fixed Radiological Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Historically there have been zero significant releases of radiation from fixed facilities in the State of Iowa, or even the United States. No reported minor incidents have occurred in the county. Any incidents that are not reported would have been contained in a very small area of the medical facilities involved.	1
Probability	Iowa has one nuclear power plant located within its borders, but it is over 100 miles from Union County and would not affect the county. Operators of facilities that use radioactive materials and transporters of radioactive waste are trained in the packaging, handling, and shipment of the radioactive waste; and, since they are closely regulated by the state, the likelihood of an incident is remote. Incidents would be limited to the two hospitals in the county, with no real impact outside of hospital property, that contain small amounts of well-controlled radioactive materials. It is very unlikely an incident would occur.	1
Vulnerability	Sources of radioactive materials include medical products, industrial products, nuclear power plant fuel, nuclear weapons, and radioactive waste from hospitals, laboratories, nuclear reactors, and military facilities. Small amounts of industrial, medical, and lab materials exist in a few locations, all within buildings. Trained people use the equipment and it is properly handled and stored. A few to a few dozen people, in a lab in a hospital, for example, may be impacted by an immediate release with a small amount of contamination, enough that they	Creston: 1 GRMC: 3

	would likely not be hospitalized.	
Maximum Extent	In 50 years of nuclear power production in the U.S., no deaths or injuries from radiation have been recorded among the general public. Each of the nuclear facilities in the country identifies a 10-mile radius Emergency Planning Zone and a 50-mile radius Ingestion Pathway Zone. No nuclear plants are close to the county. Small amounts are used in the educational and medical fields. The amounts used and the containment efforts made would mean that the materials would be contained to a room or building and would not have large-scale impacts in a community.	Creston: 1 GRMC: 2
Severity	a) Health and safety of persons in area: Depending on the level of exposure, radiation can cause loss of life and long and short term health effects. 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. Locally, the amounts used for medical purposes would be very small. Even small amounts can do some very localized damage. **6** b) Health and safety of response personnel: Proper training and equipment greatly reduce the risk to response personnel. Because of the small quantities, most trained personnel from Des Moines and local fire departments can respond without much risk. **4** c) Continuity of operations: None directly due to the small amount of radiological materials and the ease of containment in the highly regulated facilities. **2** d) Property, facilities, and infrastructure: Property damage can result from contamination. Any evacuations would be limited to rooms or small buildings. The actual amount of damaged facilities and infrastructure would be limited compared to a nuclear power plant failure or transportation incident. **3** e) Delivery of services: No power plants would be affected in Union County. Other impacts would be indirect and only if in the contaminated area. Medical services may be delayed or disturbed, but not totally lost. **3** f) Environment: Damage to the environment can be very long-lasting depending on the half-life of the products involved. Land, water, and air could be affected if the materials escaped the building housing them. The land and water would have to be isolated until treated or product deteriorated to an acceptable level. However, the minimal amounts of material in any one location in the county means the damages are very unlikely to do more than vent tiny amounts into the air. **3** g) Economic and financial: If the land and facilities cannot be used for weeks, months, or even years, the loss of production would be devastating. Economic impacts would be multi-sector and long-lasting, especially in and around the affected region. However, again, the amounts of materials would not mean the facilities would off-limits for months. Further, cleanup costs would not be too excessive. **4** h) Regulatory and contractual obligations: Indemnification would be a vital issue to address. Depending on the ownership of the facility and whether people are biologically affected, the courts would have to address all of the diverse issues related to damages direct and indirect. **4** i) Reputation: Reputation at this size of facility and incident would be minor, but people may fear using a certain room of a hospital or certain dentist if they know an incident has occurred, however minor. **2**	3
Speed of Onset	Ionizing radiation cannot be detected with human senses. Detection instruments are needed to indicate the existence of radiation. Distance from the incident would dictate the amount of time needed to avoid exposure from damaging radiation. Incidents in structures could be easy to notice, but if they are not noticed, even in small amounts, the building could be rapidly contaminated.	9
Duration of Event	Fixed radiological materials events may take several hours to clean up or even contain, depending on the size of release and potential for explosion. The process of evacuations can delay containment.	6

Rural Union County: ---	City of Cromwell: ---	Creston Schools: ---
City of Afton: ---	City of Lorimor: ---	East Union Schools: ---
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: ---
City of Creston: 22	City of Thayer: ---	Greater Regional Medical Center: 25

4.4.8: Highway Transportation Incident

Definition: A single or multi-vehicle incident which results in property damage and/or death(s)/injury(s). For the purpose of mitigation planning, highway transportation incidents are typically those that require response capacity beyond the first-responder day-to-day capacity available in the jurisdiction.

Description:

An extensive surface transportation network exists in Iowa. Local residents, travelers, businesses, and industries rely on this network on a daily basis. Thousands of trips a day are made on the streets, roads, highways, and interstates in the state. 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 (rush hour) and day of week. Incidents involving buses and other high-occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of response agencies.

Maps of highway transportation facilities are found in **Chapter 2**. The following map shows the locations of crashes resulting in injuries and deaths from 2004-2008.

Figure 4 – 7: Highway Crashes Involving Injuries and Deaths From 2004 Through 2008

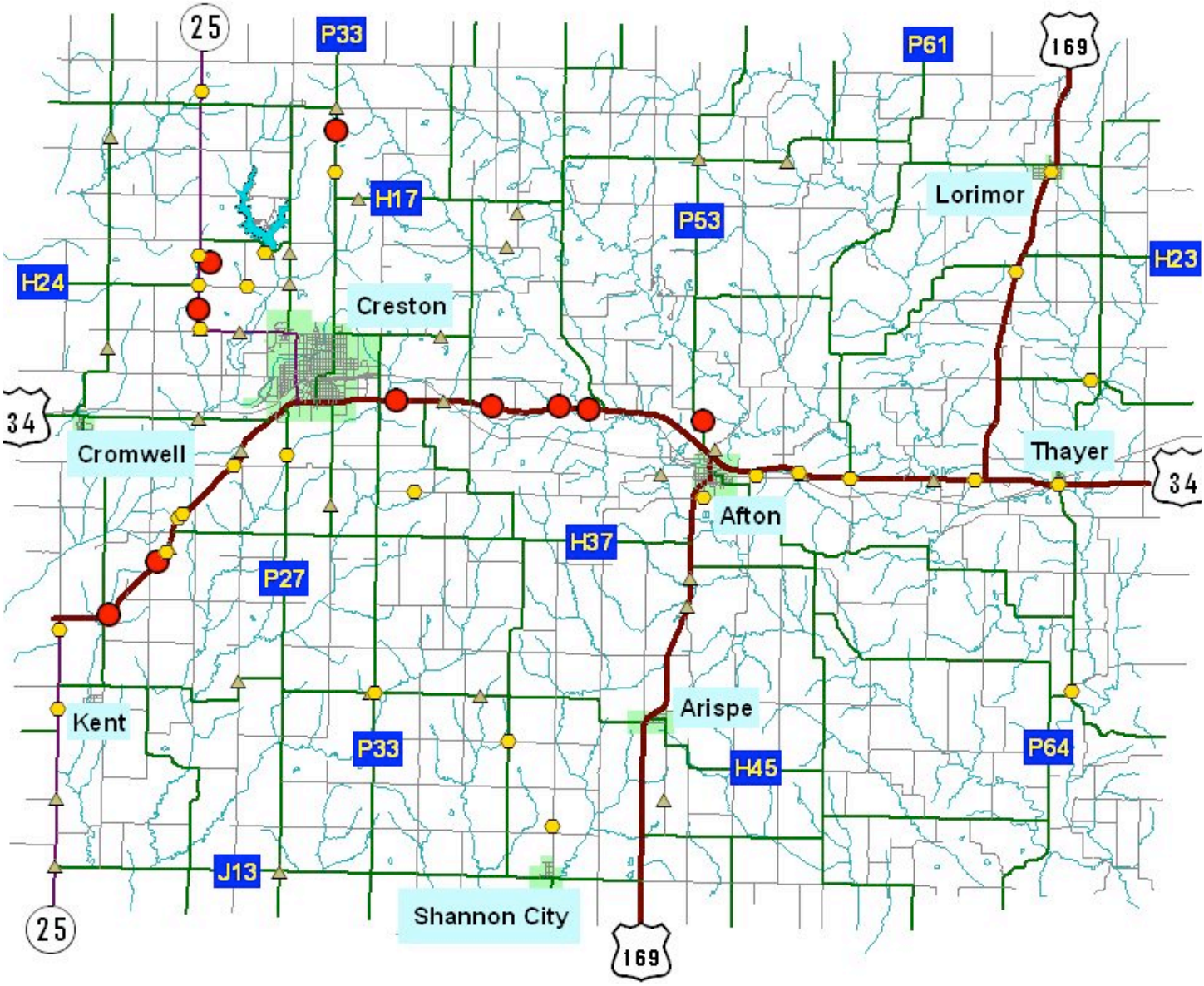


Table 4 – 48: Highway Transportation Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Numerous major and minor traffic incidents occur everyday in Iowa and result in property damage and/or death(s)/ injury(s). Major accidents involving multiple vehicles and serious injury unfortunately are not uncommon either. According to the Iowa DOT accident website, www.iowadot.gov/crashanalysis/data/county/Union.htm, Union county suffered 337 crashes from 2004-2008, of which 10 were fatal, 31 resulted in major injuries, and 35 resulted in minor injuries. In total the crashes resulted in 12 fatalities, 47 major injuries, and 69 minor injuries. As can be seen, most of the fatal crashes have been along US Highway 34. From 1996 to 2006 the IDOT reported 5 crashes in 10 years involving vehicles crossing the centerline between Afton and Creston on Highway 34. Seven fatalities resulted. This	Rural: 9 Others: 1

	has resulted in a rumble strip bring added to the area and which now extends across the county's rural sections of Highway 34. Fatal crashes have declined in number along this highway since the strips were added. 74 of the 337 crashes from 2004-08 were directly related to ice, snow, and other winter conditions. The planning team described one event where a vehicle went off the road and into the concrete spillway at Green Valley State Park, releasing diesel fuel and lawn chemicals and injuring the driver. The scores to the right reflect major injury and fatality crashes and those that exceed local response capabilities, close roads, etc.	
Probability	Although traffic engineering, inspection of traffic facilities, land use management of areas adjacent to roads and highways, and the readiness of local response agencies have increased, highway incidents continue to occur. As the volume of traffic on the state's streets, highways, and interstates increases, the number of traffic accidents will likely also increase. The combination of large numbers of people on the road, wildlife, unpredictable weather conditions, potential mechanical problems, and human error always leaves open the potential for a transportation accident. Local jurisdictions continue to look at areas traffic signals and speed limit changes are needed in order to protect the public. With the large number of recreational areas in rural Union County and the increasing number of people who commute farther to work, Union County expects crashes to continue to occur in various areas. Small towns such as Shannon City and Thayer should not be directly impacted, as they are not located on busy highways with high speeds. Creston and East Union Schools are only indirectly impacted, such as incidents in other areas involving busses. GRMC and SWCC are located along the edges of Creston and can be impacted. GRMC also treats victims and sends out ambulances, which can be in crashes.	Rural: 7 Others: 1
Vulnerability	Those who use the surface transportation system are most vulnerable. Travelers, truckers, delivery personnel, and commuters are at risk at all times that they are on the road. During rush hours and holidays the number of people on the road in Iowa is significantly higher. This is also true before and after major gatherings such as sporting events, concerts, and conventions. Pedestrians are not immune from the highway incidents. While only a small percentage of the population is involved in an individual crash, many people are at risk because so many travel.	3
Maximum Extent	Highway incidents are usually contained to areas on the roadway or directly adjacent to the roadway. Very few highway incidents affect areas outside the traveled portion of the road and the right-of-way. Extensive segments of the transportation system can be impacted during significant weather events, such as a large snowstorm, when multiple separate accidents occur. About 1% of each jurisdiction's land could be affected. When HAZMAT is involved, the impact can be a larger area (see transportation HAZMAT profile).	1
Severity	a) Health and safety of persons in area: Highway incidents threaten the health and lives of people in the vehicles, pedestrians, and citizens of the community if hazardous materials are involved. The greatest impact is in rural areas where vehicles are moving very fast. Any major highway and busy rural road can cause "pileups." **6** b) Health and safety of response personnel: Response personnel are certainly not immune to traffic accidents. Because of the number of hours that law enforcement are on the road, they have a higher risk than do other response personnel. **4** c) Continuity of operations: No significant impact. **2** d) Property, facilities, and infrastructure: Property damage would be limited to vehicles and cargo involved; roads, bridges, and other infrastructure; utilities such as light and power poles; and third party property adjacent to the accident scene such as buildings and yards. **2** e) Delivery of services: No significant impacts in most cases. There may be short term localized impacts if utility poles are affected and the like. Also, major routes, like Highway 34, can be closed down, slowing transportation of people and materials for up to several hours. Business can be impaired, as can emergency response. **3** f) Environment: Fuel and other fluids can be spilled from the affected vehicles and affect the environment. If hazardous materials hauling vehicles are involved, the impact could be much greater. Thousands of gallons or pounds of product can be released to the environment if the container is damaged. **4** g) Economic and financial: No significant impact other than business disruption of those in the affected area. **2** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Because these incidents are not unusual, they rarely cause a significant impact on the reputation of the jurisdiction. **1**	3
Speed of Onset	There is usually no warning of highway incidents. During snow storms and other weather events that may impede travel, travelers, response agencies, and hospitals alike can be notified of hazardous travel conditions.	9
Duration of Event	Highway transportation incidents occur very rapidly and are completed within a few seconds to one minute. A higher score is offered because of the delays and related impacts resulting from the immediate need to create a detour in some cases.	4

Rural Union County: 36 City of Afton: 22 City of Arispe: 22

City of Creston: 22	City of Shannon City: ---	East Union Schools: ---
City of Cromwell: 22	City of Thayer: ---	Southwestern Community College: 22
City of Lorimor: 22	Creston Schools: ---	Greater Regional Medical Center: 22

4.4.9: Human Disease Incident

Definition: A medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation).

Description:
Public health action to control infectious diseases in the 21st century is based on the 19th century discovery of microorganisms as the cause of many serious diseases (e.g., cholera and TB). Disease control has resulted from improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs. Scientific and technologic advances have played a major role in each of these areas and are the foundation for today's disease surveillance and control systems. Scientific findings also have contributed to a new understanding of the evolving relation between humans and microbes. As of January 1, 2000, a total of 60 infectious diseases were designated as notifiable at the national level. A notifiable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease.

More information on common and human disease incidents, as well as impact maps, can be found at the websites of the following organizations, Iowa Dept. of Public Health (www.idph.state.ia.us), Centers for Disease Control and Prevention (www.cdc.gov).

Table 4 – 49: Human Disease Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	The Iowa Department of Public Health tracks epidemiological statistics in Iowa. Their data indicate no major incidents of diseases that have high percentages of loss of life or severe illness in the last 25 years. Minor outbreaks of things like pertussis, mumps, and salmonella have occurred in the county. Factories, schools, and medical facilities seem to have suffered the worst from human disease incidents, but fatalities directly from communicable diseases have been limited. Humans in Union County have suffered from influenza, chicken pox, Lyme disease, pertussis, mumps, measles, Hepatitis C, and other diseases. Virtually all jurisdictions have been affected, although data to the city and school level is limited. Most disease outbreaks in recent history have been anticipated and are contained in reasonable time using existing mitigation measures.	2
Probability	Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local, and public health agencies. The County's director of public health indicates that many of the disease incidents come in cycles. There is no evidence the risk varies much by jurisdiction's location. People live close enough to one another that any disease can impact any jurisdiction. With the large water areas used for recreation, waterborne diseases are also a concern.	3
Vulnerability	Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to other diseases known and unknown. An estimated 20% of Iowans are considered high risk for disease incidents. However, a small percentage is likely to be infected in one outbreak. Union County has acute medical care and specialty care at GRMC, and the Des Moines metro hospitals are within 75 minutes. The public health leaders state that the lack of staff and funding makes the concern over a major outbreak especially significant. However, public health staff indicated the number of people in a typical event that would be directly impacted is limited and can be addressed with current mitigation measures.	Schools: 5 SWCC: 4 GRMC: 4 Others: 2
Maximum Extent	Because of our highly mobile society, these diseases can move rapidly across the state and across the nation within days, weeks, or months, impacting seemingly random areas. Individual buildings could see widespread impacts, while large areas like a county might see minimal areas of impact.	Schools: 5 SWCC: 4 GRMC: 4 Others: 2
Severity	a) Health and safety of persons in area: Many of the diseases on the national notification list result in serious illness if not death. Some are treatable; others only the symptoms are	4

	treatable. **8** b) Health and safety of response personnel: Doctors, nurses, paramedics, and emergency medical technicians are vulnerable to contagious diseases. Universal precautions can greatly diminish the transfer rate and risk to responders to human disease. **8** c) Continuity of operations: It depends on the extent that local critical assets are able to operate during events where many are ill and health-care and first-response crews are occupied with the incident response. **4** d) Property, facilities, and infrastructure: None. **1** e) Delivery of services: Limited impact on most critical services. Healthcare services may be at the limits of capacity. **4** f) Environment: No direct impact. **1** g) Economic and financial: No direct impact, but large outbreaks may warrant travel advisories to the area and will impact the tourism and general commerce in the area. Extended sick leave time can affect local businesses and services. Financial costs to care for the sick can be very high to a community. **4** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Adequate disease prevention programs and response to the outbreak can limit the damage to the jurisdiction's reputation. **2**	
Speed of Onset	The private practitioner is the first line of defense and will undoubtedly be the first to witness the symptoms of human disease incidents. The Iowa Department of Public Health and the U.S. Centers for Disease Control monitor reports submitted by doctors, hospitals, and labs to identify patterns. The Department and CDC are proactive in providing information to the health care community on medical concerns. Conditions related to scope and magnitude can escalate quickly and area resources can be drained of personnel, medications, and vaccinations rather quickly.	5
Duration of Event	Human disease incidents can spread for days even before the cause can be identified and may take a few more days before the cause can be contained or addressed.	8

Rural Union County: 26	City of Cromwell: 26	Creston Schools: 32
City of Afton: 26	City of Lorimor: 26	East Union Schools: 32
City of Arispe: 26	City of Shannon City: 26	Southwestern Community College: 30
City of Creston: 26	City of Thayer: 26	Greater Regional Medical Center: 30

4.4.10: Human Disease Pandemic

Definition: A pandemic is defined as a disease that has spread around the world to many people.

Description:
Pandemic refers to a microbe that has the ability to spread across the world. The word, 'pandemic', means that a disease has caused illness in a person on nearly every continent. Many diseases throughout the history of the world have been pandemic. Examples are HIV/AIDS and influenza. A pandemic will have wide spread economic and societal implications for our state. Response and recovery to a pandemic will likely be lengthy.

More information on human disease pandemics, as well as impact maps, can be found at the websites of the following organizations, Iowa Dept. of Public Health (www.idph.state.ia.us), Centers for Disease Control and Prevention (www.cdc.gov), and World Health Organization (www.who.int).

Table 4 – 50: Human Disease Pandemic Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Pandemics of influenza have occurred three times about every 100 years. From 1900-2000, there were three influenza pandemics, all about 30 years apart. In 2003 there were 80 new HIV patients and 76 new AIDS patients in Iowa. This seems to follow the same trend with the next occurrence to affect Iowa beginning in 2009 with the H1N1 influenza virus causing 659 hospitalizations with lab confirmed H1N1 since 9/1/09 and resulting in 41 fatalities. The County public health official indicated that much effort was put into H1N1 preparation and response. Several jurisdictions have reported sick individuals from the H1N1 pandemic in 2009. The planning team is unable to determine where in the county the effected people lived, worked, or went to school, so it is assumed that all jurisdictions have been impacted by at least one incident.	2
Probability	Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local and public/private health agencies. Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious	1

	diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to known and unknown diseases.	
Vulnerability	Influenza (flu) happens every year in nearly every country in the world. It spreads through a population for a few months and then will disappear or will move onto another country. Influenza usually occurs in the fall and winter months. Typically people who usually become ill are the elderly, the very young and people with chronic medical conditions and high-risk behaviors. Individuals that travel internationally and have high exposure to potential vectors of disease are the most susceptible. Greater than 20% of Iowa's population is considered high risk. The current H1N1 cycle could impact up to 30% of the population, mostly elderly, pregnant women, and children. The county has GRMC to provide care as well as County Public Health facilities.	Schools: 5 SWCC: 4 GRMC: 4 Others: 2
Maximum Extent	Because of our highly mobile society, diseases can move rapidly across the state and across the nation within days, weeks, or months, impacting seemingly random areas.	7
Severity	a) Health and safety of persons in area: Historically pandemics result in serious illness if not death. Some are treatable; others, only symptoms are treatable. **7** b) Health and safety of response personnel: Doctors, nurses, paramedics, and emergency medical technicians are vulnerable to contagious diseases. Universal precautions can greatly diminish the transfer rate and risk to responders. **7** c) Continuity of operations: Potential for severe or complete disruption. **7** d) Property, facilities, and infrastructure: None. **1** e) Delivery of services: Healthcare and essential services infrastructure is impacted - human resource personnel infrastructure. **5** f) Environment: Potential impact to essential environmental service personnel. Damage by disease could be widespread. **4** g) Economic and financial: Large outbreaks may warrant travel advisories to the area and will impact the tourism and general commerce in the area. High number of ill human resources will affect the conduction of local businesses and will cost the community much in healthcare provision. Economic costs could be of greater impact than the direct impact of the disease itself. **7** h) Regulatory and contractual obligations: None known. **1** i) Reputation: If panic or chaos happens as a result of poor delivery of services, the local reputation could be hindered. **4**	5
Speed of Onset	If the disease is highly infectious by the time it is discovered, it will likely have already spread across the state or nation. This will put us at a severe disadvantage during response and recovery. Incidents usually do not impact most people before some are discovered as having the disease.	2
Duration of Event	By its very nature, pandemics are widespread and take weeks to months to follow their course.	9

Rural Union County: 28	City of Cromwell: 28	Creston Schools: 31
City of Afton: 28	City of Lorimor: 28	East Union Schools: 31
City of Arispe: 28	City of Shannon City: 28	Southwestern Community College: 30
City of Creston: 28	City of Thayer: 28	Greater Regional Medical Center: 30

4.4.11: Pipeline Transportation Incident

Definition: A break in a pipeline creating a potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation.

Description:
Iowa is served by many high-pressure pipelines for residential and industrial uses. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak that is not ignited to a large rupture in which the gas is ignited. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk of those in close proximity to the pipelines.

Pipeline transportation facilities are mapped in **Chapter 2**. Pipelines cross portions of rural areas and access several of the cities in the county.

Table 4 – 51: Pipeline Transportation Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	According to the Iowa Utilities Board (IUB) and the United States Transportation Pipeline and Hazardous Materials Safety Administration, 43 pipeline accidents, incidents, or service	Creston: 3 Others: 2

	outages were reported between 2000 and 2009, resulting in a total of six (6) injuries in Iowa. There have been few known incidents and all have been localized incidents due to construction activities. There have been no fatalities or long-term impacts in the county, except for one accident in Creston where a repair worker was killed by equipment while performing work (the accident was not directly related to the pipeline itself.) Farley's and Sather's candy factory suffered the loss of needed natural gas and water for a time in 2009 and could not operate. No known incidents have occurred outside of Creston.	
Probability	The vast majority of pipeline incidents that occur are caused by third-party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. New development continues at a slow pace in most of Union County; however, some areas have several utilities crowded into a small area. Petroleum and natural gas pipeline accidents occur with some regularity in the region, but they usually have a limited impact and are quickly and adequately handled by pipeline company emergency crews and local and state responders. Pipeline operators are required to coordinate all safety preparedness and response activities with the communities. Planning, training, and exercising of emergency procedures with all involved parties help to limit the occurrence and severity of incidents. Three major pipelines travel through the county, but these have no known past incidents; they could in the future. Pipelines connect to Creston, Afton, and Lorimor. Lorimor's 4.25 mile connection runs at 140 lbs of pressure. Due to the lack of facilities, dangerous pipeline incidents cannot occur in Arispe, Cromwell, Shannon City, and Thayer.	Creston: 2 Others: 1
Vulnerability	People and property with pipelines on their land or nearby are the most at risk. People excavating earth near a pipeline are also at risk. Whether the greater hazard is posed to those upwind or downwind from a site depends on the product spilled, for example - natural gas is lighter than air. Private homes and business served by natural gas have smaller diameter pipelines connected to their structure. The underground pipelines cross public streets, roads, highways, and streams. Iowa's natural environment is also vulnerable to contamination from an underground pipeline incident. People can suffer from the loss of gas service to their homes. The greatest potential impact as a percentage of population is the cities that have full gas service. It takes days for personnel to go to each house and re-pressurize and re-light facilities for each building. Manufacturers would have to use other fuels to continue operating.	Rural: 3 Cities: 6 Schools: 5 SWCC: 5 GRMC: 6
Maximum Extent	Most incidents affect only the area directly above or near the damaged pipeline. Depending on the size of pipeline and amount of product released, the extent of impact could be several hundred feet in diameter. Large areas may need to be evacuated to remove people from the threat of fire, explosion, or exposure. Pipelines have automatic shutoff valves installed so that damaged sections can be isolated and the volume of product escaping can be limited. Identification and caution signs are posted wherever pipelines pass under roads, streams, fence lines, or at any aboveground utilities. In areas where natural gas is used for a large majority of homes and businesses, the extent would be very high. Three large pipelines cross the county's rural areas and surface facilities are found at city border stations, the largest being in the northeast corner of Creston.	Rural: 2 Others: 7
Severity	a) Health and safety of persons in area: All petroleum liquids pose dangers from fire or explosion and the fire may produce poisonous or irritating gasses. Toxic fumes and direct contact can cause health hazards. Vapor clouds can travel a distance and settle in low-lying areas where the fumes may overcome people and animals. Released products should be treated as any other hazardous material. Large areas may need to be evacuated to remove people from the threat of fire, explosion, or exposure. **7** b) Health and safety of response personnel: Specialized training is required to work around the pipeline because of hazardous materials, potential high-pressure liquids and gases, and trench rescue techniques. **7** c) Continuity of operations: Services that depend on the product moving through the pipeline may be impacted if they do not have an auxiliary source. **4** d) Property, facilities, and infrastructure: Petroleum and natural gas pipelines can leak or erupt and cause property damage, environmental contamination, injuries, and even loss of life. Accidents may be caused by internal or external corrosion, defective welds, incorrect operation, outside damage, or other defective pipeline or equipment. The explosion can damage adjacent properties. **5** e) Delivery of services: A break in water pipelines may impact fire protection. Petroleum products will not be delivered or will be delivered in limited quantity. **5** f) Environment: Impacts to the area result from saturating the soil with hazardous materials and/or causing rapid erosion. **5** g) Economic and financial: Evacuations potentially save lives and limit injury, but they also disrupt businesses and inconvenience residents. Loss of natural gas and petroleum also disrupts business and transportation. **5** h) Regulatory and contractual obligations: None known. **1** i) Reputation: A well-informed public before, during, and after an incident will greatly	5

	reduce the impact to the jurisdiction's reputation. **2**	
Speed of Onset	A pipeline incident may occur suddenly, but sight, sound, and smell can alert individuals that there may have been damage done to a pipeline in the area. Products may bubble up from the ground or collect in low-lying areas, a roaring or hissing noise may be heard, and most products give off a distinct odor. These warning signs can alert individuals not to use any devices that may act as ignition sources and cause a fire or explosion.	9
Duration of Event	Pipeline transportation incidents occur rapidly but it could be hours before the leak is sealed. The Deepwater Horizon oil leak in the Gulf of Mexico is an extreme example due to its depth under the sea, but even a land or buried pipe can take time to reach and either seal or close the valves.	4

Rural Union County: 26	City of Cromwell: ---	Creston Schools: 33
City of Afton: 34	City of Lorimor: 34	East Union Schools: 33
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: 33
City of Creston: 36	City of Thayer: ---	Greater Regional Medical Center: 34

4.4.12: Public Disorder

Definition: Mass demonstrations or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes.

Description:
People assembled together in a manner to substantially interfere with public peace constitutes a threat, by use of unlawful force or violence against another person, causing property damage; or attempting to interfere with, disrupting, or destroying the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target group or institution. Most events are within the capacity of local law enforcement. This assessment considers those that exceed local capabilities.

Table 4 – 52: Public Disorder Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Large-scale civil disturbances rarely occur; when they do, they are usually an offshoot or result of one or more of the following events: 1) labor disputes in which there is a high degree of animosity between the participating parties; 2) high profile/controversial laws or other governmental actions; 3) resources shortages caused by a catastrophic event; 4) disagreements between special interest groups over a particular issue or cause; or 5) a perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society. No such incidents have occurred in modern history in Union County; the only known event in all history was a railroad strike in the 1930s that resulted in the death of one person. A "relatively minor" incident was a bar fight in 2005 in Afton that required Union County Sheriff backup of the Afton Police Department. None of the jurisdictions is large enough that a mass incident is likely, but in the right or very unique circumstances an incident could occur in many jurisdictions on a moderate scale that may require outside response – in part because the response teams available in the county are of modest size.	Creston: 2 Afton: 2 Others: 1
Probability	Although destructive civil disturbances are rare, the potential is always there for an incident to occur. The chances are very small in all but the largest towns because the populations are not really large enough to support a major dispute. The risk of a major event is likely to increase because television, radio, and the internet provide the ability to instantly broadcast information (factual or not), in real time, to the entire community. Oftentimes, that coverage helps to spread the incident to other, uninvolved or unaffected areas, exacerbating an already difficult situation. This also allows people, previously not involved, to participate in the disturbance for no other reason than to riot, loot, burn, and destruct. Alcohol is often involved in public disorder, especially related to college campuses, sporting events, and concerts. The main hazard is not that a major event would happen but that a minor event with only a dozen people could exceed local capabilities in this small rural county. There are no major tourist gatherings in Union County, such as pro sporting events or major concerts, but community events occur regularly that can attract hundreds to a few thousand people to one area, such as McKinley Park in Creston on July 4th. School systems report a concern over near incidents and possible future incidents due to unruly fans at sporting events.	1
Vulnerability	Civil disturbances are often difficult for local communities to handle. There is a fine line between the Constitutional right of individuals and groups to assemble and air their grievances and the overall needs of the community to provide essential services, ensure personal safety of citizens, prevent property damage, and facilitate normal commerce.	Rural: 3 Cities: 5 Schools: 7 SWCC: 7

	Fortunately, most demonstrations and large public gatherings are held in a peaceful, responsible manner. When groups get out of hand and violence occurs, people at risk are mainly the willing participants and law enforcement officials. Innocent bystanders and their property are at risk; yet, only a small percent of the population is likely to be affected directly. Law enforcement and mutual aid agreements reduce vulnerability. Incidents affect hospitals when psychological committals are requested.	GRMC: 6
Maximum Extent	The social rage that causes civil unrest often comes from racism, poverty, lack of economic opportunity, and unemployment. Events usually affect a localized area of the community. Often times only a couple of blocks or streets are affected. The local government units are left to pick up the pieces in the aftermath, cleaning up the area, reestablishing services, repairing or replacing damaged public facilities and infrastructure, and trying to restore some level of citizen and private investor confidence in the community. Less than 10% of the area is likely to be affected except for individual building assets, like schools.	Rural: 1 Cities: 2 Schools: 7 SWCC: 7 GRMC: 6
Severity	a) Health and safety of persons in area: Major civil unrest causes injury and can cause widespread fatalities. **7** b) Health and safety of response personnel: Medical staff and volunteers can be overworked and supplies in local care facilities can run out. Response personnel are at high risk of injury or death when trying to quell the event. **7** c) Continuity of operations: Many community operations can be severely stretched and can run the risk of temporary failure. Equipment and supplies of operators can run out or be damaged in the violence, thus reducing future response. Courts can be jammed with prosecutions of crimes. **6** d) Property, facilities, and infrastructure: Private, local, state, and federal property, facilities, and infrastructure can be the target of disputes, thereby suffering the loss of the facilities and infrastructure for months or years and expensive repairs and replacement. **6** e) Delivery of services: Services can be severely hampered due to the actual violence, the cleanup, or the fear of future violence that keeps people from providing services in an area or to a business or organization. For example, fires can sometimes burn uncontrolled because firefighters and equipment are unable to respond due to resistance from rioters. **7** f) Environment: Depending on the type of incident and damages, short-term and long-term environmental damage is likely. **3** g) Economic and financial: Perhaps even more tragic has been the lingering, negative impact and loss of investment in the communities ravaged by the uprisings. Many riot areas do not fully recover from the damage, destruction, and negative image brought on by such events. Looting, burning, and sniping can occur during severe civil disturbances. Businesses and industry may shut down and move to a safer area. **7** h) Regulatory and contractual obligations: Events can cause the failure to keep and meet contracts and can be the result of contracts and regulations, thereby putting local business and government in strain. Labor disputes and disputes over government regulations can bring about tighter regulations, fines, and litigation. **5** i) Reputation: How the response is conducted and political leaders respond will determine the local reputation. **5**	6
Speed of Onset	Events that incite such activity can build up over hours, days, or years, and the violent disturbance is a culmination of the long-term situation. Civil disruptions can also escalate very rapidly following events where people are gathered, such as sporting events, concerts, or speeches.	6
Duration of Event	Public disorder incidents will typically take minutes to hours to be controlled and order to be restored, not including time to clean up the debris and damage.	4

Rural Union County: 22	City of Cromwell: 25	Creston Schools: 32
City of Afton: 26	City of Lorimor: 25	East Union Schools: 32
City of Arispe: 25	City of Shannon City: 25	Southwestern Community College: 32
City of Creston: 26	City of Thayer: 25	Greater Regional Medical Center: 30

5.4.13: Rail Transportation Incident

Definition: A derailment or a train accident that directly threatens life or property, or that adversely impacts a community's capabilities to provide emergency services.

Description:

Railway incidents may include derailments, collisions, and highway/rail crossing incidents. Train incidents can result from a variety of causes. Human error, mechanical failure, faulty signals, and problems with the track can all lead to railway incidents. Results of an incident can be range from minor "track hops" to catastrophic hazardous materials incidents and even passenger casualties. With the many miles of busy track in Union County, there are numerous at-grade crossings at which vehicles must cross the railroad tracks.

Rail transportation facilities are mapped in **Chapter 2**. The county contains approximately 26 miles of BNSF mainly double-track that travels west-east through Union County and the towns of Cromwell, Creston, Afton, and Thayer. Daily, approximately 50 trains use this track, including two Amtrak trains. Spurs and side tracks serve grain and chemical facilities in Creston and Afton. Several bridges and crossings pose unique risks that can cause transportation incidents involving trains and autos. Most of these are well maintained and signage is appropriate.

Table 4 – 53: Rail Transportation Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	The planning team has reported rail transportation incidents in rural Union County (a spill in 2010 for example) and the towns of Afton (in 2000 for example) and Creston. The county has sustained one Amtrak derailment in the past 30 years; in approximately 1999 or 2000 people had to be housed at the SWCC campus overnight. Incidents can also occur in Thayer and Cromwell and can impact East Union School. In addition to at least 50 moving freight trains and two passenger trains each day, the BNSF line through Union County includes a major switching yard in Creston. This yard always has activity; although trains are slow, switching activities can cause accidents, and two crossings in Creston are heavily used both by autos and switching trains. While most incidents in Union County's history have been relatively minor, in part because trains are slower as they approach Creston, incidents have occurred in the region along this track, sometimes involving death to engineers, drivers, pedestrians, and passengers. Causes of past incidents have included driver fatigue, animals and vehicles caught in front of the train, and severe weather, such as heavy snow and high wind. Creston and Afton Fire Departments have responded to fires and rescue calls along the tracks and recently purchased off-road vehicles to respond to these incidents. Creston Schools used school busses in the 1980s to transport passengers from an Amtrak incident back to town to be housed until another train could be made available.	Rural: 4 Afton: 2 Creston: 2 Others: 1
Probability	The risk continues to grow as this form of freight transportation becomes more popular. Bridges and underpasses limit the number of road crossings on the BNSF line, but secondary roads and city streets cross in some places. The future probability of incidents with fatalities or requiring extra capabilities not found locally is low but increasing in a given year. The BNSF continually invests in upgrades to rails and crossings. However, traffic on the tracks, and on roads crossing them, continues to increase. Grade crossing accidents involving autos and pedestrians are most likely, followed by trains hopping the track. Least likely but not impossible would be a major collision or a major derailment with HAZMAT.	Rural: 3 Afton: 1 Creston: 2 Others: 1
Vulnerability	People and property in close proximity to the railway lines, crossings, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved. Likely the greatest vulnerability to the public would be in Creston, where the trains pass through residential, commercial, and industrial areas and two busy crossings are at grade. Generally, local fire departments have the capabilities to address minor derailments. However, if HAZMAT is involved or if passengers needed rescued and medical care, local capabilities can be easily exceeded and people in areas like the town of Creston and others may be evacuated.	Rural: 3 Creston: 7 Other cities: 6 East Union CSD: 2
Maximum Extent	Vehicle/train collisions are usually limited to areas in and near intersections. Rarely, the incident will result in widespread effects. The direct area of impact is usually quite small, but depending on the products and materials involved, the area could become extensive. If hazardous materials are involved, the effects could reach areas up to 1.5 miles from the scene. Harmful products may contaminate streams, rivers, water distribution systems, and storm water systems. If this occurs, a large portion of the community could be affected. The ability of response agencies to contain the product on-scene usually limits the area affected. The greatest effect would be to agricultural processing areas and not residential and retail areas.	Rural: 2 Cities: 5 East Union CSD: 2
Severity	a) Health and safety of persons in area: Deaths and injuries can range from those directly involved, to citizens in the community affected by hazardous materials. Depending on the materials involved, evacuations may occur, moving residents away from dangerous products and the possibility of explosion. **6** b) Health and safety of response personnel: If hazardous materials are involved, there could be much higher risk (see transportation HAZMAT incident profile). Railroad officials have specially trained personnel and equipment to respond to rail incidents. **5** c) Continuity of operations: No significant impacts unless losses are very severe. **3** d) Property, facilities, and infrastructure: Damage may be limited to the train, railcars, and cargo involved, but it could also include rail infrastructure and adjacent properties. Crossings and bridges can be damaged and thus disrupt other transportation methods. **5** e) Delivery of services: Rail transportation routes may be out of commission until the accident is cleaned up and the infrastructure repaired. Cargo will be delayed significantly and services that depend on cargo can be diminished or delayed on this very busy rail line. **7** f) Environment: Gases, liquids, and solids can contaminate air, soil, and water in and near the	5

	incident scene. **6** g) Economic and financial: Impacts include loss of production, business disruption due to evacuations, and business disruptions of those served by the railroad. Business and traffic disruptions could last several days until the clean-up efforts are complete. **6** h) Regulatory and contractual obligations: None known. **1** i) Reputation: Most communities with rail routes in them are familiar with the level of rail traffic, but they may not be familiar with the cargo that may be transported on them. Most are not aware of the significant risk that hazardous materials pose to the community. Education, public information, and a timely and effective response will determine the impact to the jurisdiction's reputation. **3**	
Speed of Onset	A railway incident would occur with no warning. There may be no or a limited amount of time to warn those in the pathway of the harmful effects.	9
Duration of Event	Rail transportation incidents will likely occur rather quickly from the time the moving train begins to fall off the tracks until motion stops. Stopping oncoming trains and other immediate actions may prolong the incident up to several minutes to an hour.	3

Rural Union County: 29	City of Cromwell: 30	Creston Schools: ---
City of Afton: 31	City of Lorimor: ---	East Union Schools: 23
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: ---
City of Creston: 33	City of Thayer: 30	Greater Regional Medical Center: ---

4.4.14: Structural Failure

Definition: The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings.

Description:

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.

Table 4 – 54: Structural Failure Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	There have been several sporadic structural failures across the state. They have included homes, commercial structures, bridges, and communications towers. There is no central collection point for this information. In the past five years, several rural culverts and bridges failed or were closed due to the threat of failure. Old farm buildings, mostly unoccupied, have failed. Many buildings are slowly collapsing due to neglect and age. Grain facilities in Creston have not failed, but in the past five years at least one incident occurred where someone working on a grain elevator had to be rescued because climbing equipment failed. The tornado of 2012 caused partial failures of buildings in Creston and rural Union County, some of them had to be demolished because they were no longer structurally sound enough to be repaired.	Rural: 6 Afton: 2 Creston: 4 Others: 1
Probability	Civil structures may fail in a variety of modes. The unprecedented growth in technology has resulted in a host of problems related to complex structures, special materials, and severe operational and environmental loads, such as fire, excessive vibrations, explosion, high-energy piping failures, missiles, and earthquakes. With the possible exception of misuse, accidental or environmental loads, the causes of failure may be found in deficiencies of design, detailing, material, workmanship, or inspection. With the aging structures in the country along with problems with new materials discussed above, structural failures will continue to occur. Efforts to inspect and maintain these structures will lessen the probability of a failure, but not guarantee that it will not happen in the future. Internal weaknesses can be hidden from inspectors and not be realized until it is too late. In Union County, old bridges, culverts, homes, abandoned buildings pose a failure risk. These structures are only getting older, and resources to improve them are lacking. Some areas of neglect, such as the former town of Kent, have numerous abandoned properties that are slowly collapsing. Due to the number and the age of buildings and structures, Creston and the rural county have the greatest probability of building failure. Creston has a building inspection program for rental buildings and certain commercial	Rural: 7 Creston: 4 Other cities: 2 Others: 1

	buildings, as well as an active dangerous building abatement program.	
Vulnerability	There are many buildings in Union County that are very old or which may become hazardous in the event of an earthquake, fire, high winds, or other natural events. In some historic downtown areas and other towns with 1800s brick buildings, old downtown buildings could collapse and impact surrounding buildings and the public. All bridges are vulnerable to the effects of the elements and the deterioration that results. Increases in the amount and weight of traffic they are expected to support increase their vulnerability to failure. Grain and other elevators and towers have failed due to changes in use. While most buildings that are likely to fail are not occupied, failure could impact business activity, produce toxic wastes, or impact traffic patterns.	Rural: 2 Cities: 3 Others: 5
Maximum Extent	The impacts of the failed structure would be contained to the immediate area and adjacent properties. This could be as small as the house and yard of a fallen chimney, or the area could be relatively extensive if the structure that failed was a multi-story downtown building, a grain elevator, and a tall communication tower. Dam and bridge failures can impact a wider area. Bridge failures cause transportation problems. HAZMAT spills can result and affect a wider area.	Rural: 1 Cities: 2 Others: 3
Severity	The following is offered with the understanding that the severity is based on the structure that fails, how fast it fails, and even time of day. a) Health and safety of persons in area: Personal injury, death, and property damage may occur in the collapse itself or by falling debris from nearby structures. Because the population and height of structures in the county is generally low, most incidents would not result in death or extensive injury. **6** b) Health and safety of response personnel: Response personnel could limit their risk through proper training and equipment. Structural collapse rescue is a specialized form of rescue and can result in injury or death to responders. **4** c) Continuity of operations: Functional purpose of the building would be terminated or suspended until the integrity of the structure could be restored. **5** d) Property, facilities, and infrastructure: Impacts could range from minor disruption to full destruction of the structure. Structures that could be impacted would range from private homes and businesses to government facilities to transportation infrastructure. **6** e) Delivery of services: Bridge failures and debris in the streets and sidewalks would interrupt normal routes of travel. Utilities may be cut off to surrounding areas and communication transmissions may be lost for a period of time. **6** f) Environment: No severe impact to the environment unless the structural failure released a hazardous substance that could contaminate the air, water, or soil. **2** g) Economic and financial: There would also be a considerable price tag to replace or fix the structure, not to mention the loss of revenue that would occur because the structure could not be used. **5** h) Regulatory and contractual obligations: Failure during construction can be the liability of the contractor or owner. This would depend upon the contract for construction and at which time the property ownership is transferred. Code development and enforcement can play a significant role in limiting the impact from structural failures. **4** i) Reputation: If the structural collapse could have been averted or limited in any way by code enforcement, the reputation could suffer from public outcry. **4**	5
Speed of Onset	The actual failure of the structure would likely occur suddenly with little or no warning. There are several events that could lead up to the failure that have various warning times (discussed in separate hazard profiles). Casual hazards can include fire, explosion, overloading of ice and snow, vibration, earthquakes, flooding, high wind, erosion, chemical corrosion, subsidence, and lack of general upkeep.	8
Duration of Event	Structural failures will usually be immediate but can occur slowly. Rarely will a total collapse that can impact surrounding areas take more than six hours.	5

Rural Union County: 34	City of Cromwell: 26	Creston Schools: 28
City of Afton: 27	City of Lorimor: 26	East Union Schools: 28
City of Arispe: 26	City of Shannon City: 26	Southwestern Community College: 28
City of Creston: 31	City of Thayer: 26	Greater Regional Medical Center: 28

4.4.15: Structural Fire

Definition: An uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities.

Description:

Structural fires present a great 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 fire fighting equipment, training, and techniques, lessen the chance and impact of a major urban fire.

Most structural fires 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 of the volume or type of the material involved.

Fire stations and response facilities are mapped in *Chapter 2*.

Table 4 – 55: Structural Fire Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Creston Fire Department responds to dozens of structural fires each year, most of them not inhabited by persons at the time of the fire. Creston Fire reports between $250,000 to $500,000 in fire losses each year; $404,000 in losses were reported in 2010 in Creston and $10,000 in losses were reported in Cromwell. A major house fire in 2009 damaged Shannon City. Fires in 2010 and 2011 damaged homes in Afton. Union County Landfill had a trailer fire in 2009. East Union Schools has suffered one fire resulting in Afton Fire Department being called. Nearly all fires have been quickly extinguished by on-site personnel or local fire departments. Local structural fires have required more than the local fire department capacity but are extinguished with Automatic Aid from one or more neighboring departments. Occasionally, incidents occur that require assistance from fire departments outside the county via Mutual and Automatic Aid Compacts. Most jurisdictions need outside assistance for fire extinguishing in a given year. Local fire departments have data about past events but data was not shared with the planning team. It is believed that larger communities tend to have more fires due to the larger number of structures. Rural areas have many fires to outbuildings and other structures. The candy company has had fires requiring both Creston and Afton Fire Departments to respond. Fires have not occurred at Creston Schools, SWCC, and GRMC.	Rural: 6 Creston: 6 Other Cities: 3 East Union Schools: 2 Others: 1
Probability	Much of the fire prevention efforts have gone into nonresidential fires and the results have been highly effective. Even with an increase in the prevention efforts in residential fires, both residential and nonresidential fires will continue to occur. During colder months, clogged chimneys and faulty furnaces and fireplaces can increase the probability of structural fires. Based on the current trends for new development and continued fire prevention efforts, the annual probability in any jurisdiction is low to moderate.	Rural: 5 Creston: 5 Other Cities: 3 Others: 1
Vulnerability	Older structures with outdated electrical systems not built to current fire codes are particularly vulnerable to fire. 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 because of climate, poverty, education, and demographics. The fire death risk for the elderly and children under 5 years of age is more than twice that of the average population. Industrial and business fires could affect hundreds of people due to lost employment. Some public and high-occupancy buildings are not sprinkled due to being built before sprinkling was required.	Rural: 2 Cities: 4 Others: 5
Maximum Extent	With modern training, equipment, fire detection devices, and building regulations and inspections, most fires can be quickly contained and limited to the immediate structure involved. Certain circumstances, such as the involvement of highly combustible materials or high winds, can threaten a larger area. The age and density of a particular neighborhood can also make it more vulnerable to fire from neighboring structures.	Rural: 2 Creston: 3 Other cities: 4 Others: 5
Severity	a) Health and safety of persons in area: Based on national averages in the 1990s, there is one death for every 119 residential structure fires and one injury for every 22 residential fires. In nonresidential fires, there is one death for every 917 fires and one injury for every 52 fires. From 2006-April 2010, Iowa sustained 167 fire fatalities. **7** b) Health and safety of response personnel: In the US, about 100 firefighters die each year in duty-related incidents. (According to best available information, data is unchanged.) **7** c) Continuity of operations: Only in certain cases would a structural fire affect continuity of operations. These cases could be fire at a critical facility, data storage areas, communications, infrastructure, etc. Factories can be closed for a time. **3** d) Property, facilities, and infrastructure: Fire damages can be very high as more and more highly combustible chemicals are used in building materials, furnishings, adhesives, etc. **5** e) Delivery of services: Fires can affect critical services such as electrical energy. **3** f) Environment: No significant impact except in occasions where vapors and chemicals are released or burned. **3** g) Economic and financial: Localized impacts. However, if a large business or industry burns, the economic impact could be more substantial and could affect a company with operations all over the nation and world. **4** h) Regulatory and contractual obligations: No significant impact known. **1**	4

	i) Reputation: Structural fires are common; hence, little damage is expected, unless fire suppression is inadequate or the departments respond late. **3**	
Speed of Onset	While fires usually start with little or no warning time, alert devices can allow time for responders to contain the fire and allow occupants to evacuate the area.	9
Duration of Event	Structural fires will usually be immediate but the fire can burn for hours before it is totally extinguished.	6

Rural Union County: 34	City of Cromwell: 33	Creston Schools: 31
City of Afton: 33	City of Lorimor: 33	East Union Schools: 32
City of Arispe: 33	City of Shannon City: 33	Southwestern Community College: 31
City of Creston: 37	City of Thayer: 33	Greater Regional Medical Center: 31

4.4.16: Terrorism: Agro-Terrorism

Definition: An action causing intentional harm to an agricultural product or vandalism of an agricultural/animal related facility. Activities could include the following examples: animal rights activists who release lab animals; disgruntled employees who intentionally contaminate bulk milk tanks or poison animals; ecoterrorists who destroy crops/facilities; theft of agricultural products, machinery, or chemicals; or criminals who vandalize agricultural facilities.

Description:
This category covers a large variety of incidents from potential intentional introduction of disease; vandalism of facilities; theft of agricultural products, machinery, or chemicals; release of animals; and contamination of agricultural products. Depending upon the type of action taken, the implications will vary greatly.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 56: Agro-Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Agro-terrorism has occurred in Iowa. Over the past 10 years Iowa has experienced at least 10 incidents in which animal rights activists have vandalized or released animals in agricultural facilities. Additionally, vandalism to agricultural facilities or incidents of disgruntled employees causing damage to animals and animal products has occurred. There are frequent cases of theft of agricultural machinery, products, and chemicals. Angst among farmers or against confinement feeding operations has brought about incidents in recent years in rural southwest and south central Iowa related to poisoning of animal feed and the like. Some may call this "ecoterrorism." No major incidents have been reported in Union County. Some meth-making ammonia has been stolen in the county, however.	1
Probability	With growing environmental pressure to diminish the production of animals for food and the increasing number of hog confinements in the county, agro-terrorism is certainly possible. There are numerous animal facilities and animal and plant processing facilities in various towns and rural areas that could be targeted by those who disagree with the methods of agricultural production. Hog confinements have been particularly controversial in the county over the past ten years. Agro-terrorism could impact directly all jurisdictions except GRMC, which is thousands of feet from any agricultural assets.	Rural: 2 Others: 1
Vulnerability	Usually these incidents have a limited area of impact. They may involve one herd of animals, one facility, one field of crops, etc. In most cases, the human impact would be limited to a small proportion of the population, although people may change farming practices or food purchasing habits. Financial impact to farmers could be very notable in Union County. The planning team feels the risk is higher for agro-terrorism than most other types because of the existence of far more livestock than people in the county and the proximity of people to farms. Many residents can be downwind from attacked farms. Rural area residents are at the greatest risk directly and economically.	Rural: 4 Cities: 2 Others: 1
Maximum Extent	Usually these incidents have a limited area of impact. They may involve one herd of animals, one facility, one field of crops, etc. However, the economic and fear impacts could be very great in area.	2
Severity	a) Health and safety of persons in area: Health and safety of humans would not be impacted directly unless contaminants and poisons are transmitted to humans. **3** b) Health and safety of response personnel: Response personnel could be impacted, especially due to further attacks during the response and investigation process or if diseased animals are involved. **4** c) Continuity of operations: Likely minor, but farming operations may be hindered and agricultural personnel may be tied up in the investigation process. **3** d) Property, facilities, and infrastructure: Likely minimal, but farm buildings can be bombed	4

	or burned. **4** e) Delivery of services: Limited impact on most critical services. **2** f) Environment: Could be significant; for example, if a feedlot is bombed, untreated animal wastes could enter a stream or lake. **5** g) Economic and financial: Loss of crops and animals could greatly impact local economies and, in the most extreme events, world markets. **6** h) Regulatory and contractual obligations: Impacts to commodities contracts and regulations could be extensive. **4** i) Reputation: If the response is poor, the impact could be negative. **3**	
Speed of Onset	In most incidents we would have no warning time. The only exception would be if someone called in a threat.	9
Duration of Event	Agro-terrorism can take some time to identify after it occurs and it can be confused with a plant or animal disease incident, which may delay initiation of proper response.	7

Rural Union County: 29	City of Cromwell: 26	Creston Schools: 25
City of Afton: 26	City of Lorimor: 26	East Union Schools: 25
City of Arispe: 26	City of Shannon City: 26	Southwestern Community College: 25
City of Creston: 26	City of Thayer: 26	Greater Regional Medical Center: ---

4.4.17: Terrorism: Biological Terrorism

Definition: Use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Description:
Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point or line sources such as munitions, covert deposits and moving sprayers. Biological agents may pose viable threats from hours to years depending upon the agent and the conditions in which it exits. Depending on the agent used and the effectiveness with which it is deployed, contamination can be spread via wind and water. Infections can be spread via human or animal vectors. This is similar to agro-terrorism, except the target is a human agent in most cases.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 57: Biological Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Iowa has experienced many threats in the past. Most incidents have been limited to reported "suspect" powders, actual threats and hoaxes. Beginning in October 2001, Iowa has experienced a large number of responses for suspicious powders following the original "Amerithrax" scares. Following the development of a threat assessment/response protocol the number of responses was reduced, and now averages a few responses each month. No confirmed biological terrorism events have occurred in Union County.	1
Probability	Bioterrorism is likely to become a more significant problem in all parts of the world. While the US has significant counter-terrorism measures, the potential to spread powders and agents into the nation is high. Union County, having significant part of the land in agriculture and having biological agents at several small and mid-sized agricultural products processing facilities, is at a greater risk for terrorism events involving biological agents. Yet the planning team believes the probability is remove in any given year.	1
Vulnerability	Innocent people are often victims of terrorist activity targeted at certain organizations and activities. Based on the method of delivery, the general public is vulnerable to bioterrorism. State and local agencies developed the Biological Chemical Threat Agent (BCTA) Protocol Model to guide response agencies. The American public is not vaccinated for many of the agents used as weapons by Terrorist groups. Iowa vaccinated volunteers against smallpox at 15 hospitals in early 2003. The U.S. Postal Service installed Bio-Detection Systems (BDS) in 2005-2006 in several postal sorting facilities in Iowa, to address early detection since many of the threats have used the postal system for delivery. Yet, the types of events likely to occur in this area would impact only a small portion of the population. Concentrated population areas are most at risk.	Rural: 2 Cities: 3 Schools: 7 SWCC: 7 GRMC: 7
Maximum Extent	Innocent people are often victims of terrorist activity targeted at certain organizations and activities. Based on the method of delivery, the general public is vulnerable to bioterrorism. State and local agencies developed the Biological Chemical Threat Agent (BCTA) Protocol Model to guide response agencies. The American public is not vaccinated for many of the agents used as weapons by Terrorist groups. Iowa vaccinated volunteers against smallpox at 15 hospitals in early 2003. The U.S. Postal Service installed Bio-Detection Systems (BDS) in 2005-2006 in several postal sorting facilities in Iowa, to	Rural: 1 Cities: 2 Schools: 6 SWCC: 5 GRMC: 6

	address early detection since many of the threats have used the postal system for delivery. Yet, the types of events likely to occur in this area would impact only a small portion of the population.	
Severity	a) Health and safety of persons in area: The intent of the terrorist is to cause fear based on illness, injury, and death. A bioterrorism incident would likely result in illness at a minimum, with multiple deaths and long-term health problems possible. **8** b) Health and safety of response personnel: Responders may not initially be aware that they are responding to a biological incident and may not have the personal protective equipment necessary to protect them against the released agent. This could result in injuries, illness, and death among responders at a high rate. **8** c) Continuity of operations: Indirect impacts would be felt, but chain of command could limit the impact. **5** d) Property, facilities, and infrastructure: Limited direct impact to actual structures. **4** e) Delivery of services: Critical services could be affected such as health care. Capability of health care services to diagnose and treat a biological agent may be severely limited in rural areas. Most services would be impacted by being overwhelmed. **5** f) Environment: Biological agents could contaminate soil, air, and water resulting in loss of flora and fauna in the initial targeted area and eventually contaminated by transported biological agents. **5** g) Economic and financial: If the event is widespread and infects many people, the economic impact would be tremendous, from days lost at work, to business shut-downs, to loss of water and food supplies and transportation, to the loss of postal services, to the impacts of quarantining the population. **6** h) Regulatory and contractual obligations: Widespread changes in lifestyle in an area due to sickness, death, and panic would affect many contractual obligations related to business and service provision, etc. **4** i) Reputation: Would be based on the adequacy of the response. **3**	5
Speed of Onset	Acts of terrorism can be immediate and often come after little or no warning. There are occasions when terrorists have warned the targeted organization beforehand, but often the attack comes without previous threat. Terrorists threaten people and facilities through "bomb threats" and other scare tactics. Even if it is a trivial threat, precautions must be taken to ensure the safety of the people and property involved.	9
Duration of Event	Bio-terrorism can take some time to identify after it occurs and it can be confused with a human disease incident, which may delay initiation of proper response by hours or more.	7

Rural Union County: 26	City of Cromwell: 28	Creston Schools: 36
City of Afton: 28	City of Lorimor: 28	East Union Schools: 36
City of Arispe: 28	City of Shannon City: 28	Southwestern Community College: 35
City of Creston: 28	City of Thayer: 28	Greater Regional Medical Center: 36

4.4.18: Terrorism: Chemical Terrorism

Definition: Use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Description:
Liquid/aerosol, or dry contaminants can be dispersed using sprayers or other aerosol generators; liquids vaporizing from puddles/containers; or munitions. Other dispersal methods may include intentional releases from petro-chemical facilities or intentional releases during rail or truck transportation. Chemical agents may pose viable threats for hours to weeks depending on the agent and the conditions in which it exists. Contamination can be carried out of the initial target area by persons, vehicles, water and wind. Chemicals may be corrosive or otherwise damaging over time if not mitigated.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 58: Chemical Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Iowa has experienced very few chemical terrorism events, and all have been of minor impact. In 2005, an event involved chemicals through the postal service. Since then, there have been suspected contamination of water supplies on one occasion, and there were two incidents in Des Moines in 2007 and 2009. Locally and all over Iowa there has been many releases of anhydrous ammonia by persons engaged in clandestine drug manufacturing.	1
Probability	The probability many not change much over time, but chemicals continue to be produced, transported, and used in the county, both for manufacturing and for agriculture.	1

	Methamphetamine production continues in homes, barns, vehicles, and other locations where the public can be impacted. There is not extensive monitoring of chemical traffic.	
Vulnerability	Chemical agents may pose viable threats for hours to weeks depending on the agent and the conditions in which it exists. Shielding in the form of sheltering in place can protect people and property from harmful effects. There are a limited number of antidotes available to reduce the vulnerability from chemical agents. The planning team indicates that water supplies in the area are very vulnerable to chemical attacks because surface drinking water is easy to contaminate.	Rural: 3 Cities: 4 Others: 5
Maximum Extent	Contamination can be carried out of the initial target area by persons, vehicles, water and wind. The micro-meteorological effects of buildings and terrain can alter travel and duration of agents. The extent is largely determined by the type of chemical, the method of dispersal, and the conditions at the time it is released.	Rural: 3 Cities: 4 Others: 5
Severity	a) Health and safety of persons in area: Because the public may be the target of the attack, the terrorists will try to maximize injuries, illnesses, and deaths among the population. Chemicals can spread rapidly and impact dozens or hundreds. **8** b) Health and safety of response personnel: A highly trained and properly equipped response force would be well protected from harm from a chemical terrorism event. Recognizing the hazardous environment is not always possible in the early stages of the response. Responders may become victims if they do not recognize the hazardous environment. **8** c) Continuity of operations: Evacuations would shut down most operations until an alternative operations site could be set up outside the effected area. This may take days to weeks and may be a degraded operation due to assets that are unable to be duplicated. **6** d) Property, facilities, and infrastructure: A highly persistent chemical would not destroy property, facilities, or infrastructure, but would render the facility useless until the facility was decontaminated. **4** e) Delivery of services: Services will be compromised in the affected area. Services outside the affected area will also be compromised because assets will be called to respond and become contaminated. **6** f) Environment: Depending upon the chemicals used, soil, air, and water could be affected. Dilution, disbursement, and natural factors may lessen the impact over time depending upon the chemical's persistence. **5** g) Economic and financial: Economic impacts would vary depending upon the persistence of the chemical used and the time required for decontamination. However, industries and businesses could suffer for days or months if employees are sick or production cannot resume due to contamination. **6** h) Regulatory and contractual obligations: No significant impacts known at this time. **1** i) Reputation: Timely and adequate response will minimize damage to the jurisdiction's reputation. Given today's environment, even a small chemical terrorism incident will receive national media attention. **3**	5
Speed of Onset	Acts of terrorism can be immediate and often come after little or no warning. There are occasions where terrorists have warned the targeted organization beforehand, but often the attack comes without previous threat. Even if it is a shallow threat, precautions must be taken to ensure the safety of the people and property involved.	9
Duration of Event	Chemical terrorism can take some time to identify after it occurs and it can be confused with a HAZMAT incident, which may greatly delay initiation of proper response.	7

Rural Union County: 29	City of Cromwell: 31	Creston Schools: 33
City of Afton: 31	City of Lorimor: 31	East Union Schools: 33
City of Arispe: 31	City of Shannon City: 31	Southwestern Community College: 33
City of Creston: 31	City of Thayer: 31	Greater Regional Medical Center: 33

4.4.19: Terrorism: Conventional Terrorism

Definition: Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.

Description:
Detonation of explosive device on or near target; delivery via person, vehicle, or projectile. Hazard effects are instantaneous; additional secondary devices may be used, lengthening the duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences, incremental structural failures, etc. Conventional terrorism can also include tactical assault or sniping from remote locations.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 59: Conventional Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	The most common type of terrorism in Iowa is conventional terrorism. Annually, there are numerous threats and some actual acts of terrorism violence involving conventional weapons. Most of these have been small in nature, such as random pipe bombs in mailboxes, hostage taking by criminals, individual snipers, and the like. Most of these events have been in urban areas, such as Des Moines, but random events intended to bring about fear and intimidation have occurred in rural areas, and there have been bomb and other violence threats at Creston and East Union Schools since 1995.	Schools: 2 Others: 1
Probability	Unfortunately, there will never be a way to totally eliminate the many types and methods of conventional terrorism and threats of terrorism from local youth to international organizations. The increasingly volatile economy and increasingly political discord will likely increase risk over time. As perpetrators of terrorism improve their ability to collect information, raise money and issue rhetoric, implementation of effective counter measures becomes even more important. Middle and High Schools are likely to continue to see incidents, as well as key government buildings, especially as angst against government appears to increase.	Rural: 1 Creston: 2 Other cities: 1 Schools: 2 SWCC: 2 GRMC: 1
Vulnerability	Energy decreases logarithmically as a function of distance from seat of blast. Terrain, forestation, structures, etc. can provide shielding by absorbing or deflecting energy and debris. Exacerbating conditions include ease of access to target; lack of barriers/shielding; poor construction; and ease of concealment of device. The population is generally spread out and only a large blast would kill a large number of people in most areas of the county.	Rural: 3 Cities: 4 Others: 6
Maximum Extent	Extent of damage is determined by type and quantity of explosive. Effects are generally static other than cascading consequences, incremental structural failure, etc. A major explosion could affect a large part of the county and the cities in the county.	Rural: 3 Cities: 4 Others: 6
Severity	a) Health and safety of persons in area: As with an explosion or structural collapse, injuries and deaths are not uncommon especially in a terrorism incident where one of the intended acts is to harm people and property and to cause fear among the population. **8** b) Health and safety of response personnel: Secondary devices can be used to intentionally harm the responders assisting victims of the initial attack. Injuries and deaths could also result from unstable structures and fire. **8** c) Continuity of operations: Operations will be minimally affected unless the target is a critical facility such as government buildings, emergency operations centers, communication hubs, etc. However, if a blast is very large, the operations in an entire region could be crippled. **6** d) Property, facilities, and infrastructure: Property, facilities, and infrastructure can be severely impacted from a conventional terrorism incident. One of the intended results is damaged or destroyed property and infrastructure. **7** e) Delivery of services: Delivery of services will be moderately affected unless the target is a particular service. Other impacts could result from reallocation of resources to respond to the incident. **5** f) Environment: Minimal impact on the environment unless the damaged or destroyed property, facility, or infrastructure contained a hazardous material that was released. **4** g) Economic and financial: Threats and scares have psychological impacts and disrupt activities at a cost to productivity. Damaged facilities disrupt productivity, and many times have difficulty reopening and may eliminate jobs in the area. A major blast could permanently displace businesses and laborers. **7** h) Regulatory and contractual obligations: No significant impacts known. **2** i) Reputation: Reputation of the entity will depend on a quality response to the incident. **3**	6
Speed of Onset	Explosions are usually instantaneous; additional secondary devices may be used, lengthening the duration of the hazard until the attack site is determined to be clear.	9
Duration of Event	Conventional terrorism can usually be identified easily, but finding the perpetrator or stopping the attack may take hours or more.	7

Rural Union County: 28	City of Cromwell: 32	Creston Schools: 38
City of Afton: 32	City of Lorimor: 32	East Union Schools: 38
City of Arispe: 32	City of Shannon City: 32	Southwestern Community College: 38
City of Creston: 33	City of Thayer: 32	Greater Regional Medical Center: 37

4.4.20: Terrorism: Cyber Terrorism

Definition: Electronic attack using one computer system against another in order to intimidate people or disrupt other electronic systems and business activity.

Description:
Cyber terrorism may last from minutes to days depending upon the type of intrusion, disruption, or infection. Generally, there are no direct effects on the built environment, but secondary effects may be felt depending upon the system being terrorized. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 60: Cyber Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Cyber-security and critical infrastructure protection are among the most important national security issues facing our country today, and they will only become more challenging in the years to come. Recent attacks on Iowa's infrastructure components have taught us that security has been a relatively low priority in the development of computer software and Internet systems. These attacks not only have disrupted electronic commerce, but also have had a debilitating effect on public confidence in the Internet. While no widespread events have occurred that have affected large numbers of people in Union County (isolated hacking and ID theft have been reported), an attack from anywhere can impact the county easily. Afton Police Department computer system was attacked in 2010/11, but the nature or cause has not been determined.	1
Probability	Security experts describe the threat as eminent. The planning team states that the risk "grows daily." Intrusion detection systems log thousands of attempts in a single month. There are constant probes by individuals and groups with intent to cause anything from total system shutdown to simply "seeing if they can do it." It is somewhat likely an event impacting parts of the county will occur in the next five to ten years, but losses would be limited to only a few systems, possibly E911. More and more local jurisdictions are updating software and programs to help combat terrorism and related events using computers and the Internet. Some rural areas are not yet even wired so they face less direct impacts.	3
Vulnerability	Security professionals argue that current approaches are inadequate. With companies increasingly using the Internet to connect to suppliers and customers, they say organizations place too much faith in technology to protect their data, and do not pay enough attention to security education and awareness. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks. Depending on the intensity of attack on local systems, hundreds of individuals, students, and businesses can be subject to negative impacts.	4
Maximum Extent	Our society is highly networked and interconnected. An attack could be launched from anywhere on Earth and could impact an area as small as a computer lab to as large as the World Wide Web. It is very difficult to define the impact boundary, but many areas and users in various parts of any jurisdiction can be impacted.	5
Severity	a) Health and safety of persons in area: No direct loss of life. Indirect injuries or deaths may result from secondary impacts to critical life sustaining sectors such as energy, water, etc. **2** b) Health and safety of response personnel: None directly. **1** c) Continuity of operations: Severe impacts to continuity of operations could result if cyber attack reached critical operational systems or systems that were needed to carry out the operation. **6** d) Property, facilities, and infrastructure: Generally, there are no direct effects on the built environment. **2** e) Delivery of services: Impacts can range from annoyance to complete shutdown of critical infrastructures due to infiltration of supervisory control and data acquisition (SCADA) systems. Secondary impacts could affect welfare of people and property by denying service or providing false readings. **7** f) Environment: Only impacts would result if system was infiltrated and directed to malfunction by self destructing, overloading, etc. **2** g) Economic and financial: Because of the heavy reliance on the electronic transfer of economic and commercial information, the economy could be impacted because of communication difficulties. **6** h) Regulatory and contractual obligations: No significant impacts other than the possible elimination of electronic records of regulatory and contractual obligations. **3** i) Reputation: If exposed vulnerabilities were known and not reduced or eliminated before the attack, the entity would suffer major damage to their reputation for not taking action before the incident. **3**	4
Speed of Onset	Because of the networks (formal and informal) that exist to share intrusion attempts and impacts, warnings can be put out in advance to alert those in similar situations to take protective security recommendations such as updating virus detection software, making sure security patches are in place, etc. Warning times can range from no warning to days. Because of our highly evolved computer networks and data sharing, bugs, viruses, and worms can proliferate rapidly. Effects can be instantaneous.	9

Duration of Event	Cyber terrorism is difficult to identify and finding the perpetrator or stopping the attack may take hours or more, even with modern anti-virus software.	6

Rural Union County: 32	City of Cromwell: 32	Creston Schools: 32
City of Afton: 32	City of Lorimor: 32	East Union Schools: 32
City of Arispe: 32	City of Shannon City: 32	Southwestern Community College: 32
City of Creston: 32	City of Thayer: 32	Greater Regional Medical Center: 32

4.4.21: Terrorism: Radiological Terrorism

Definition: The use of radiological materials against a person or persons in order to bestow fear upon a larger group of people with the ultimate goal of creating coercion to achieve a specific political or religious agenda. It is the strategic use of intimidation, threats, and pressure in order to cause disruption to an opposing system, and align that system with that of a specific group or organization.

Description:
Radioactive materials can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers.

Useful information and mitigation ideas for terrorism incidents can be found at www.ready.gov.

Table 4 – 61: Terrorism: Radiological Terrorism Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Iowa has not received any radiological terrorism events or threats.	1
Probability	With no prior events by which to judge probability, it becomes necessary to consider the technical feasibility of radiological terrorism. The committee believes the threat is low because it is difficult in uncontrolled conditions to assemble the components. Union County is not a logical location to detonate a weapon that is so difficult to build. A bomb that is being transported could detonate accidentally, but that likelihood is very low.	1
Vulnerability	Duration of exposure, distance from the source of radiation, and the amount of shielding between source and target determine exposure to radiation. There are no target radiological facilities in the Union County immediate area.	Rural: 3 Cities: 4 Others: 6
Maximum Extent	Initial effects will be localized to site of attack; depending on meteorological conditions, subsequent behavior of radioactive contaminants may be dynamic.	Rural: 2 Cities: 3 Others: 5
Severity	Given the technical infeasibility of radiological terrorism, the severity of an incident would primarily be isolated to the detonation of explosive materials; however the discovery of slightly elevated radiation levels would incite public hysteria. a) Health and safety of persons in area: The potential for mass casualties is great if the event were to take place in the right location. However, in order for this event to take place with its full magnitude, a number of factors must be addressed: a) the amount of material that was used to make the device; b) the type of material that was used; c) the construction of the device; d) the site of detonation, and populous in the detonation area; e) the wind direction. A nuclear blast is divided into three areas that are measured by the radius from the blast center. People would be killed in a large area around a blast. **7** b) Health and safety of response personnel: In a detonation, there could be a significant risk to the health and safety of personnel that would respond to the site. Again, it is completely dependent upon the magnitude of the explosion, and the infrastructure in the area. Soil and rubble may be unstable and unsafe to operate in. Precautions must be made prior to deploying emergency services. Careful consideration to safety in the removing of hazardous rubble as to not further harm the victims as well as the responders should be a priority. Radiation detection and protection equipment must be available and utilized in the event of such an attack. These measures greatly reduce the risk of health and safety of responders. **7** c) Continuity of operations: Dependent upon many factors, especially location of detonation compared to the critical operations. There could be a great impact on operations due to the lack of resources to handle the situation. The continuity of operations will depend upon the capabilities of all responders. The blast may also disrupt communication lines and some equipment. **5** d) Property, facilities, and infrastructure: The extent of destruction to property and infrastructure is dependent on the size and the location of the blast itself. **5** e) Delivery of services: Delivery services from within the blast area will be rendered incapable. All delivery services outside the blast ring will be affected by the range and capabilities of their own services. Radiation may also disrupt some equipment. **5** f) Environment: A nuclear blast would dispense radioactive contamination into the	5

	environment, harming many organisms. **6** g) Economic and financial: Disruption of business because of potential evacuations and damage to buildings and inventory itself. Prolonged after-effects could severely hinder a local or regional economy for many years to come. **5** h) Regulatory and contractual obligations: No known impacts. **1** i) Reputation: Reputation of the entity can be very damaging because of the high profile of these events. The negative impact can be felt for decades following a contamination. **6**	
Speed of Onset	Acts of terrorism can be immediate and often come after little or no warning. There are occasions where terrorists have warned the targeted organization beforehand, but often the attack comes without previous threat. Even if it is a trivial threat, precautions must be taken to ensure the safety of the people and property involved. With radiation, the initial release may not be identified for a period of time until symptoms become apparent.	9
Duration of Event	Radiological terrorism might be identified easily, but finding the perpetrator or stopping the attack may take hours or more. Radioactive materials may remain concentrated for hours to days, rendering the site inaccessible.	8

Rural Union County: 29	City of Cromwell: 31	Creston Schools: 35
City of Afton: 31	City of Lorimor: 31	East Union Schools: 35
City of Arispe: 31	City of Shannon City: 31	Southwestern Community College: 35
City of Creston: 31	City of Thayer: 31	Greater Regional Medical Center: 35

4.4.22: Transportation Hazardous Materials Incident

Definition: An accidental release of chemical substances or mixtures that present a danger to public health or safety as a result of transportation.

Description:

A hazardous substance is one that may cause damage to persons, property, or the environment when released. 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. 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.

Under the Emergency Planning and Right to Know Act of 1986, the US Department of Transportation (USDOT) identified as hazardous 308 specific chemicals from 20 chemical categories. DOT classifies HAZMAT in the following categories:

- Explosive
- Blasting agent
- Flammable liquid
- Flammable solid
- Oxidizer
- Organic peroxide
- Corrosive material
- Compressed gas
- Flammable compressed gas
- Poison (A and B)
- Irritating materials
- Inhalation hazard
- Etiological agent
- Radioactive materials
- Other regulated material

The 1986 Act requires that companies report releases of designated hazardous chemicals to USEPA, even if releases do not result in human exposure.

Natural hazards may cause transportation HAZMAT events. Heavy rainfall during thunderstorms can cause slippery road conditions resulting in highway carrier accidents. Flood, lightning, fires, and severe winter storms cause pipelines to fail. Snow ice, and high-wind conditions during severe winter storms cause traffic accidents. High velocities and volumes of floodwaters wash out bridges and roads.

Highway and rail transportation facts:

- Transportation on highways involves tanker trucks or trailers and specialized bulk-cargo vehicles.
- Average trip lengths are 28 miles for gasoline trucks and 260 miles for chemical trucks.
- Train collisions and derailments result in large spills or discharges.
- Releases from leaks in fittings, seals, or relief valves, and improper closures or defective equipment account for 70% of the nearly 1,000 railroad-related events each year nationally.

Air transportation facts:

- Limited to small packages
- 1986 figures: 200,000 to 300,000 tons
- Few events occur each year; usually due to violations of regulations

To identify the extent of the hazard in a particular community, planning personnel and others must determine what types of HAZMAT are stored, handled, processed, or transported and where and how those functions are performed.

See the "Fixed Hazardous Materials Incident" profile to see data on fixed and transportation incidents in Union County in recent years and to see more general details about this hazard. Many of the reported incidents are directly related to transportation, most by auto and truck. A good resource on hazardous materials safety is the USDOT site, http://hazmat.dot.gov.

Table 4 – 62: Transportation Hazardous Materials Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	According to the IDNR, from 2000 through May 2010, there have been 2,440 transportation in Iowa incidents involving highways and roads. This is nearly 30% of all hazardous materials incidents. Most of them are minor and involve individual vehicles with common chemicals and materials, like anhydrous and manure. Some have been more significant, involving fires and causing the temporary closure of roads for hours at a time. Analysis of IDNR data (Table 4 – 45) indicates that four events since 2007 were transportation-related and 20 events were outdoor events in fields and other areas that function like a transportation incident. It is estimated, by the planning team, that there are 5 transportation HAZMAT events per year in the county, almost all in rural areas. There have been no widespread evacuations as a result of incidents to date. Memorable events include a railroad spill in 2010. Afton reports a minor event in the city in 2010.	Rural: 7 Afton: 2 Creston: 3 Others: 1
Probability	With hundreds of miles of highways and rural roads, Union County and all of the participating jurisdictions in the county could be subject to transportation HAZMAT incidents. The probability varies by jurisdiction; however, the risk is low in all jurisdictions of a significant event requiring extended road closures, large fires, evacuations, and/or full mobilization of outside response capabilities. Local manufacturers transport materials from factories daily via semi-trailers and sometimes trains. Weather events can increase the chance of an incident. Planning team members feel the greatest risks are found along the railroad and Highway 34. Shannon City, due to its location away from major routes, is not at sufficient risk of an incident.	Rural: 6 Others: 1
Vulnerability	A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors and 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. Using a 1,000-foot buffer, areas that are at risk are mostly populated or heavily traveled. Some jurisdictions are greatly impacted; others will only see a small part of the population at risk.	Rural: 2 Afton: 4 Creston: 5 Other cities: 2 Others: 2
Maximum Extent	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 and the volume of the hazardous material, the affected area can be as small as the vehicle involved or as large as 5 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. However, a buffer of 1,000 feet is used. Buildings and assets near the traveled routes would be impacted, even if people can be evacuated or taken indoors.	Rural: 2 Cities: 4 Others: 5
Severity	Union County currently does not participate in a regional team and few local personnel are trained and certified to perform all functions on HAZMAT response and cleanup. a) Health and safety of persons in area: Immediate dangers from hazardous materials include fires and explosions. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Some chemicals cause painful and damaging burns if they come in direct contact with skin. **5** b) Health and safety of response personnel: Since personnel handle the materials, there is even greater concern over the protection for personnel. Without local certified HAZMAT teams meeting all standards, local officials may make mistakes when dealing with rescue	5

	events that require immediate attention. **6** c) Continuity of operations: The occurrence of a HAZMAT incident many times shuts down transportation corridors for hours at a time while the scene is stabilized, the product is off-loaded, and reloaded on a replacement container. **6** d) Property, facilities, and infrastructure: Damage may be limited to the cargo liner, and cargo involved, but it could also include highway, railroad, or street infrastructure, and adjacent properties. **4** e) Delivery of services: Contaminated water resources may be unsafe and unusable, depending on the amount of contaminant. **4** f) Environment: Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops in the form of debilitation, disease, or birth defects over a long period of time. **5** g) Economic and financial: Loss of the cargo, infrastructure damage, vehicle damage, transportation delays, and evacuations may lead to economic hardships within the community and the region and high costs for emergency services and medical care. **5** h) Regulatory and contractual obligations: Transportation of hazardous materials is regulated by the DOT. However, if a release of hazardous materials were to take place, then the DNR becomes the regulatory and managing agency. **3** i) Reputation: Although citizens are aware of the shipping industry, they may not be as aware of the dangers that some cargo may pose. Most are not aware of the significant risk that hazardous materials pose to the community. Education, public information, and a timely and effective response will determine the impact to the jurisdiction's reputation. **3**	
Speed of Onset	Hazardous materials 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 to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Radio are used to disseminate emergency messages about hazardous materials incidents.	9
Duration of Event	Transportation hazardous materials events may take several hours to clean up or even contain, depending on the size of release, weather conditions in the area, and type of chemical or substance. The process of evacuations can delay containment. This score is particularly high where traffic hinders access and cleanup activities along Highway 34 and the BNSF Railroad.	7

Rural Union County: 38	City of Cromwell: 29	Creston Schools: 30
City of Afton: 32	City of Lorimor: 29	East Union Schools: 30
City of Arispe: 29	City of Shannon City: ---	Southwestern Community College: 30
City of Creston: 43	City of Thayer: 29	Greater Regional Medical Center: 30

4.4.23: Transportation Radiological Incident

Definition: An incident resulting in a release of radioactive material during transportation.

Description:
Transportation of radioactive materials through Iowa over the interstate highway and rail systems is considered a radiological hazard. The federal government regulates all means of transportation of radioactive material.

Table 4 – 63: Transportation Radiological Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	Since 1990, hundreds of shipments have been made through Iowa. There have been no occurrences of radiological incidents in Iowa. Generally, small or minor shipments will go through the community in support of hospitals and other small quantity users. However, most will use Interstate 80, which is 30 miles north of the county, including many shipments per year. Highways 34 and 169 are routes for spent fuels, but other highways rarely, if other, transport substances through the county. Other major roads near GRMC may have small and rare shipments. The BNSF railroad might have shipments, but data is not confirmed. The events that have occurred in other states have been limited; there have been no known serious radiation exposures resulting from a transportation incident because the nature of the materials being transported and the use of protective packaging is commensurate with the potential hazard of the radioactive materials contained.	1
Probability	Operators of facilities that use radioactive materials and transporters of radioactive waste are trained in the packaging, handling, and shipment of the radioactive waste; and, since they are closely regulated by a variety of federal, state, and local organizations, the likelihood of an incident is remote. When these materials are moved across Iowa highways, Iowa officials are notified and appropriate escorts are provided. The planning team, in light of the tight regulations on transport and the amount of fuels transported, put the annual risk of an incident	1

	requiring outside intervention is at less than 1%. Incidents cannot impact Shannon City and Creston Schools.	
Vulnerability	The danger to the public is less than a wide array of other hazardous materials. Those working with or near sources of radiation are at a greater risk than the general citizens of the community. Those responding to a radiological incident should be trained in recognizing a radiological incident and minimizing exposure to radioactive materials. The amounts shipped in the county are likely very low and would not cause significant loss. The impact would be a few blocks at best (1,000 feet from the transportation route). Handling of materials at GRMC during unloading may present the highest risk. East Union Schools and Thayer could be impacted by events outside of the jurisdictions but within a buffer zone of airborne contamination.	GRMC: 4 Creston: 2 Others: 1
Maximum Extent	Other than a transportation incident involving large amounts of high-level radioactive materials, radiation exposure will be limited to very localized areas. Only a small part of any jurisdiction will be impacted in the type of event that can occur in Union County.	GRMC: 4 Others: 1
Severity	a) Health and safety of persons in area: 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. **5** b) Health and safety of response personnel: Despite the frequency of shipments, there have been no known serious nuclear radiation exposures resulting from transportation accidents. **5** c) Continuity of operations: None directly. **1** d) Property, facilities, and infrastructure: If an explosion occurs or radiation is thorough, property damage could be very severe up to half-mile of the site. **4** e) Delivery of services: Disruption in evacuated areas. **3** f) Environment: Long lasting impacts on the environment from radiological fallout could include soil, air, and water contamination. **6** g) Economic and financial: Disruption of business due to potential evacuations. **5** h) Regulatory and contractual obligations: Indemnification would be a vital issue to address, because of the ownership of the facility by the private sector. Courts would address damages. **4** i) Reputation: Reputation of the entity can be very damaging due to the high profile of these events. The negative impact could be felt for decades following a contamination. **4**	4
Speed of Onset	A radiological incident in Iowa could result from an incident in handling or transporting radioactive materials. This accident could occur with little or no warning. Ionizing radiation cannot be detected with human senses. Detection instruments are needed. Distance from the incident would dictate the amount of time needed to avoid exposure from damaging radiation.	9
Duration of Event	Transportation radiological materials events may take several hours to clean up or even contain, depending on the size of release, weather conditions in the area, and explosion risk. The process of evacuations can delay containment, as well as traffic rerouting.	7

Rural Union County: 24	City of Cromwell: 24	Creston Schools: ---
City of Afton: 24	City of Lorimor: 24	East Union Schools: 24
City of Arispe: 24	City of Shannon City: ---	Southwestern Community College: 24
City of Creston: 25	City of Thayer: 24	Greater Regional Medical Center: 30

4.4.24: Waterway/Water Body Incident

Definition: An accident involving any vessel that threatens life or which adversely impacts a community's capability to provide emergency services. An incident such as a drowning that results in large-scale rescue or search efforts involving extensive capabilities.

Description:
Waterway incidents will primarily involve pleasure craft on area rivers and lakes. In the event of an incident involving a water vessel, the greatest threats would be drowning, fuel spillage, and property damage. Water rescue events would largely be handled by first responding agencies. Waterway incidents may also include events in which persons fell through the ice on partially frozen water bodies.

Table 4 – 64: Waterway/Water Body Incident Ranking Assessment

Evaluation Criteria	Description	Score
Historical Occurrence	There have been few significant waterway incidents in Iowa. There have been numerous search and rescue events involving a single person or small boats with only a few people on board. Small-scale incidents on the state's lakes and rivers have resulted in loss of life from pleasure craft collisions and falls from vessels. Anglers have also fallen through the ice during Iowa winters. Several Union County lakes are very popular for angling, pleasure boating, and swimming. Limited data about past incidents is available; but incidents have occurred, all in	Rural: 2 Creston: 1

	rural area. (this analysis does not include pool drowning incidents, such as have occurred at the local YMCA in Creston).	
Probability	No local rivers are navigable. However, several lakes are used for recreation, including angling, boating, and swimming. Grand River is large enough to support non-motorized pleasure boats only. The number of users of Iowa lakes and rivers is increasing. Minor incidents involving one or two boats and/or individuals can occur that tie up response resources and cause death and injury are possible but unlikely in a given year. Incidents will be recreational-related, as opposed to transportation-related, because the waterways are too small to support barges. In the rural area and in Creston an incident could occur. Work to improve lakes throughout the county and in Creston will result in more users and deeper water.	Rural: 3 Creston: 1
Vulnerability	Operators and passengers of pleasure craft are vulnerable to a waterway incident. The environment is vulnerable to contents and fuels that come from boats and vehicles/equipment on the top of winter ice; however, only a very small percentage of the population is at risk of a single incident. Vulnerability may be reduced by the improved water rescue training and equipment capabilities of local first response departments. Signage and law enforcement are also important mitigation measures.	2
Maximum Extent	The maximum extent of a waterway incident would be limited. Impacts would not extend beyond the immediate incident scene. The only exception would include a search and rescue event that could expand downstream. In the case of a hazardous material being released to the waterway, the impact could expand considerably but still would be a very small part of any jurisdiction.	1
Severity	a) Health and safety of persons in area: Impacts would be limited to personal injuries and possibly death of the persons directly involved. Deaths occur annually in Iowa due to boat, swimming, and ice incidents. **8** b) Health and safety of response personnel: Small fuel spills could result from damaged watercraft. During cold weather or storms, personnel engaged in a rescue attempt are at even greater risk. **6** c) Continuity of operations: Minor disruption to operations may occur due to the possibility of conflicting operations in the area. Site may be restricted until the rescue, salvage or possible cleanup/decontamination operations have been completed. For example salvage operations may not be able to get underway until a successful testing and decontaminating operation is completed. **6** d) Property, facilities, and infrastructure: Property damage would be restricted to the craft involved in almost all cases. **2** e) Delivery of services: Search and rescue efforts could tie up considerable first response and medical resources. **5** f) Environment: Environmental damage could impact aquatic flora and fauna, as well as water quality, if hazardous materials are released from vessels. **5** g) Economic and financial: Varies. If major contamination results or a lake were closed for recreation, the costs of clean-up and lost tourism spending could be considerable. **5** h) Regulatory and contractual obligations: The Army Corps of Engineers is responsible for the upkeep on the state's waterways, as well as accurately recording and mapping topographical data. They then must locate and designate dangerous areas in the water and mark them accordingly. The DNR monitors watercraft regulations and polices the state's waterways. Union County Conservation also has a role in this process. **3** i) Reputation: An incident/accident may only affect the watercraft operator's reputation directly. If rescue operations and official actions by appropriate agencies were slow or ineffective, the reputation of the jurisdiction and water body would be impacted. **3**	5
Speed of Onset	Incidents would occur with little or no warning. Leading causes of waterway incidents are inclement weather and operator error. Weather forecasts offer some warning, but driver error incidents can occur with little or no warning. Ice and drowning incidents are often caused by overestimating one's abilities and/or the stability of the ice.	9
Duration of Event	Like highway and rail transportation incidents, waterway or water body incidents are likely to take only a few minutes to no more than one hour before containment, except in extreme conditions, such as rapidly flowing water. Access to the site issues may extend the duration by hours or up to one day.	5

Rural Union County: 27	City of Cromwell: ---	Creston Schools: ---
City of Afton: ---	City of Lorimor: ---	East Union Schools: ---
City of Arispe: ---	City of Shannon City: ---	Southwestern Community College: ---
City of Creston: 24	City of Thayer: ---	Greater Regional Medical Center: ---

4.5: Summary and Profile Score Information

In summary, the planning team along with input from the planning consultant, officials in each jurisdiction, and third party research, has scored for each hazard in each jurisdiction. The scores on the following page reflect the potential impact of each hazard on each community.

Table 4 – 65: Summary Profile Scores for Hazards That Can Impact Union County

Hazard	Rural County	City of Afton	City of Arispe	City of Creston	City of Cromwell	City of Lorimor	City of Shannon City	City of Thayer	Creston CSD	East Union CSD	SWCC	GRMC
Dam Failure	29	--	--	29	--	--	--	--	--	--	--	--
Drought	39	35	35	35	35	35	35	35	35	35	35	35
Earthquake	26	24	24	24	24	24	24	24	24	24	24	24
Expansive soils	29	23	19	26	19	19	19	19	21	20	26	17
Extreme heat	43	43	43	43	43	43	43	43	40	40	42	43
Flash flood	38	33	29	39	29	29	29	29	31	31	38	34
Grass and wildland fire	37	26	25	25	25	25	25	25	26	26	25	--
Hailstorm	39	35	32	38	33	33	32	32	31	31	31	28
Landslide	19	--	--	--	--	--	--	--	--	--	--	--
River flood	34	--	--	29	24	--	26	--	29	--	--	--
Severe winter storm	48	48	48	48	48	48	48	48	46	46	46	46
Sink Hole	18	18	18	18	18	18	18	18	18	18	18	18
Thunderstorm/lightning	46	46	46	46	46	46	46	46	42	42	44	42
Tornado	40	37	35	39	35	35	35	35	37	36	36	37
Windstorm	48	48	48	48	48	48	48	48	45	45	45	45
Air transportation incident	25	24	24	25	24	24	24	24	26	26	26	26
Animal/crop/plant disease	29	24	24	24	24	24	24	24	24	24	24	24
Communications failure	37	33	33	34	33	32	32	32	31	31	32	32
Enemy attack	29	29	29	29	29	29	29	29	29	29	29	29
Energy failure	51	46	46	46	49	45	46	46	41	41	42	41
Fixed hazardous materials incident	30	31	--	43	--	--	--	--	33	33	31	34
Fixed radiological incident	--	--	--	22	--	--	--	--	--	--	--	25
Highway transportation incident	36	22	22	22	22	22	--	--	--	--	22	22
Human disease incident	26	26	26	26	26	26	26	26	32	32	30	30
Human disease pandemic	28	28	28	28	28	28	28	28	31	31	30	30
Pipeline transportation incident	26	34	--	36	--	34	--	--	33	33	33	34
Public disorder	22	26	25	26	25	25	25	25	32	32	32	30
Rail transportation incident	29	31	--	33	30	--	--	30	--	23	--	--
Structural failure	34	27	26	31	26	26	26	26	28	28	28	28
Structural fire	34	33	33	37	33	33	33	33	31	32	31	31
Terrorism – agro-terrorism	29	26	26	26	26	26	26	26	25	25	25	--
Terrorism – bioterrorism	26	28	28	28	28	28	28	28	36	36	35	36
Terrorism – chemical terrorism	29	31	31	31	31	31	31	31	33	33	33	33
Terrorism – conventional terrorism	28	32	32	33	32	32	32	32	38	38	38	37
Terrorism – cyber terrorism	32	32	32	32	32	32	32	32	32	32	32	32
Terrorism – radiological terrorism	29	31	31	31	31	31	31	31	35	35	35	35
Trans. hazardous materials incident	38	32	29	43	29	29	--	29	30	30	30	30
Trans. radiological incident	24	24	24	25	24	24	--	24	--	24	24	30
Waterway/water body incident	27	--	--	24	--	--	--	--	--	--	--	--

--- Incident does not occur or has no affect on jurisdiction.

Several notes are made on the above table. First, the above information is provided to show the individual event rankings in the county by jurisdiction. However, events rarely occur singly, and can often result in triggered events. This rating system alone does not give a full picture of risk. Second, the rankings do not consider the direct effect on property (see next two chapters). Third, for the various jurisdictions in the county, scores are somewhat based on "feelings" about the hazards, especially when local data is absent. Smaller cities tend to have greater relative risk from natural hazards and lower risk from man-made hazards. This is simply because the smaller cities do not have all the services and facilities that pose a risk for certain man-made hazards, such as fixed HAZMAT sites or radiological sites. Therefore, while not perfect, the system paints a picture of relative risk.

4.6: Hazard Rankings by Jurisdiction and Composite Risk Assessment

However, we believe we can use the data in the hazard profile to provide a ranking of hazard risks for each jurisdiction. This risk assessment will help to determine which hazards by jurisdiction will be further analyzed in terms of assets at risk and loss estimation.

The HARA is a prioritization tool. It provides enough data about the hazards themselves, the impacts they have on the community, and potential losses per year due to each type of hazard. Using these criteria, the HARA is a helpful tool to break down hazards into three priorities for mitigation. Priority I includes hazards that have unacceptable risk that should be addressed with sustained new mitigation actions. Priority II includes hazards that have risk that should be minimized through continued and improved mitigation measures. Priority III includes hazards that have acceptable risk. Generally current mitigation measures will be sufficient to mitigate these hazards and/or their effects. There is no ranking in each group; hazards are treated equally within each. The following data shows the relative rating by hazard type. This data is provided by jurisdiction individually.

Figure 4 – 8: Risk Acceptance Chart

Table 4 – 66: Hazard Ranking for Rural Union County

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Energy failure	51	1
	Severe winter storm	48	T 2
	Windstorm	48	T 2
	Thunderstorm/lightning	46	4
	Extreme heat	43	5
	Tornado	40	6
	Drought	39	T 7
	Hailstorm	39	T 7
	Flash flood	38	T 9
	Transportation hazardous materials incident	38	T 9
	Grass and wildland fire	37	T 11
	Communications failure	37	T 11
Priority Group II	Highway transportation incident	36	13
	River flood	34	T 14
	Structural failure	34	T 14
	Structural fire	34	T 14
	Cyber terrorism	32	17
	Fixed hazardous materials incident	30	18
	Dam failure	29	T 19
	Expansive soils	29	T 19
	Animal/crop/plant disease	29	T 19
	Enemy attack	29	T 19
	Rail transportation incident	29	T 19
	Agro-terrorism	29	T 19
	Chemical terrorism	29	T 19
	Radiological terrorism	29	T 19
Priority Group III	Human disease pandemic	28	T 27
	Conventional terrorism	28	T 27
	Waterway/water body incident	27	29
	Earthquake	26	T 30
	Human disease incident	26	T 30
	Bioterrorism	26	T 30
	Pipeline transportation incident	26	T 30
	Air transportation incident	25	34
	Transportation radiological incident	24	35
	Public disorder	22	36

	Landslide	19	37
	Sink hole	18	38

Table 4 – 67: Hazard Ranking for City of Afton

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1
	Windstorm	48	T 1
	Thunderstorm/lightning	46	T 3
	Energy failure	46	T 3
	Extreme heat	43	5
	Tornado	37	6
	Drought	35	T 7
	Hailstorm	35	T 7
	Pipeline transportation incident	34	9
	Flash flood	33	T 10
	Communications failure	33	T 10
	Structural fire	33	T 10
Priority Group II	Cyber terrorism	32	T 13
	Conventional terrorism	32	T 13
	Transportation hazardous materials incident	32	T 13
	Fixed hazardous materials incident	31	T 16
	Rail transportation incident	31	T 16
	Chemical terrorism	31	T 16
	Radiological terrorism	31	T 16
	Enemy attack	29	20
	Human disease pandemic	28	T 21
	Bioterrorism	28	T 21
	Structural failure	27	23
	Human disease incident	26	T 24
Priority Group III	Grass and wildland fire	26	T 24
	Public disorder	26	T 24
	Agro-terrorism	26	T 24
	Earthquake	24	T 28
	Air transportation incident	24	T 28
	Animal/crop/plant disease	24	T 28
	Transportation radiological incident	24	T 28
	Expansive soils	23	32
	Highway transportation incident	22	33
	Sink hole	18	34

Table 4 – 68: Hazard Ranking for City of Arispe

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1
	Windstorm	48	T 1
	Thunderstorm/lightning	46	T 3
	Energy failure	46	T 3
	Extreme heat	43	5
	Tornado	35	T 6
	Drought	35	T 6
	Communications failure	33	T 8
	Structural fire	33	T 8
	Hailstorm	32	T 10
Priority Group II	Conventional terrorism	32	T 10
	Cyber terrorism	32	T 10
	Chemical terrorism	31	T 13
	Radiological terrorism	31	T 13
	Flash flood	29	T 15
	Enemy attack	29	T 15
	Transportation hazardous materials incident	29	T 15
	Human disease pandemic	28	T 18
	Bioterrorism	28	T 18
	Human disease incident	26	T 20
	Structural failure	26	T 20

	Agro-terrorism	26	T 20
Priority Group III	Grass and wildland fire	25	T 23
	Public disorder	25	T 23
	Earthquake	24	T 25
	Air transportation incident	24	T 25
	Animal/crop/plant disease	24	T 25
	Transportation radiological incident	24	T 25
	Highway transportation incident	22	29
	Expansive soils	19	30
	Sink hole	18	31

Table 4 – 69: Hazard Ranking for Creston

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1
	Windstorm	48	T 1
	Thunderstorm/lightning	46	T 3
	Energy failure	46	T 3
	Extreme heat	43	T 5
	Fixed hazardous materials incident	43	T 5
	Transportation hazardous materials incident	43	T 5
	Flash flood	39	T 8
	Tornado	39	T 8
	Hailstorm	38	10
	Structural fire	37	11
	Pipeline transportation incident	36	12
Priority Group II	Drought	35	13
	Communications failure	34	14
	Rail transportation incident	33	T 15
	Conventional terrorism	33	T 15
	Cyber terrorism	32	17
	Structural failure	31	T 18
	Chemical terrorism	31	T 18
	Radiological terrorism	31	T 18
	Dam failure	29	T 21
	River flood	29	T 21
	Enemy attack	29	T 21
	Human disease pandemic	28	T 24
	Bioterrorism	28	T 24
	Human disease incident	26	T 26
	Expansive soils	26	T 26
Priority Group III	Public disorder	26	T 26
	Agro-terrorism	26	T 26
	Grass and wildland fire	25	T 30
	Air transportation incident	25	T 30
	Transportation radiological incident	25	T 30
	Earthquake	26	T 33
	Animal/crop/plant disease	26	T 33
	Waterway/water body incident	26	T 33
	Fixed radiological incident	22	T 36
	Highway transportation incident	22	T 36
	Sink hole	18	38

Table 4 – 70: Hazard Ranking for City of Cromwell

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Energy failure	49	1
	Severe winter storm	48	T 2
	Windstorm	48	T 2
	Thunderstorm/lightning	46	4
	Extreme heat	43	5
	Drought	35	T 6
	Tornado	35	T 6
	Hailstorm	33	T 8
	Communications failure	33	T 8

	Structural fire	33	T 8
Priority Group II	Conventional terrorism	32	T 11
	Cyber terrorism	32	T 11
	Chemical terrorism	31	T 13
	Radiological terrorism	31	T 13
	Rail transportation incident	30	15
	Flash flood	29	T 16
	Enemy attack	29	T 16
	Transportation hazardous materials incident	29	T 16
	Human disease pandemic	28	T 19
	Bioterrorism	28	T 19
	Human disease incident	26	T 21
	Structural failure	26	T 21
Priority Group III	Agro-terrorism	26	T 21
	Grass and wildland fire	25	T 24
	Public disorder	25	T 24
	Earthquake	24	T 26
	River flood	24	T 26
	Air transportation incident	24	T 26
	Animal/crop/plant disease	24	T 26
	Transportation radiological incident	24	T 26
	Highway transportation incident	22	31
	Expansive soils	19	32
	Sink hole	18	33

Table 4 – 71: Hazard Ranking for Lorimor

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1
	Windstorm	48	T 1
	Thunderstorm/lightning	46	3
	Energy failure	45	4
	Extreme heat	43	5
	Drought	35	T 6
	Tornado	35	T 6
	Pipeline transportation incident	34	8
	Hailstorm	33	T 9
	Structural fire	33	T 9
	Communications failure	32	11
Priority Group II	Conventional terrorism	32	T 12
	Cyber terrorism	32	T 12
	Chemical terrorism	31	T 14
	Radiological terrorism	31	T 14
	Flash flood	29	T 16
	Enemy attack	29	T 16
	Transportation hazardous materials incident	29	T 16
	Human disease pandemic	28	T 19
	Bioterrorism	28	T 19
	Human disease incident	26	T 21
	Structural failure	26	T 21
Priority Group III	Agro-terrorism	26	T 21
	Grass and wildland fire	25	T 24
	Public disorder	25	T 24
	Earthquake	24	T 27
	Air transportation incident	24	T 27
	Animal/crop/plant disease	24	T 27
	Transportation radiological incident	24	T 27
	Highway transportation incident	22	31
	Expansive soils	19	32
	Sink hole	18	33

Table 4 – 72: Hazard Ranking for Shannon City

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1

	Windstorm	48	T 1
	Thunderstorm/lightning	46	T 3
	Energy failure	46	T 4
	Extreme heat	43	5
	Drought	35	T 6
	Tornado	35	T 6
	Structural fire	33	8
	Hailstorm	32	T 9
	Communications failure	32	T 9
Priority Group II	Conventional terrorism	32	T 11
	Cyber terrorism	32	T 11
	Chemical terrorism	31	T 13
	Radiological terrorism	31	T 13
	Flash flood	29	T 15
	Enemy attack	29	T 15
	Human disease pandemic	28	T 17
	Bioterrorism	28	T 17
	Human disease incident	26	T 19
	River flood	26	T 19
	Structural failure	26	T 19
Priority Group III	Agro-terrorism	26	T 19
	Grass and wildland fire	25	T 23
	Public disorder	25	T 23
	Earthquake	24	T 25
	Air transportation incident	24	T 25
	Animal/crop/plant disease	24	T 25
	Expansive soils	19	28
	Sink hole	18	29

Table 4 – 73: Hazard Ranking for Thayer

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	48	T 1
	Windstorm	48	T 1
	Thunderstorm/lightning	46	T 3
	Energy failure	46	T 4
	Extreme heat	43	5
	Drought	35	T 6
	Tornado	35	T 6
	Structural fire	33	8
	Hailstorm	32	T 9
	Communications failure	32	T 9
Priority Group II	Conventional terrorism	32	T 11
	Cyber terrorism	32	T 11
	Chemical terrorism	31	T 13
	Radiological terrorism	31	T 13
	Rail transportation incident	30	15
	Flash flood	29	T 16
	Enemy attack	29	T 16
	Transportation hazardous materials incident	29	T 16
	Human disease pandemic	28	T 19
	Bioterrorism	28	T 19
	Human disease incident	26	T 21
	Structural failure	26	T 21
Priority Group III	Agro-terrorism	26	T 21
	Grass and wildland fire	25	T 24
	Public disorder	25	T 24
	Earthquake	24	T 26
	Air transportation incident	24	T 26
	Transportation radiological incident	24	T 26
	Animal/crop/plant disease	24	T 26
	Expansive soils	19	30
	Sink hole	18	31

Table 4 – 74: Hazard Ranking for Creston Community School District

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	46	1
	Windstorm	45	2
	Thunderstorm/lightning	42	3
	Energy failure	41	4
	Extreme heat	40	5
	Conventional terrorism	38	6
	Tornado	37	7
	Bioterrorism	36	8
	Drought	35	T 9
Priority Group II	Radiological terrorism	35	T 9
	Fixed hazardous materials incident	33	T 11
	Pipeline transportation incident	33	T 11
	Chemical terrorism	33	T 11
	Human disease incident	32	T 14
	Public disorder	32	T 14
	Cyber terrorism	32	T 14
	Flash flood	31	T 17
	Hailstorm	31	T 17
	Communications failure	31	T 17
	Human disease pandemic	31	T 17
	Structural fire	31	T 17
	Transportation hazardous materials incident	30	22
Priority Group III	River flood	29	23
	Enemy attack	29	24
	Structural failure	28	25
	Grass and wildland fire	26	T 26
	Air transportation incident	26	T 26
	Agro-terrorism	25	28
	Earthquake	24	T 29
	Animal/crop/plant disease	24	T 29
	Expansive soils	21	31
	Sink hole	18	32

Table 4 – 75: Hazard Ranking for East Union Community School District

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	46	1
	Windstorm	45	2
	Thunderstorm/lightning	42	3
	Energy failure	41	4
	Extreme heat	40	5
	Conventional terrorism	38	6
	Tornado	36	7
	Bioterrorism	36	8
	Drought	35	T 9
Priority Group II	Radiological terrorism	35	T 9
	Fixed hazardous materials incident	33	T 11
	Pipeline transportation incident	33	T 11
	Chemical terrorism	33	T 11
	Human disease incident	32	T 14
	Public disorder	32	T 14
	Cyber terrorism	32	T 14
	Structural fire	32	T 14
	Hailstorm	31	T 18
	Communications failure	31	T 18
	Human disease pandemic	31	T 18
	Flash flood	31	T 18
	Transportation hazardous materials incident	30	22
Priority Group III	Enemy attack	29	23
	Structural failure	28	24
	Grass and wildland fire	26	T 25
	Air transportation incident	26	T 25

	Agro-terrorism	25	27
	Earthquake	24	T 28
	Animal/crop/plant disease	24	T 28
	Transportation radiological incident	24	T 28
	Rail transportation incident	23	31
	Expansive soils	20	32
	Sink hole	18	33

Table 4 – 76: Hazard Ranking for Southwestern Community College

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	46	1
	Windstorm	45	2
	Thunderstorm/lightning	44	3
	Energy failure	42	T 4
	Extreme heat	42	T 4
	Conventional terrorism	38	T 6
	Flash flood	38	T 6
	Tornado	36	8
	Bioterrorism	35	T 9
	Drought	35	T 9
Priority Group II	Radiological terrorism	35	T 9
	Pipeline transportation incident	33	T 12
	Chemical terrorism	33	T 12
	Public disorder	32	T 14
	Cyber terrorism	32	T 14
	Communications failure	32	T 14
	Hailstorm	31	T 17
	Structural fire	31	T 17
	Fixed hazardous materials incident	31	T 17
	Human disease incident	30	T 20
	Human disease pandemic	30	T 20
	Transportation hazardous materials incident	30	T 20
Priority Group III	Enemy attack	29	23
	Structural failure	28	24
	Expansive soils	26	T 25
	Air transportation incident	26	T 25
	Agro-terrorism	25	T 27
	Grass and wildland fire	25	T 27
	Earthquake	24	T 29
	Animal/crop/plant disease	24	T 29
	Transportation radiological incident	24	T 29
	Highway transportation incident	22	32
	Sink hole	18	33

Table 4 – 77: Hazard Ranking for Greater Regional Medical Center

Risk Acceptance Rating	Hazard	Assessment Rating	Hazard Risk Ranking
Priority Group I	Severe winter storm	46	1
	Windstorm	45	2
	Extreme heat	43	3
	Thunderstorm/lightning	42	4
	Energy failure	41	5
	Conventional terrorism	37	T 6
	Tornado	37	T 6
	Bioterrorism	36	8
	Drought	35	T 9
Priority Group II	Radiological terrorism	35	T 9
	Flash flood	34	T 11
	Pipeline transportation incident	34	T 11
	Fixed hazardous materials incident	34	T 11
	Chemical terrorism	33	14
	Cyber terrorism	32	T 15
	Communications failure	32	T 15
	Structural fire	31	17

	Public disorder	30	T 18
	Human disease incident	30	T 18
	Human disease pandemic	30	T 18
	Transportation hazardous materials incident	30	T 18
Priority Group III	Transportation radiological incident	30	T 18
	Enemy attack	29	23
	Structural failure	28	T 24
	Hailstorm	28	T 24
	Air transportation incident	26	26
	Fixed radiological incident	25	27
	Earthquake	24	T 28
	Animal/crop/plant disease	24	T 28
	Highway transportation incident	22	30
	Sink hole	18	31
	Expansive soils	17	32

As can be seen, most of the hazards are ranked similarly among the various jurisdictions. Hazards like thunderstorms, energy failure, windstorms, and extreme heat rate high in all jurisdictions. Hazards like earthquakes and sinkholes rank very low in all jurisdictions. Note that some of the dividing lines among the three priority groups are somewhat arbitrary and sometimes even crosses hazards of the same score. This is not a real issue when we consider that some hazards with the same score may be easier to mitigate than others or are given higher priority due to being natural hazards.

The next chapter of this plan details how hazards affect the jurisdictions in Union County in terms of assets that can be impacted by the various kinds of hazard events.

Chapter 5: Assets at Risk

5.1: Introduction

Step 3 of the HARA process involves the assessment of risk to the assets in the county's jurisdictions. The assessment of risks includes an analysis of how each hazard affect: a) populations, b) structures, and c) land. Of notable interest is the impact on critical facilities, which are those facilities that are to be the target of potential mitigation projects. The vulnerability assessment includes at a minimum: 1) assessment of each hazard and how it impacts the community, 2) types of structures at risk, 3) the key assets at risk, 4) determination of extent of damages, and 5) estimation of losses.

The data in this chapter is based on the best available or, in the absence of qualified data, estimated data.

5.2: Description of Areas of Hazard Risk

This chapter quantifies, as much as possible the effects the profiled hazards have on the physical planning area, which is all of Union County. It also includes analysis of hazard impacts on individual participating jurisdictions. In order to make the plan as useful as possible, the planning team chose to profile the assets at risk only to Priority I hazards and to river flooding no matter its priority status, due to FEMA's concern with this hazard. The following matrix describes the areas of hazard risk and the types of risk factors for those hazards. This helps fulfill the "overall summary of each hazard and its impact on the community" requirement of Section 201.6(c)(2)(ii) of the Stafford Act.

5 – 1: Description of Risk Due to Priority 1 Hazards

			Primary Natures of Risk (top three ranked)					
Hazards (** - natural)	Priority I Jurisdictions	Areas At Risk	People	Structures	Land, Resources	Economic	Personal property	Intangibles *
Biioterrorism	All schools, SWCC, GRMC	Widespread, depending on substance	1			2		3
Communications failure	County, all Cities	Widespread/anywhere		2		1	3	
Conventional Terrorism	All schools, SWCC, GRMC	Widespread/anywhere	1	2		3		
Drought **	All jurisdictions	Widespread/anywhere			2	1	3	
Energy failure	All jurisdictions	Widespread/anywhere	2			1	3	
Extreme heat **	All jurisdictions	Widespread/anywhere	1		3	2		
Fixed HAZMAT	Creston	1,000 feet of fixed sites	1	2		3		
Flash flood **	County, Afton, SWCC	Widespread/anywhere	3	1	2			
Grass and wildland fire **	County	On or near un-managed vegetation, crop, wildland areas	3		1	2		
Hailstorm **	County, all Cities	Widespread/anywhere		1	3		2	
Pipeline trans. incident	Afton, Creston, Lorimor	1,000 feet of major pipelines, any building or structure served by flammable materials	2	1		3		
River flood **	No jurisdictions (Priority II Rural, Creston, Cromwell, and Shannon City)	Within identified flood hazard areas and unmapped areas identified as flood prone		2	1	3		
Severe winter storm **	All jurisdictions	Widespread/anywhere	2	3		1		
Structural fire	Afton, Arispe, Cromwell, Lorimor, Shannon City, Thayer	Anywhere there are structures	2	1			3	
Thunderstorm/lightning **	All jurisdictions	Widespread/anywhere	2	1		3		
Transportation HAZMAT	County, Creston	1,000 feet of noted highways, truck routes, and railroads	3			1	2	
Tornado **	All jurisdictions	Widespread/anywhere	1	2			3	
Windstorm **	All jurisdictions	Widespread/anywhere	3	1			2	

** Intangibles are things of intrinsic value: important records, emotional impacts, personal financial impacts, etc.*

Most hazards can affect every property in the county. This means that ALL PROPERTIES are "at risk" for direct or indirect impact of the hazards. Priority I natural hazards that can occur anywhere include drought, extreme heat, flash flood, hailstorm, severe winter storm, thunderstorm/lightning, tornado, and windstorm. Few, if any, other low-priority hazards can impact all properties. Priority I man-made/combination hazards that can occur anywhere include communications failure, energy failure, conventional terrorism, and bioterrorism. Many other lower-priority hazards can impact all properties, such as other forms of terrorism, different forms of disease incidents, and air transportation incidents.

What this means is that all people and structures are vulnerable to direct or secondary effects of these hazards. Some effects are going to be more direct, such as a tornado hitting a home. The above table provides a glimpse of the types or natures of impacts that are likely to occur. Some hazards will have a more direct impact on structures, such as tornadoes and fires, while others, like transportation and technological hazards will impact personal property and the economy. All Priority I hazards will have some impact on people, some more directly than others. Some will provide some impact on intangibles, such as irreplaceable records and possessions and items with high emotional value. They may cause people to change lifestyle habits to reduce future risk.

Only small parts of the planning area are susceptible to many of the Priority I hazards and to river flooding. Some hazards can only impact an immediate area around the source of the hazard. River flooding can only occur close to the source of the water, which is the river. Because Union County is hilly, only a small part of the county would be flooded by the flood of a given stream, not matter if the cause is heavy rain, dam failure, or any other reason. Flood hazard areas are mapped in **Chapter 2** by jurisdiction; these maps are now being updated and will be more useful in the format in which they are being prepared. Any type of hazardous materials site or release can occur only near the release site; possible release sites are specific, such as a certain hazard materials handler, a specific pipeline, or specific transportation route. Generally, these incidents can be mapped. The planning team used a 1,000-foot buffer on existing sites, pipelines, and routes to demark likely incidents. However, depending on the substance released, it is possible for a larger area to be impacted or to be subjected to response actions, such as evacuations.

It is difficult to define the impact areas of several Priority I hazards. The most complicated may be flash floods. The planning team identifies them as being able to occur anywhere. Because heavy rain can fall anywhere, damage can occur wherever the water may be. While the damages might logically be the worst on steep grades and in low-lying areas where the water collects, even land and structures on hilltops can be damaged. This is proven by events in the area in the past. Heavy rains can erode soils on hilltops and slopes; home foundation and basements can be flooded in the same area, and roads collect water no matter the elevation. Any sloping areas are subject to flowing water during excessive rains, which has damaged roads, yards, landscaped areas, buildings, and basements.

Impact areas for terrorism events are difficult to calculate. Depending on the type and magnitude of incident, the impact area may be very small to very large. Most terrorism events can occur most anywhere where the explosive, powder, or even threat can be placed. There is no way to exclude any area of the county for some of the key terrorism hazard types.

Structural fires can only occur and impact structures directly. While they can spread to become wildfires if they burn out of control in surrounding areas, structural fires are identified for simplicity as impacting all structures and majority of populations that use those structures at a given time. Grass and wildland fires occur where they there is adequate cover for fires to spread. In rural areas and cities, these areas include un-managed vegetation areas and ditches, croplands out of season, heavily forested areas, and areas like CRP and managed prairie grounds. Structures are identified based on estimates of numbers that are within proximity to such vegetation that they can be directly impacted either through damage to the buildings themselves or personal property near the buildings.

Priority II and III hazards can impact all or parts of the planning area as well. While, other than river flooding, they are not covered in the following sections of this chapter, it is notable that the impacts of these hazards can be significant. Incidents like rail and highway transportation incidents as well as human and animal disease incidents can and do take lives in the county; and these hazards remain a concern for planners, elected officials, and responders. Other forms of terrorism and public disorder can be very deadly, even though the probability is very

low. Mitigation efforts have reduced those threats, but more mitigation measures may be necessary. It is good that many of the proposed mitigation measures in this plan will incidentally aid in mitigating Priority II and III hazards while targeting Priority I hazards.

Overall, certain areas of Union County are deemed to be at greater risk to hazards than other areas, although the variance in risk is relatively minor. For instance, areas like downtown Creston have a concentration of older buildings and lack trees. These buildings are located near busy transportation routes, hazardous materials sites, and the mainline railroad. The lack of pervious surfaces enhances flash flood risk. Therefore, areas such as this, have great risk of more hazards than others and the cascading effects of one hazard can be greater due to factors, such as concentration and age of buildings, density of people in the area, traffic volume, and exposure to weather and hazardous substances. Other major economic areas, like downtown Afton and industrial areas of Creston and Afton, also have unique exposure due again to the concentration of large buildings and population, hazardous substances handled in the area, traffic volumes (especially of trucks), and the nearby railroad. It is beyond the scope of this plan to create a reliable vulnerability map, because there are no exceptional unique risk areas that must be protected far more than any other areas.

When planning team members were asked about areas of jurisdictions that are facing unique hazard risks, many thoughtful answers were gained. One person stated that general degradation of physical infrastructure and assets is taking a toll on the overall community. Another stated that park areas need more storm shelters and that some flood hazard areas are being developed or have been developed. Additionally in park areas, equipment and staffing is inadequate to address pruning and tree removal needs to prevent hazard losses due to storm damage to trees. Any areas where culverts and bridges are located are impacted by stream degradation. Areas along Hurley Creek in Creston continue to be a source of concern for local officials, because there is development along the creek as well as many bridges and culverts that must handle water flows.

5.3: Critical Assets – Assets at Risk

DMA 2000 calls for the determination of the assets at risk for various hazards, both hazards that can affect all assets and those that can affect only certain areas. Tables are organized by jurisdiction and then hazard.

As a summary of risk, FEMA requires that all properties, not just critical assets, be ascertained as to impact by hazard events. The combination of both types of data allows for several things useful to hazard mitigation: a) providing a full picture of a hazard's impact on a community, b) allowing the comparison of impacts among hazards in a jurisdiction, and c) allowing the comparison of impacts among jurisdictions as a whole, i.e., which towns are more susceptible to hazards in general in terms of total properties that are susceptible.

The planning team used existing resources and FEMA "Understanding Your Risks" worksheets to determine what should be included as locally identified critical facilities and lifeline utilities and transportation systems. Numerous tables in this chapter detail the assets. The values used in the tables provided from local data sources, where available, and the remaining values are estimated. The consultant worked with the planning team and others to determine approximate values. The team relied upon tables in the "Understanding Your Risks" text.

This assessment includes a summary of each hazard's potential impact on the multiple jurisdictions' vulnerable structures and properties. The following pages detail the estimated impacts of each hazard event on the assessed valuation of each property category, including infrastructure and government buildings. These estimates are not losses. Rather, this chapter covers the percentage of structures and the population *that can be* impacted negatively by the hazard, from minimal to total loss. *Chapter 6* covers estimated losses from natural hazards only.

The types of structures in the following tables are assessed by the many profiled hazards that may have an impact on the county and each of the applicable jurisdictions. The focus of the asset at risk determination is upon the Priority I hazards as outlined in *Chapter 4*. River flooding is also considered no matter its priority status.

NOTE: The number of persons in each chart is based on their locations during a workday during the school year, for example, 2 PM on September 11.

5.4: Vulnerability Risk Assessment By Priority I Hazards Affecting Rural Union County

Rural Union County is exposed to twelve Priority I hazards as well as river flooding, which is scored as a Priority II hazard. This section delineates those risks by properties and population.

5.4.1. Hazards That Can Impact All Properties

Rural Union County is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Flash flood
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 2: Hazard Risk Analysis: Widespread Events Affecting All of Rural Union County

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	1,400	1,400	100%	$123,500	$123,500	100%	900	900	100%
Commercial	25	25	100%	$6,650	$6,650	100%	100	100	100%
Industrial	10	10	100%	$6,850	$6,850	100%	900	900	100%
Ag Structures	200	200	100%	$16,600	$16,600	100%	25	25	100%
Ag Land	235,500 ac	235,500 ac	100%	$160,050	$160,050	100%	--	--	--
Institutional ***	10	10	100%	$10,000	$10,000	100%	20	20	100%
Government ****	20	20	100%	$50,000	$50,000	100%	500	500	100%
Education	1	1	100%	$20,000	$20,000	100%	800	800	100%
Utilities *****	10	10	100%	$48,900	$48,900	100%	5	5	100%
Totals	1,676	1,676	100%	$442,550	$442,550	100%	3,250	3,250	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** Based on estimated assessed valuations and other measures rather than pre-determined replacement costs. For religions-NP structures, government, and education, there are no assessed values because these are tax exempt. The values are estimated.*
*** Number of people on a weekday (2 PM) at a given location during the school year. These figures will change depending on time of year, day of week, and time of day. The total may fluctuate from the jurisdiction's population due to net migration of workers and students.*
**** Institutional includes non-government religious, non-profit, special needs housing, medical, and related typically untaxed facilities.*
***** Government includes all city, county, state, and federal government buildings and facilities, and all non-taxed utilities property.*
****** Mostly vertical and horizontal infrastructure that cannot be identified as a structure. Includes rail valuations where rail exists. Structures can be occupied.*

There are approximately 1,675 primary structures in the rural part of the county. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $442,550,000. The total population in the area during the planning timeframe is approximately 3,250. This compares to the Census population of 3,163. During the daytime, many people living in the rural area go into towns to work or shop, thereby reducing the rural population in the hazard area. However, schools and industry located just east of Creston and Afton more than make up these losses. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. Because of the large number and capacity of rural recreational assets, the impacted population can change greatly by time of day, time of year, and day of week. Summer weekends will attract especially high rural recreational populations.

The following table shows rural Union County's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

Table 5 – 3: List of Critical Assets in Rural Union County At Risk For Widespread Events

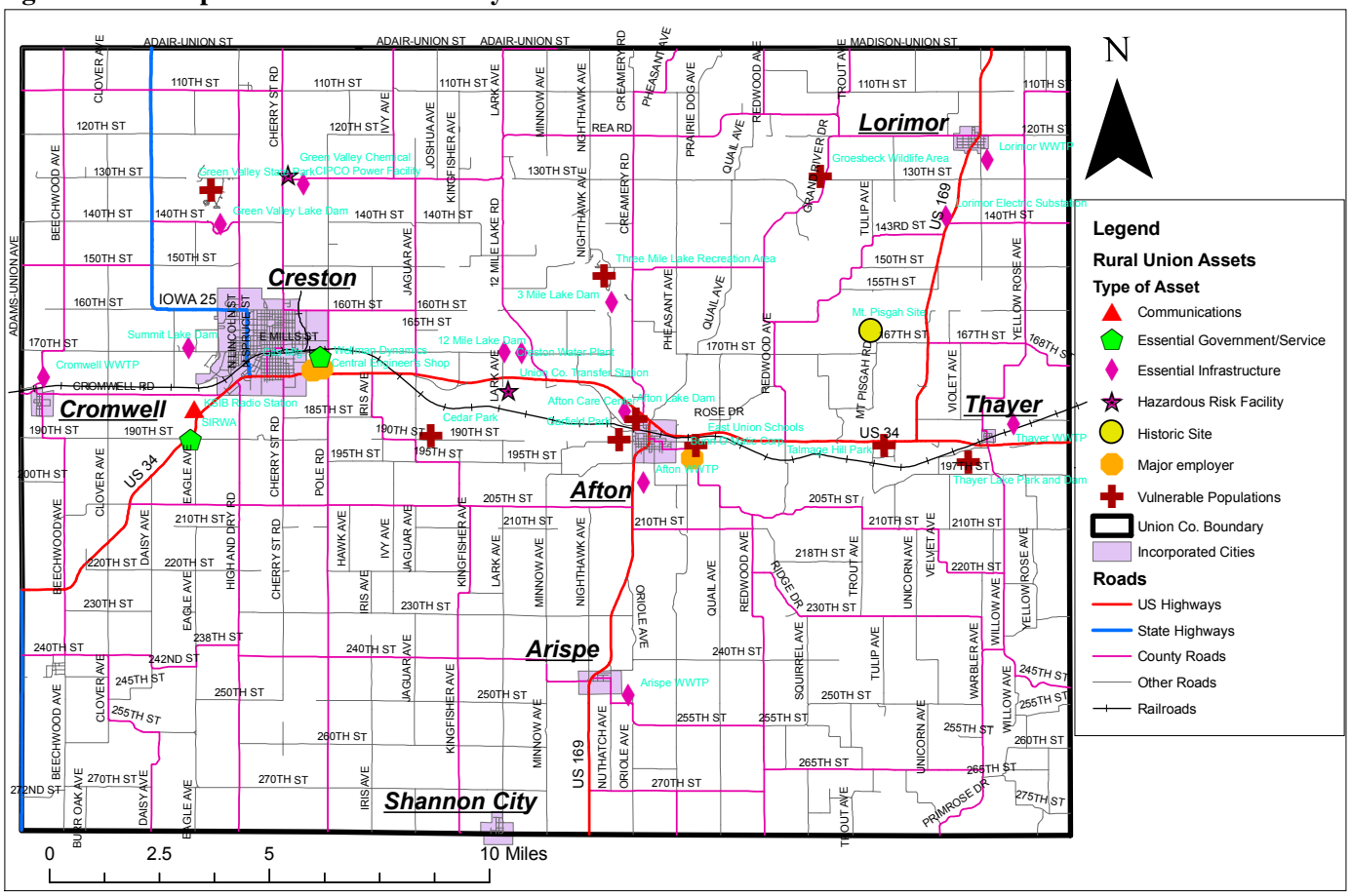
Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Central Shop	1701 Commerce Rd.	X				10,000	$200 K	$50 K	$800 K	$100	18
Engineer's Shop	1701 Commerce Rd. area	X				7,500	$150 K	$20 K	$35 K	$75	5
Green Valley office	1480 130th St.	X				2,000	$200 K	$50 K	$100 K	$100	2
Green Valley shop	1480 130th St.	X				4,000	$400 K	$200 K	$50 K	$200	3
Green Valley campground	1480 130th St.		X	X		25 acres	$1.5 M	$50 K	$60 K	$1,000	400
Green Valley cabins	1480 130th St.		X	X		2,000	$75 K	$15 K	$5 K	$150	18
Green Valley Lake and Park	1480 130th St.	X	X	X		750 acres	$4 M	$400 K	$50 K	$1,000	100
Green Valley dam	1480 130th St.	X		X		1,000 LF	$6 M	$100 K	$10 K	$5,000	--
Afton WWTP	1901 S. Colfax, Afton	X				40 acres	$5 M	$0	$150 K	$5,000	1
Arispe WWTP	¼ mi SE of Arispe	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Cromwell WWTP	Just N. of Cromwell	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Lorimor WWTP	½ mi S of Lorimor	X				35 acres	$1.5 M	$35 K	$18 K	$2,000	2
Thayer WWTP	½ mi NE of Thayer	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Twelve Mile Lake dam	4 mi E. of Creston	X		X		2,000 LF	$15 M	$250 K	$50 K	$5,000	--
Three Mile Lake dam	4 mi N. of Afton	X		X		2,000 LF	$15 M	$250 K	$50 K	$7,500	--
Afton Lake dam	¼ mi W. of Afton	X		X		500 LF	$3 M	$50 K	$7 K	$2,000	--
Thayer Lake park and dam	1940 Thayer Lk. Rd., Thayer	X		X		200 LF; 47 acres	$1.5 M	$15 K	$3 K	$250	50
Summit Lake dam	½ mi W of Creston	X		X		1,000 LF	$2 M	$100 K	$10 K	$4,000	--
Lorimor electric substation	1 mi S. of Lorimor	X				1 acre	$500 K	$500 K	$400 K	1,000	2
KSIB Radio station	½ mi SW of Creston	X		X		5,000	$3 M	$1.5 M	$1 M	$5,000	8
Wellman Dynamics	¼ mi E of Creston		X	X		50,000	$5 M	$5 M	$5 M	$10,000	400
Gits Mfg.	¼ mi E of Creston		X	X		15,000	$964 K	$750 K	$2 M	$7,000	200
Bunn-O-Matic Corp.	1924 High School Drive		X	X		15,000	$3 M	$2 M	$1 M	$4,000	150-200
Union Co. Transfer Station	4 mi W of Afton	X				10 acres	$1 M	$100 K	$200 K	$1,000	5
Green Valley Chemical plant	3 mi N of Creston	X		X		25,000	$4 M	$4 M	$3 M	$10,000	18
Three Mile Lake park amenities *	1577 Creamery Rd., Afton	X	X	X		500 ac, 40 bldgs	$3.6 M	$150 K	$180 K	$3,000	1,000
Three Mile Lodge	4 mi N. of Afton	X	X			4,000	$1.5 M	$250 K	$100 K	$500	250
Mount Pisgah Site	1741 Mt. Pisgah Rd., Afton				X	17 acres	$50 K	$15 K	$3 K	$20	20
Cedar Park	1937 190th St.		X			15 acres	$45 K	$25 K	$3 K	$10	50
Garfield Park	2371 190th St.		X			10 acres	$30 K	$15 K	$3 K	$10	50
Talmage Hill Park	1902 Umbrella Ave.		X			36 acres	$108 K	$15 K	$2 K	$10	25
Talmage Hill Wildlife Area	2965 US Hwy 34		X			210 acres	$630 K	$25 K	$1 K	$10	25
Groesbeck Wildlife Area	1402 Grand River Dr., Lorimor		X			112 ac.	$336 K	$25 K	$1 K	$10	$10
Afton Care Center	508 W. Pearl St.,	X	X			15,000	$4 M	$3 M	$1.5 M	$7.500	50

	Afton										
SIRWA offices	1391 190th St.	X		X		5,000	$1 M	$1 M	$3 M	$5,000	30
Creston Water Plant	4 Mi E of Creston	X		X		10,000	$6 M	$6 M	$2 M	$100 K	12
CIPCO power facility	3 Mi N of Creston	X		X		10,000	$6 M	$6 M	$1.5 M	$7,500	50
East Union School District *	1916 High School Drive	X		X		50,000	$20 M	$10 M	$3.5 M	$5,000	800

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site*

The following map shows the rural Union County critical assets as listed in the above table.

Figure 5 – 1: Map of Rural Union County Critical Assets



Additional to the listed specific assets above, the rural county's vast expanse of are contains many other facilities the planning team wanted mentioned. The following are important lifeline systems in the county:

- Water towers: SIRWA owns several water towers throughout the county that are at risk of damage due to numerous hazards. SIRWA has provided lightning protection to the towers.
- Lifeline highway systems: US Highways 34 and 169 and Iowa Highway 25.
- Rural bridges: 173 located around the county; the Secondary Roads Department possesses a full inventory of bridges that includes type, size, capacity, traffic volume, year build, replacement costs, detour length, and displacement cost per day. The total bridge replacement cost is $31,194,700 or an average of $180,316. The total daily bridge displacement cost is $43,549 or an average of $252.
- Rural culverts: approximately 4,000 around the county with an average replacement value of $2,000 each and displacement cost of $250 per day.
- Rural secondary roads: Total value of $9,500,000 with a functional use value of $2,050,000, a displacement cost of $150,000 per day, and traffic volume ranging from a few vehicles per day (VPD) to 2,500 VPD.
- Communications towers (cellular, radio, etc.): Approximately a dozen towers located mostly near Creston,

Afton, and Lorimor have a total value of $7 million with a $100,000 functional use value and $500 displacement cost per day.

5.4.2: Grass and Wildland Fire

Grass and wildland fires certainly impact rural Union County, sometimes causing significant crop losses. Grass and wildland fires can impact much of the rural area, including some or all areas on most properties. While fuel models indicate certain land covers are more likely for hazards, many are at risk in the right conditions no matter the fuel rating. For this reason, we cannot accurately map the areas that are susceptible. The following table is the best estimate of assets at risk.

Table 5 – 4: Hazard Risk Analysis: Grass and Wildland Fires Affecting Rural Union County

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	1,400	750	54%	$123,500	$65,000	53%	900	450	50%
Commercial	25	10	40%	$6,650	$2,600	39%	100	40	40%
Industrial	10	7	70%	$6,850	$5,750	84%	900	750	83%
Ag Structures	200	190	95%	$16,600	$16,000	97%	25	23	92%
Ag Land	235,500 ac	235,500 ac	100%	$160,050	$160,050	100%	--	--	--
Institutional ***	10	7	70%	$10,000	$7,000	100%	20	14	70%
Government ****	20	18	90%	$50,000	$48,000	96%	500	450	90%
Education	1	1	100%	$20,000	$20,000	100%	800	800	100%
Utilities *****	10	5	50%	$48,900	$20,000	41%	5	3	60%
Totals	1,676	988	59%	$442,550	$344,400	78%	3,250	2,530	78%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Grass and wildland fires can impact many of the land area and structures in the rural part of the county. Few buildings and structures are exempt, and most of these are located some distance from agricultural fields and forest areas that can be burned. Those that are exempt are typically underground or made of concrete, such as certain infrastructure, roads, towers, and pipelines. Approximately 59% of properties/buildings, 78% of values, and 78% of the population are in hazard areas.

Most of the critical assets in the rural part of Union County, shown in Table 5 – 3, are at direct risk due to grass and wildland fires.

Table 5 – 5: List of Critical Assets in Rural Union County At Risk for Grass and Wildland Fires

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Green Valley office	1480 130th St.	X				2,000	$200 K	$50 K	$100 K	$100	2
Green Valley shop	1480 130th St.	X				4,000	$400 K	$200 K	$50 K	$200	3
Green Valley campground	1480 130th St.		X	X		25 acres	$1.5 M	$50 K	$60 K	$1,000	400
Green Valley cabins	1480 130th St.		X	X		2,000	$75 K	$15 K	$5 K	$150	18
Green Valley Lake and Park	1480 130th St.	X	X	X		750 acres	$4 M	$400 K	$50 K	$1,000	100
Green Valley dam	1480 130th St.	X		X		1,000 LF	$6 M	$100 K	$10 K	$5,000	--
Afton WWTP	1901 S. Colfax	X				40 acres	$5 M	$0	$150 K	$5,000	1
Arispe WWTP	¼ mi SE - Arispe	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Cromwell WWTP	Just N. of Cromwell	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Lorimor WWTP	½ mi S of	X				35 acres	$1.5 M	$35 K	$18 K	$2,000	2

	Lorimor										
Thayer WWTP	½ mi NE of Thayer	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Twelve Mile Lake dam	4 mi E. of Creston	X		X		2,000 LF	$15 M	$250 K	$50 K	$5,000	--
Three Mile Lake dam	4 mi N. of Afton	X		X		2,000 LF	$15 M	$250 K	$50 K	$7,500	--
Afton Lake dam	¼ mi W. of Afton	X		X		500 LF	$3 M	$50 K	$7 K	$2,000	--
Thayer Lake park and dam	1940 Thayer Lk. Rd., Thayer	X		X		200 LF; 47 acres	$1.5 M	$15 K	$3 K	$250	50
Summit Lake dam	½ mi W of Creston	X		X		1,000 LF	$2 M	$100 K	$10 K	$4,000	--
Lorimor electric substation	1 mi S. of Lorimor	X				1 acre	$500 K	$500 K	$400 K	1,000	2
KSIB Radio station	½ mi SW of Creston	X		X		5,000	$3 M	$1.5 M	$1 M	$5,000	8
Wellman Dynamics	¼ mi E of Creston		X	X		50,000	$5 M	$5 M	$5 M	$10,000	400
Gits Mfg.	¼ mi E. of Creston		X	X		15,000	$964 K	$750 K	$2 M	$7,000	200
Bunn-O-Matic Corp.	1924 High School Drive		X	X		15,000	$3 M	$2 M	$1 M	$4,000	150-200
Union Co. Transfer Station	4 mi W of Afton	X				10 acres	$1 M	$100 K	$200 K	$1,000	5
Green Valley Chemical plant	3 mi N of Creston	X		X		25,000	$4 M	$4 M	$3 M	$10,000	18
Three Mile Lake park amenities *	1577 Creamery Rd., Afton	X	X	X		500 ac, 40 bldgs	$3.6 M	$150 K	$180 K	$3,000	1,000
Three Mile Lodge	4 mi N. of Afton	X	X			4,000	$1.5 M	$250 K	$100 K	$500	250
Mount Pisgah Site	1741 Mt. Pisgah Rd., Afton				X	17 acres	$50 K	$15 K	$3 K	$20	20
Cedar Park	1937 190th St.		X			15 acres	$45 K	$25 K	$3 K	$10	50
Garfield Park	2371 190th St.		X			10 acres	$30 K	$15 K	$3 K	$10	50
Talmage Hill Park	1902 Umbrella Ave.		X			36 acres	$108 K	$15 K	$2 K	$10	25
Talmage Hill Wildlife Area	2965 US Hwy 34		X			210 acres	$630 K	$25 K	$1 K	$10	25
Groesbeck Wildlife Area	1402 Grand River Dr., Lorimor		X			112 ac.	$336 K	$25 K	$1 K	$10	$10
SIRWA offices	1391 190th St.	X		X		5,000	$1 M	$1 M	$3 M	$5,000	30
Creston Water Plant	4 Mi E of Creston	X		X		10,000	$6 M	$6 M	$2 M	$100 K	12
CIPCO power facility	3 Mi N of Creston	X		X		10,000	$6 M	$6 M	$1.5 M	$7,500	50
East Union School District *	1916 High School Drive	X		X		50,000	$20 M	$10 M	$3.5 M	$5,000	800

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site*

5.4.3: River Flood

River floods certainly impact rural Union County, sometimes causing significant crop losses, losses to structures, and losses to infrastructure like roads and bridges. Rural Union County, as of mid-2012, has not been mapped, either by FEMA or the IDNR. We can estimate the areas where hazards can occur based on locations and size of rivers as well as slope information. We have some data about the locations of structures and can fairly accurately estimate the number of homes and agricultural structures in river flood prone areas. The following table is the best estimate of assets at risk.

Table 5 – 6: Hazard Risk Analysis: River Floods Affecting Rural Union County

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	1,400	20	1%	$123,500	$1,500	1%	900	12	1%
Commercial	25	0	0%	$6,650	$0	0%	100	0	0%
Industrial	10	0	0%	$6,850	$0	0%	900	0	0%
Ag Structures	200	10	5%	$16,600	$1,000	6%	25	1	4%
Ag Land	235,500 ac	20,000 ac	8%	$160,050	$14,000	9%	--	--	--
Institutional ***	10	0	0%	$10,000	$0	0%	20	0	0%
Government ****	20	10	50%	$50,000	$40,000	80%	500	250	50%
Education	1	0	0%	$20,000	$0	0%	800	0	0%
Utilities *****	10	1	10%	$48,900	$10,000	20%	5	1	20%
Totals	1,676	41	2%	$442,550	$66,500	15%	3,250	264	8%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

River flooding can impact the county primarily by damaging crops, farmland, and infrastructure such as roads, bridges, and culverts. It can destroy or damage a few scattered homes and yards, some farm outbuildings, and possible livestock. It can damage utility infrastructures, such as overhead lines. Flooding can reduce or stop transportation in certain parts of the county, thereby affecting more people than the above table indicates. Approximately 2% of properties/buildings, 15% of values, and 8% of the population are in hazard areas. This data can be updated following the provision of flood maps and a survey of structures and properties located in flood areas.

Many critical assets in the rural part of Union County, shown in Table 5 – 3, are at direct risk due to river floods.

Table 5 – 7: List of Critical Assets in Rural Union County At Risk for River Flooding

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Green Valley Lake and Park	1480 130th St.	X	X	X		750 acres	$4 M	$400 K	$50 K	$1,000	100
Green Valley dam	1480 130th St.	X		X		1,000 LF	$6 M	$100 K	$10 K	$5,000	--
Twelve Mile Lake dam	4 mi E. of Creston	X		X		2,000 LF	$15 M	$250 K	$50 K	$5,000	--
Three Mile Lake dam	4 mi N. of Afton	X		X		2,000 LF	$15 M	$250 K	$50 K	$7,500	--
Afton Lake dam	¼ mi W. of Afton	X		X		500 LF	$3 M	$50 K	$7 K	$2,000	--
Thayer Lake park and dam	1940 Thayer Lk. Rd., Thayer	X		X		200 LF; 47 acres	$1.5 M	$15 K	$3 K	$250	50
Summit Lake dam	½ mi W of Creston	X		X		1,000 LF	$2 M	$100 K	$10 K	$4,000	--
Union Co. Transfer Station	4 mi W of Afton	X				10 acres	$1 M	$100 K	$200 K	$1,000	5
Three Mile Lake park amenities *	1577 Creamery Rd.	X	X	X		500 ac, 40 bldgs	$3.6 M	$150 K	$180 K	$3,000	1,000
Cedar Park	1937 190th St.		X			15 acres	$45 K	$25 K	$3 K	$10	50

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site*

The Union Co. Transfer Station will not flood directly, but the only access to the transfer station can be cut off if the bridge just south of Highway 34 on the gravel access road is washed away or blocked.

5.4.4: Transportation Hazardous Materials Incident

Transportation incidents, whether involving hazardous materials or not, can impact areas only near the transportation routes where there is sufficient traffic and volume of materials to have necessary levels of risks. For the plan, the planning team has recognized the buffer within 1,000 feet of railroads and paved highways. The following table is the best estimate of assets at risk.

Table 5 – 8: Hazard Risk Analysis: Transportation Hazardous Materials Incidents Affecting Rural Union County

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	1,400	100	7%	$123,500	$10,000	8%	900	70	8%
Commercial	25	22	88%	$6,650	$6,400	96%	100	90	90%
Industrial	10	9	90%	$6,850	$6,700	98%	900	875	97%
Ag Structures	200	10	5%	$16,600	$1,000	6%	25	1	4%
Ag Land	235,500 ac	10,000 ac	4%	$160,050	$7,000	4%	--	--	--
Institutional ***	10	0	0%	$10,000	$0	0%	20	0	0%
Government ****	20	10	50%	$50,000	$30,000	60%	500	200	40%
Education	1	1	100%	$20,000	$20,000	100%	800	800	100%
Utilities *****	10	5	50%	$48,900	$20,000	41%	5	2	40%
Totals	1,676	157	9%	$442,550	$101,100	23%	3,250	2,038	63%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Transportation HAZMAT incidents can impact a relatively small area compared to the rural part of Union County; however, the vulnerable area contains a disproportionate share of the assets, especially commercial, industrial, government, and utilities properties. Generally, these assets are located along major highways. Therefore, 9% of properties/assets, 23% of values, and 63% of the population at a given time could be at risk.

Most of the critical assets in the rural part of Union County, shown in Table 5 – 3, are at direct risk due to transportation HAZMAT incidents.

Table 5 – 9: List of Critical Assets in Rural Union County At Risk for Transportation Hazardous Materials Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Central Shop	1701 Commerce	X				10,000	$200 K	$50 K	$800 K	$100	18
Engineer's Shop	1701 Commerce	X				7,500	$150 K	$20 K	$35 K	$75	5
Green Valley Lake and Park	1480 130th St.	X	X	X		750 acres	$4 M	$400 K	$50 K	$1,000	100
Green Valley dam	1480 130th St.	X		X		1,000 LF	$6 M	$100 K	$10 K	$5,000	--
Afton WWTP	1901 S. Colfax	X				40 acres	$5 M	$0	$150 K	$5,000	1
Cromwell WWTP	Just N. of Cromwell	X				25 acres	$1 M	$25 K	$12 K	$1,000	2
Afton Lake dam	¼ mi W. of Afton	X		X		500 LF	$3 M	$50 K	$7 K	$2,000	--
Thayer Lake park and dam	1940 Thayer Lk. Rd.	X		X		200 LF; 47 acres	$1.5 M	$15 K	$3 K	$250	50
Lorimor electric substation	1 mi S. of Lorimor	X				1 acre	$500 K	$500 K	$400 K	1,000	2
KSIB Radio station	½ mi SW of Creston	X		X		5,000	$3 M	$1.5 M	$1 M	$5,000	8
Wellman Dynamics	¼ mi E of Creston		X	X		50,000	$5 M	$5 M	$5 M	$10,000	400
Gits Mfg.	¼ mi E. of Creston		X	X		15,000	$964 K	$750 K	$2 M	$7,000	200

Bunn-O-Matic Corp.	1924 High School Drive		X	X		15,000	$3 M	$2 M	$1 M	$4,000	150-200
Union Co. Transfer Station	4 mi W of Afton	X				10 acres	$1 M	$100 K	$200 K	$1,000	5
Green Valley Chemical plant	3 mi N of Creston	X		X		25,000	$4 M	$4 M	$3 M	$10,000	18
Three Mile Lake park amenities *	1577 Creamery Rd.	X	X	X		500 ac, 40 bldgs	$3.6 M	$150 K	$180 K	$3,000	1,000
Three Mile Lodge	4 mi N. of Afton	X	X			4,000	$1.5 M	$250 K	$100 K	$500	250
Talmage Hill Park	1902 Umbrella		X			36 acres	$108 K	$15 K	$2 K	$10	25
Talmage Hill Wildlife Area	2965 US Hwy 34		X			210 acres	$630 K	$25 K	$1 K	$10	25
Afton Care Center	508 W. Pearl St., Afton	X	X			15,000	$4 M	$3 M	$1.5 M	$7.500	50
SIRWA offices	1391 190th St.	X		X		5,000	$1 M	$1 M	$3 M	$5,000	30
CIPCO power facility	3 Mi N of Creston	X		X		10,000	$6 M	$6 M	$1.5 M	$7,500	50
East Union School District *	1916 High School Drive	X		X		50,000	$20 M	$10 M	$3.5 M	$5,000	800

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site*

5.4.5: Other Hazards

Other Priority II and III hazards in rural Union County can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.5: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Afton

Afton's incorporated area is exposed to twelve Priority I hazards. This section delineates those risks by properties and population.

5.5.1. Hazards That Can Impact All Properties

The town of Afton is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Flash flood
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 10: Hazard Risk Analysis: Widespread Events Affecting All of Afton

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	400	400	100%	$17,500	$17,500	100%	300	300	100%
Commercial	25	25	100%	$3,000	$3,000	100%	100	100	100%
Industrial	3	3	100%	$450	$450	100%	25	25	100%
Ag Structures	2	2	100%	$35	$35	100%	1	1	100%
Ag Land	250 ac	250 ac	100%	$105	$105	100%	--	--	--
Institutional ***	10	10	100%	$10,000	$10,000	100%	125	125	100%
Government ****	8	8	100%	$8,000	$8,000	100%	25	25	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	8	8	100%	$1,000	$1,000	100%	4	4	100%
Totals	456	456	100%	$40,090	$40,090	100%	580	580	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 456 primary structures in Afton. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $40,090,000. The total

population in the area during the planning timeframe is approximately 580. This compares to the Census population of 845. During the daytime, many people in Afton travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Afton's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

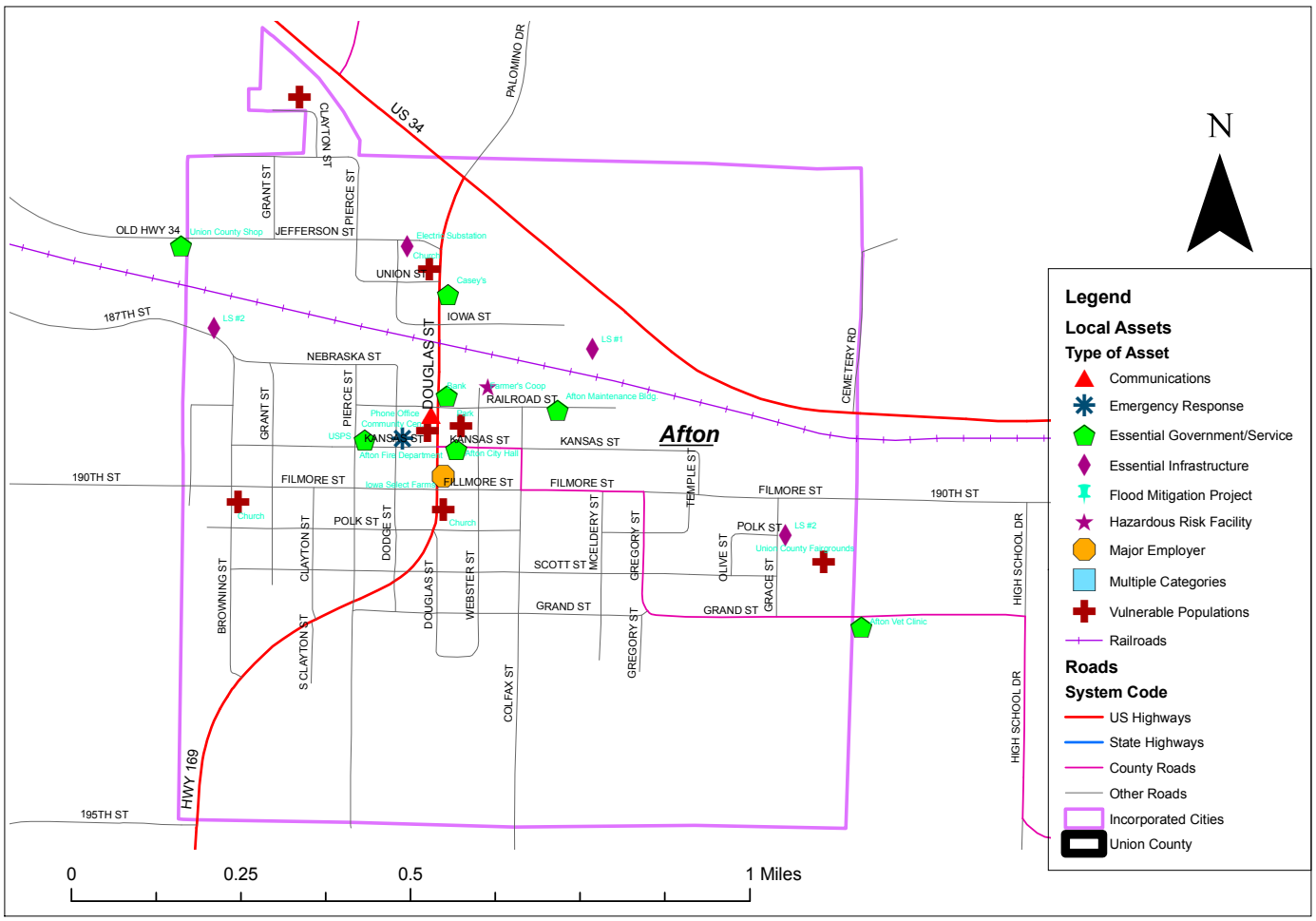
Table 5 – 11: List of Critical Assets in Afton At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall/police sta.	115 E. Kansas	X				2,500	$500 K	$500 K	$1.5 M	$3,000	10
City maint. bldg.	316 E. Railroad	X				5,000	$350 K	$1 M	$250 K	$1,000	5
Afton Fire Dept.	108 W. Kansas	X				5,000	$600 K	$800 K	$100 K	$1,000	25
U.C. Fairgrounds	211 S. Grace	X	X		X	10 acres	$4 M	$1.5 M	$200 K	$500	10-500
US Post Office	208 W. Kansas	X				5,000	$250 K	$200 K	$250 K	$1,000	10-20
Community center	240 N. Douglas	X	X	X		5,000	$400 K	$100 K	$150 K	$500	1-100
Sewer lift station #1	509 E. Iowa	X				1,000	$150 K	$50 K	$150 K	$2,000	0
Sewer lift station #2	512 W. Nebraska	X				1,000	$150 K	$50 K	$150 K	$2,000	0
Sewer lift station #3	311 S. Grace	X				1,000	$150 K	$50 K	$150 K	$2,000	0
Electric substation	111 W. Jefferson	X		X		½ acre	$5 M	$5 M	$1.5 M	$5,000	0
Phone station	105 N. Douglas	X		X		2,000	$200 K	$500 K	$200 K	$500	1-5
Casey's Gen. Stores	501 N. Douglas	X		X		4,000	$500 K	$1 M	$1 M	$2,000	10-50
First National Bank	100 E. Railroad	X		X		7,500	$750 K	$1 M	$5 M	$5,000	10-50
United Methodist Ch.	111 S. Douglas		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
County C.A.R.E.	500 Opal St.		X			20,000	$3 M	$4 M	$1.5 M	$5,000	30-75
St. Edwards Catholic	100 W. Union		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
Assembly of God	105 S. Browning		X		X	5,000	$750 K	$1 M	$100 K	$500	10-100
Farmer's Coop	196 E. Railroad			X		2 acres	$3 M	$1 M	$2 M	$2,000	20-30
Afton Vet Clinic	2508 E. Grand			X		5,000	$250 K	$200 K	$250 K	$500	2-5
Iowa Select Farms	101 N. Douglas			X		5,000	$250 K	$400 K	$1 M	$1,000	10-20
Union County Shop	W. edge of Afton	X				7,500	$65 K	$5,000	$1,700	$30	2
Central Park	Downtown square		X		X	2 acres	$50 K	$250 K	$25 K	$25	0-200

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site*

The map on the next page shows Afton's critical assets as listed in the above table.

Figure 5 – 2: Map of Afton Critical Assets



5.5.2: Pipeline Transportation Incident

Almost all occupiable structures in Afton are at risk of a pipeline transportation incident, which could cause an explosion and release of deadly fumes in homes and businesses. Most of Afton's homes have access to pipelines that supply natural gas. Manufacturers use natural gas for heating and production processes. A buffer of 1,000 feet is used for the main coming into town; no buffer is used for pipelines serving areas of town. These pipelines connect most properties, however, so a failure can cause energy failure to a wider area than the pipeline failure itself. The following table is the best estimate of assets at risk.

Table 5 – 12: Hazard Risk Analysis: Pipeline Transportation Incidents Affecting Afton

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	400	300	75%	$17,500	$15,000	86%	300	250	83%
Commercial	25	20	80%	$3,000	$2,500	83%	100	90	90%
Industrial	3	3	100%	$450	$450	100%	25	25	100%
Ag Structures	2	0	0%	$35	$0	0%	1	0	0%
Ag Land	250 ac	25 ac	10%	$105	$10	10%	--	--	--
Institutional ***	10	8	80%	$10,000	$9,000	90%	125	110	88%
Government ****	8	6	75%	$8,000	$7,000	88%	25	20	80%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	8	6	75%	$1,000	$750	75%	4	3	75%
Totals	456	343	75%	$40,090	$34,710	87%	580	498	86%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Pipeline transportation incidents can impact the town of Afton primarily by causing energy failure. Explosions and gas leaks can cause damage and widespread evacuations. It can damage utility infrastructures, such as other nearby pipelines, including water and sewer. Because most structures have natural gas service, approximately 75% of properties/buildings, 87% of values, and 86% of the population are in hazard areas. Because of the nature of this hazard, it is almost impossible to map the hazard areas throughout the town, especially when maps will not show which buildings are connected. In the future such data may be available if having it is of strong value.

Most of the critical assets in Afton, shown in Table 5 – 11, are at direct risk due to pipeline transportation incidents.

Table 5 – 13: List of Critical Assets in Afton At Risk for Pipeline Transportation Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall/police sta.	115 E. Kansas	X				2,500	$500 K	$500 K	$1.5 M	$3,000	10
City maint. bldg.	316 E. Railroad	X				5,000	$350 K	$1 M	$250 K	$1,000	5
Afton Fire Dept.	108 W. Kansas	X				5,000	$600 K	$800 K	$100 K	$1,000	25
U.C. Fairgrounds	211 S. Grace	X	X		X	10 acres	$4 M	$1.5 M	$200 K	$500	10-500
US Post Office	208 W. Kansas	X				5,000	$250 K	$200 K	$250 K	$1,000	10-20
Community center	240 N. Douglas	X	X	X		5,000	$400 K	$100 K	$150 K	$500	1-100
Phone station	105 N. Douglas	X		X		2,000	$200 K	$500 K	$200 K	$500	1-5
Casey's Gen. Stores	501 N. Douglas	X		X		4,000	$500 K	$1 M	$1 M	$2,000	10-50
First National Bank	100 E. Railroad	X		X		7,500	$750 K	$1 M	$5 M	$5,000	10-50
United Methodist Ch.	111 S. Douglas		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
County C.A.R.E.	500 Opal St.		X			20,000	$3 M	$4 M	$1.5 M	$5,000	30-75
St. Edwards Catholic	100 W. Union		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
Assembly of God	105 S. Browning		X		X	5,000	$750 K	$1 M	$100 K	$500	10-100
Farmer's Coop	196 E. Railroad			X		2 acres	$3 M	$1 M	$2 M	$2,000	20-30
Afton Vet Clinic	2508 E. Grand			X		5,000	$250 K	$200 K	$250 K	$500	2-5
Iowa Select Farms	101 N. Douglas			X		5,000	$250 K	$400 K	$1 M	$1,000	10-20
Union County Shop	W. edge of Afton	X				7,500	$65 K	$5,000	$1,700	$30	2

Source: Hazard Mitigation Planning Team, local officials

5.5.3: Structural Fire

Almost all occupiable structures in Afton are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonably common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 14: Hazard Risk Analysis: Structural Fires Affecting Afton

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	400	400	100%	$17,500	$17,500	100%	300	300	100%
Commercial	25	25	100%	$3,000	$3,000	100%	100	100	100%
Industrial	3	3	100%	$450	$450	100%	25	25	100%
Ag Structures	2	2	100%	$35	$35	100%	1	1	100%
Ag Land	250 ac	0 ac	0%	$105	$0	0%	--	--	--
Institutional ***	10	8	80%	$10,000	$9,000	90%	125	120	95%
Government ****	8	4	50%	$8,000	$6,000	75%	25	13	52%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	8	5	63%	$1,000	$650	65%	4	3	75%
Totals	456	447	98%	$40,090	$36,635	91%	580	562	97%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Afton, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. Some structures, mostly government and utilities, are not combustible and would not be at significant risk.

Most of the critical assets in Afton, shown in Table 5 – 11, are at direct risk due to structural fires.

Table 5 – 15: List of Critical Assets in Afton At Risk for Structural Fires

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall/police sta.	115 E. Kansas	X				2,500	$500 K	$500 K	$1.5 M	$3,000	10
City maint. bldg.	316 E. Railroad	X				5,000	$350 K	$1 M	$250 K	$1,000	5
Afton Fire Dept.	108 W. Kansas	X				5,000	$600 K	$800 K	$100 K	$1,000	25
U.C. Fairgrounds	211 S. Grace	X	X		X	10 acres	$4 M	$1.5 M	$200 K	$500	10-500
US Post Office	208 W. Kansas	X				5,000	$250 K	$200 K	$250 K	$1,000	10-20
Community center	240 N. Douglas	X	X	X		5,000	$400 K	$100 K	$150 K	$500	1-100
Electric substation	111 W. Jefferson	X		X		½ acre	$5 M	$5 M	$1.5 M	$5,000	0
Phone station	105 N. Douglas	X		X		2,000	$200 K	$500 K	$200 K	$500	1-5
Casey's Gen. Stores	501 N. Douglas	X		X		4,000	$500 K	$1 M	$1 M	$2,000	10-50
First National Bank	100 E. Railroad	X		X		7,500	$750 K	$1 M	$5 M	$5,000	10-50
United Methodist Ch.	111 S. Douglas		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
County C.A.R.E.	500 Opal St.		X			20,000	$3 M	$4 M	$1.5 M	$5,000	30-75
St. Edwards Catholic	100 W. Union		X		X	7,500	$1 M	$1.1 M	$100 K	$500	10-150
Assembly of God	105 S. Browning		X		X	5,000	$750 K	$1 M	$100 K	$500	10-100
Farmer's Coop	196 E. Railroad			X		2 acres	$3 M	$1 M	$2 M	$2,000	20-30
Afton Vet Clinic	2508 E. Grand			X		5,000	$250 K	$200 K	$250 K	$500	2-5
Iowa Select Farms	101 N. Douglas			X		5,000	$250 K	$400 K	$1 M	$1,000	10-20
Union County Shop	W. edge of Afton	X				7,500	$65 K	$5,000	$1,700	$30	2

Source: Hazard Mitigation Planning Team, local officials

5.5.4: Other Hazards

Other Priority II and III hazards in Afton can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.6: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Arispe

Arispe's incorporated area is exposed to ten Priority I hazards. This section delineates those risks by properties and population.

5.6.1. Hazards That Can Impact All Properties

The town of Arispe is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 16: Hazard Risk Analysis: Widespread Events Affecting All of Arispe

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	49	49	100%	$2,050	$2,050	100%	35	35	100%
Commercial	3	3	100%	$383	$383	100%	5	5	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$10	$10	100%	1	1	100%
Ag Land	332 ac	332 ac	100%	$120	$120	100%	--	--	--
Institutional ***	2	2	100%	$500	$500	100%	2	2	100%
Government ****	2	2	100%	$500	$500	100%	2	2	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	2	100%	$150	$150	100%	1	1	100%
Totals	59	59	100%	$3,713	$3,713	100%	46	46	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 59 primary structures in the rural part of the county. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $3,713,000. The total population in the area during the planning timeframe is approximately 46. This compares to the Census population of 100. During the daytime, many people in Arispe travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Arispe's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

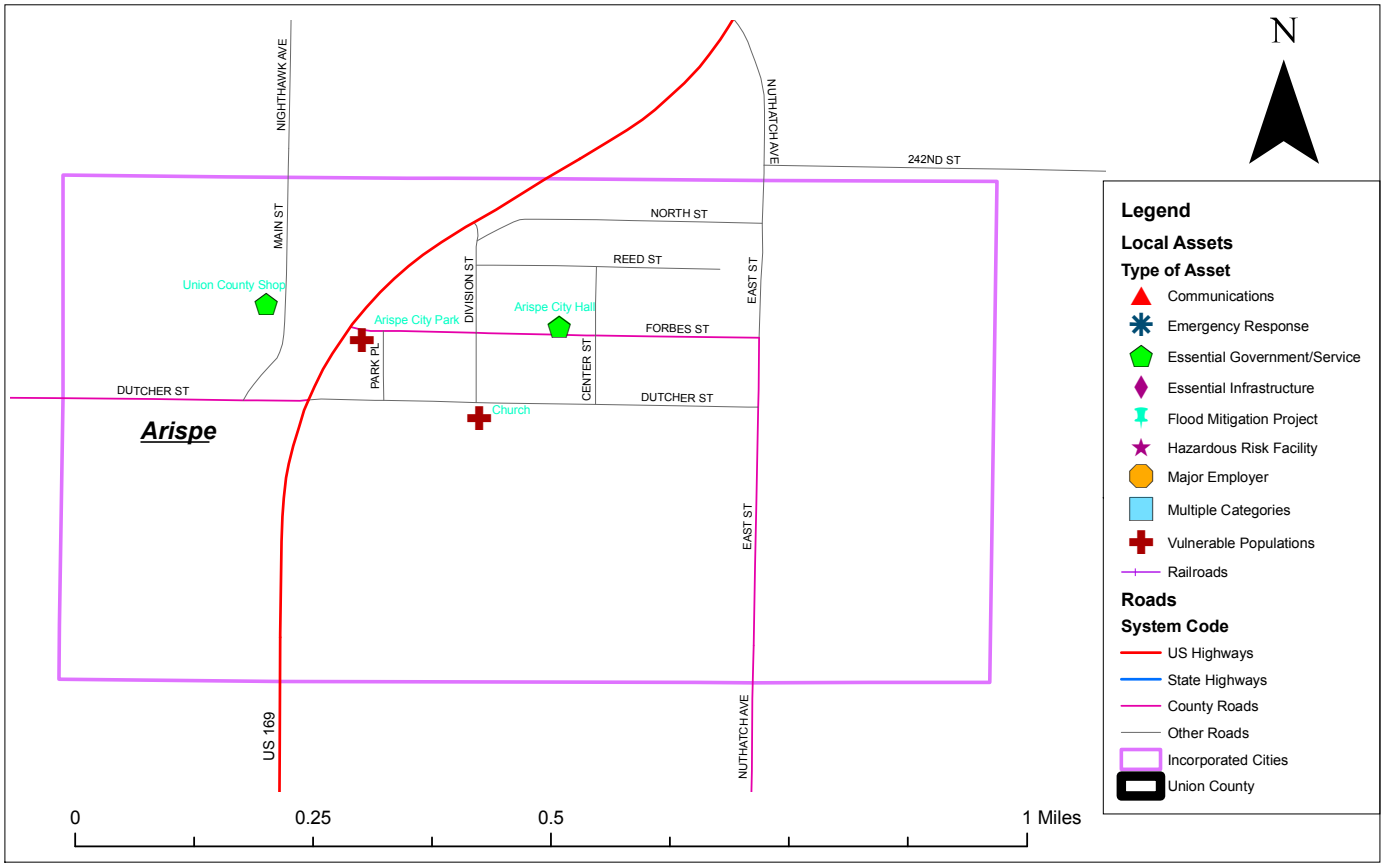
Table 5 – 17: List of Critical Assets in Arispe At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Arispe City Hall	Arispe	X				1,000	$50 K	$10,000	$25,000	$50	10
United Methodist Ch. with fixed generator	South pt Arispe	X	X			5,000	$300 K	$100 K	$75,000	$50	100
Arispe city park	West pt. Arispe		X			2 acres	$50 K	$50 K	$2,000	$25	100
Union County Shop	Arispe	X				2,500	$65 K	$4,000	$1,600	$20	1

Source: Hazard Mitigation Planning Team, local officials

The map on the next page shows Arispe's critical assets as listed in the above table.

Figure 5 – 3: Map of Arispe Critical Assets



5.6.2: Structural Fire

Almost all occupiable structures in Arispe are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonable common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 18: Hazard Risk Analysis: Structural Fires Affecting Arispe

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	49	49	100%	$2,050	$2,050	100%	35	35	100%
Commercial	3	3	100%	$383	$383	100%	5	5	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$10	$10	100%	1	1	100%
Ag Land	332 ac	0 ac	0%	$120	$0	0%	--	--	--
Institutional ***	2	2	100%	$500	$500	100%	2	2	100%
Government ****	2	1	50%	$500	$250	50%	2	1	50%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	1	50%	$150	$75	50%	1	1	100%
Totals	59	57	97%	$3,713	$3,268	88%	46	45	98%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Arispe, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. Some structures, mostly government and utilities, are not combustible and would not be at significant risk.

Most of the critical assets in Arispe, shown in Table 5 – 17, are at direct risk due to structural fires.

Table 5 – 19: List of Critical Assets in Arispe At Risk for Structural Fires

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Arispe City Hall	Arispe	X				1,000	$50 K	$10,000	$25,000	$50	10
United Methodist Ch. with fixed generator	South pt Arispe	X	X			5,000	$300 K	$100 K	$75,000	$50	100
Union County Shop	Arispe	X				2,500	$65 K	$4,000	$1,600	$20	1

Source: Hazard Mitigation Planning Team, local officials

5.6.3: Other Hazards

Other Priority II and III hazards in Arispe can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.7: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Creston

Creston's incorporated area is exposed to twelve Priority I hazards, plus river flooding, which is a Priority II hazard. This section delineates those risks by properties and population.

5.7.1. Hazards That Can Impact All Properties

The town of Creston is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Extreme heat
- Flash flood
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 20: Hazard Risk Analysis: Widespread Events Affecting All of Creston

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	3,773	100%	$215,000	$215,000	100%	3,500	3,500	100%
Commercial	300	300	100%	$69,000	$69,000	100%	1,250	1,250	100%
Industrial	12	12	100%	$13,250	$13,250	100%	1,250	1,250	100%
Ag Structures	2	2	100%	$39	$39	100%	1	1	100%
Ag Land	1,100 ac	1,100 ac	100%	$415	$415	100%	--	--	--
Institutional ***	50	50	100%	$50,000	$50,000	100%	750	750	100%
Government ****	35	35	100%	$50,000	$50,000	100%	250	250	100%
Education	8	8	100%	$50,000	$50,000	100%	2,500	2,500	100%
Utilities *****	15	15	100%	$15,000	$15,000	100%	25	25	100%
Totals	4,195	4,195	100%	$462,704	$462,704	100%	9,526	9,526	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 4,195 primary structures in Creston. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $462,704,000. The total population in the area during the planning timeframe is approximately 9,526. This compares to the Census population of 7,834. During the daytime, many people from outside of Creston travel into town for school, work,

shopping, and access to services, thereby increasing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. Because of the large number of events that attract people to town and from town to other places, like Des Moines, the impacted population can change greatly by time of day, time of year, and day of week. During the school year, when college students are in town, the populations impacted will generally be higher than in the summer.

The following table shows Creston's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

Table 5 – 21: List of Critical Assets in Creston At Risk For Widespread Events

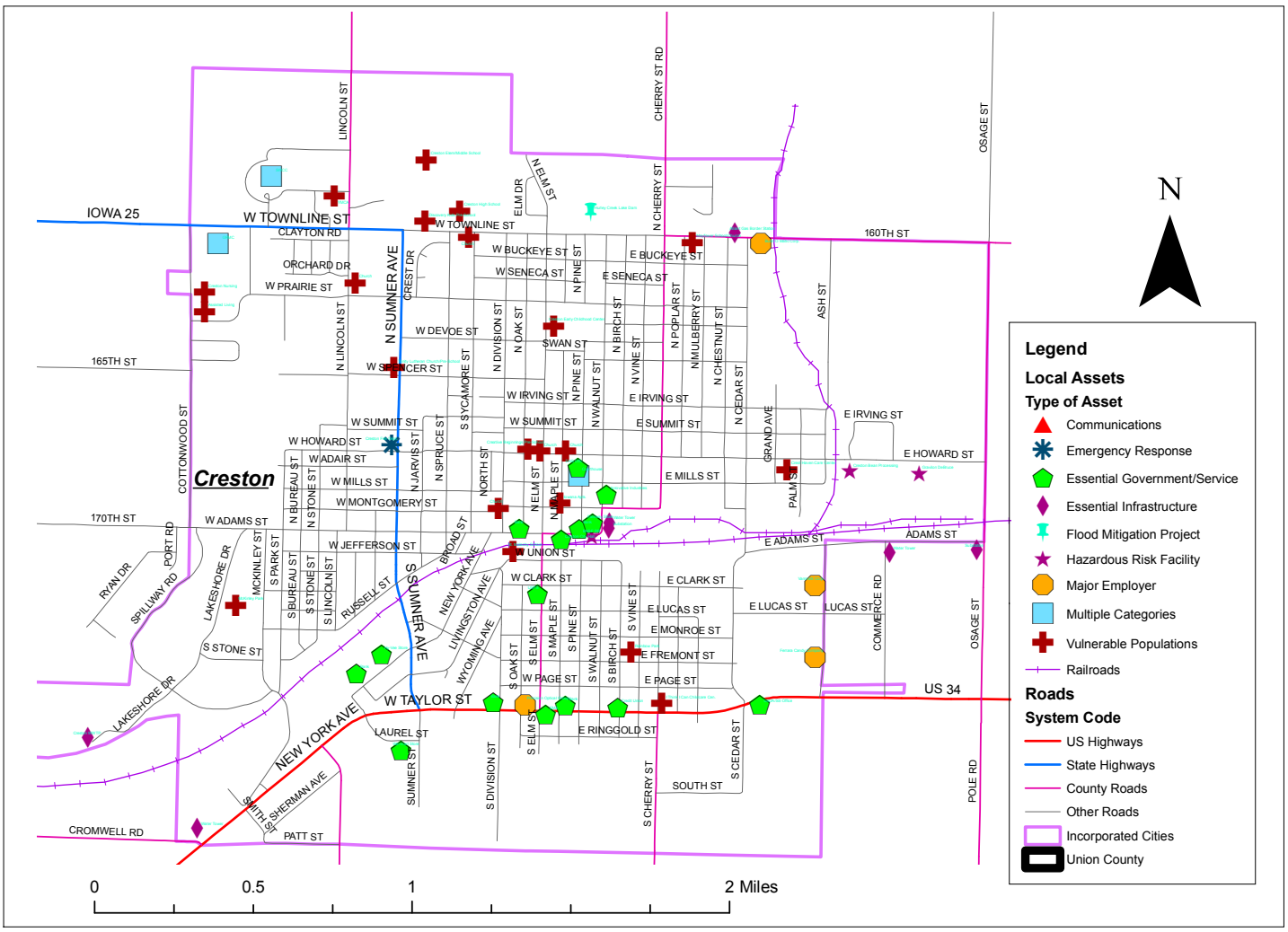
Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Creston City Hall	116 W. Adams	X			X	10,000	$1 M	$500 K	$5 M	$2,000	100
Creston Fire Dept.	500 N. Sumner St.	X				15,000	$750,000	$2 M	$1 M	$2,000	30
Creston WWTP	W. edge of town	X				10 acres	$6 M	$1 M	$2 M	$10,000	10
Creston Water Towers (3)	Uptown, SW, industrial park	X				3 towers	$3 M	$250 K	$250 K	$5,000	--
Greater Regional Medical Center * # @	1610 W. Townline St.	X	X	X		150,000	$31 M	$3.5 M	$39 M	$65,000	550
U.C. Law Enforcement Center	302 N. Pine St.	X				25,000	$7 M	$1 M	$725 K	$5,000	30
U.C. Courthouse	300 N. Pine St.	X			X	50,000	$3 M	$2 M	$7.5 M	$1,500	250
Emergency Mgt. Ofc	208 W. Taylor	X				20,000	$2 M	$200 K	$85,000	$100	1
Dept. of Human Svcs	304 N. Pine St.	X				1,500	$50 K	$200 K	$40,000	$100	6
USDA/Farm Service	904 E. Taylor St.	X				5,000	$447 K	$250 K	$500 K	$100	10
Social Security Ofc	E. Taylor St.	X				5,000	$455 K	$500 K	$500 K	$250	15
US Post Office	300 S. Elm St.	X				10,000	$1 M	$500 K	$1 M	$500	25
McKinley Park, lake, and safe room *	S. McKinley St.	X	X		X	150 acres	$1 M	$4 M	$250 K	$250	1,000
Rainbow Park	S. Birch St.		X			5 acres	$100 K	$100 K	$25 K	$25	100
Hurley Creek lake dam	North of Townline St.	X				750 LF	$2 M	$10 K	$10 K	$250	5
Creston High School * # @	601 W. Townline	X	X	X	X	150,000	$17.5 M	$3 M	$5 M	$10,000	730
Creston Elem/Middle School * # @	805 Academic Ave.	X	X	X	X	100,000	$19.6 M	$3.1 M	$5 M	$10,000	1,102
Creston Early Childhood Center * #	801 N. Elm	X	X	X		100,000	$11 M	$542 K	$3 M	$5,000	291
Mayflower School, Crest Baptist Ch. #	1211 N. Poplar St.	X	X	X		15,000	$2 M	$500 K	$150 K	$1,000	200
St. Malachy School #	403 W. Clark St.	X	X	X		40,000	$4 M	$750 K	$500 K	$2,000	200
SWCC Student Center * # @	1404 Spartan Drive	X	X	X	X	75 acres	$10 M	$500 K	$2.6 M	$5,000	3,000
SWCC Student Dorms	1314 Student Dr.		X	X	X	50,000	$5.5 M	$500 K	$200 K	$5,000	200
SWCC Instructional Center	1415 Southwestern Blvd.	X	X	X	X	75,000	$20 M	$2.2 M	$4.92 M	$5,000	5,000
SWCC Admin Bldg	1311 Southwestern		X	X		10,000	$1.5 M	$400 K	$1 M	$2,000	300
SWCC Tech Center	1209 Southwestern		X	X		20,000	$3.5 M	$500 K	$390 K	$3,500	400
SWCC Allied Health Bldg	1409 Southwestern		X	X		20,000	$7.5 M	$500 K	$1.5 M	$2,500	350
SWCC Maintenance	1507 Spartan Dr.	X	X	X	X	20,000	$500 K	$350 K	$1 M	$2,000	1100

Building											
I Think I Can Childcare	705 S. Cherry St.		X	X		15,000	$2 M	$500 K	$250 K	$1,000	100
Trinity Lutheran Ch. & Pre-school #	800 N. Sumner St.	X	X			10,000	$1.5 M	$500 K	$250 K	$600	25
Discovery Kids Pre-school	701 W. Townline St.		X			2,500	$500 K	$250 K	$100 K	$500	25
Creative Beginnings Pre-school	305 W. Howard St.		X			3,000	$500 K	$250 K	$100 K	$500	25
YMCA, Performing Arts Center # @	1201 W. Townline St.	X	X		X	50,000	$3 M	$3 M	$500 K	$2,500	250
Creston Bean Processing	1310 E. Howard St.			X		50,000+	$1.5 M	$1.5 M	$1 M	$10,000	30
Gravilon DeBruce	300 N. Osage St.			X		100,000+	$5 M	$5 M	$1 M	$10,000	50
BNSF Railroad	Uptown Creston	X		X		25,000	$2 M	$1 M	$1 M	$10,000	25
Vanmark Corp.	Industrial Pkwy.		X	X		5,000	$1 M	$1 M	$1 M	$5,000	30
Bunn-O-Matic Corp	900 E. Townline		X	X		100,000	$1.6 M	$5 M	$3 M	$5,000	500
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500
Precision Optical	701 S. Oak St.		X	X		50,000	$437 K	$2 M	$1 M	$2,500	200
Alliant Energy Gas Border station	E. Townline St.	X				Half acre	$2 M	$50,000	$2 M	$10,000	1
First National Bank	101 W. Adams St.	X		X		5,000	$1 M	$1 M	$750 K	$5,000	25
Iowa State Savings Bank	401 W. Adams St.	X		X		7,500	$1 M	$2 M	$1 M	$7,500	30
First Federal Savings Bank	501 W. Taylor St.	X		X		4,000	$750 K	$750 K	$600 K	$4,000	20
State Savings Bank	602 Sheldon St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Great Western Bank	103 W. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Nishna Valley Credit Union	E. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Wal-mart Store	806 Laurel St.		X	X		75,000	$8.7 M	$8.7 M	$2 M	$5,000	500
Hy-Vee Store	600 Sheldon Ave.		X	X		40,000	$1.3 M	$1.3 M	$1 M	$2,500	250
Fareway Store	105 E. Adams St.		X	X		40,000	$0.9 M	$0.9 M	$1 M	$2,500	250
Innovative Industries	215 N. Walnut St.		X	X		25,000	$867 K	$500 K	$500 K	$2,000	130
Crest Haven Nursing Home # @	1000 E. Howard St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Creston Nursing and Rehab Center # @	1001 Cottonwood St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Prairie View Assisted Living	1709 W. Prairie St.	X	X	X		75,000	$3 M	$750 K	$500 K	$7,000	75
Iowana Apartments	203 W. Montgomery St.		X		X	50,000	$4 M	$1 M	$500 K	$2,500	40
Salem Lutheran Ch. #	602 W. Townline	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
United Methodist Ch. #	400 N. Elm St.	X	X			15,000	$3 M	$500 K	$150 K	$100	250
Catholic Ch. #	107 W. Howard	X	X			15,000	$3 M	$500 K	$150 K	$100	250
First Baptist Ch #	1001 N. Lincoln	X	X			20,000	$3 M	$500 K	$150 K	$100	250
United Church of Christ #	501 W. Montgomery St.	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
Central electric substation	Uptown Creston	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2
Industrial park substation	S. Osage St.	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

The map on the next page shows Creston's critical assets as listed in the above table.

Figure 5 – 4: Map of Creston Critical Assets



5.7.2: River Flood

River floods certainly impact Creston, usually causing damage to basements, roads, culverts, and school property. Creston has been mapped, but the latest FIRM map is over 30 years old; an updated map will be created in the next few years. Based on the existing map and the FEMA Community Overview, we have a good idea about how many structures are vulnerable. We have some data about the types of structures and can accurately estimate the number of homes and other buildings in river flood prone areas. The following table is the best estimate of assets at risk.

Table 5 – 22: Hazard Risk Analysis: River Floods Affecting Creston

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	34	1%	$215,000	$2,000	1%	3,500	102	3%
Commercial	300	5	2%	$69,000	$1,000	1%	1,250	12	1%
Industrial	12	1	8%	$13,250	$5,000	38%	1,250	500	40%
Ag Structures	2	0	0%	$39	$0	0%	1	0	0%
Ag Land	1,100 ac	200 ac	18%	$415	$70	17%	--	--	--
Institutional ***	50	0	0%	$50,000	$0	0%	750	0	0%
Government ****	35	3	9%	$50,000	$5,000	10%	250	50	20%
Education	8	1	13%	$50,000	$5,000	10%	2,500	200	8%
Utilities *****	15	2	13%	$15,000	$2,000	13%	25	2	8%
Totals	4,195	46	1%	$462,704	$20,070	4%	9,526	866	9%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

River flooding can impact the city primarily by damaging basements, some homes, culverts, park areas, a few businesses, and some farmland. It can (has) also damage the gym of the Creston Early Childhood Center. It can damage utility infrastructures, such as overhead lines. The candy factory is also built on a waterway, which has been channeled to the west of the building but within the property. Flooding can reduce or stop transportation in certain parts of the city, thereby affecting more people than the above table indicates. Approximately 1% of properties/buildings, 4% of values, and 9% of the population are in hazard areas. This data can be updated following the provision of new flood maps and a survey of structures and properties located in flood areas.

Many critical assets in Creston, shown in Table 5 – 21, are at direct risk due to river floods.

Table 5 – 23: List of Critical Assets in Creston At Risk for River Flooding

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
McKinley Park, lake, and safe room *	S. McKinley St.	X	X		X	150 acres	$1 M	$4 M	$250 K	$250	1,000
Hurley Creek lake dam	North of Townline St.	X				750 LF	$2 M	$10 K	$10 K	$250	5
Creston Early Childhood Center * #	801 N. Elm	X	X	X		100,000	$11 M	$542 K	$3 M	$5,000	291
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

5.7.3: Fixed Hazardous Materials Incident

Many structures in Creston are at risk of a fixed hazardous materials incident, which could cause an explosion and release of deadly chemicals and gases into the air. Many businesses, industries, and institutions use hazardous materials for manufacturing, research, medical care, cooking, and other uses. A buffer of 1,000 feet is used as a proxy for all 33 EPA listed hazardous materials sites in Creston (as of August 2012). Note that the EPA and other agencies may give different risk radii for different facilities, but this assessment does not go into that level of detail. Based on the accepted buffer zones, the following table is the best estimate of assets at risk.

Table 5 – 24: Hazard Risk Analysis: Fixed Hazardous Materials Incidents Affecting Creston

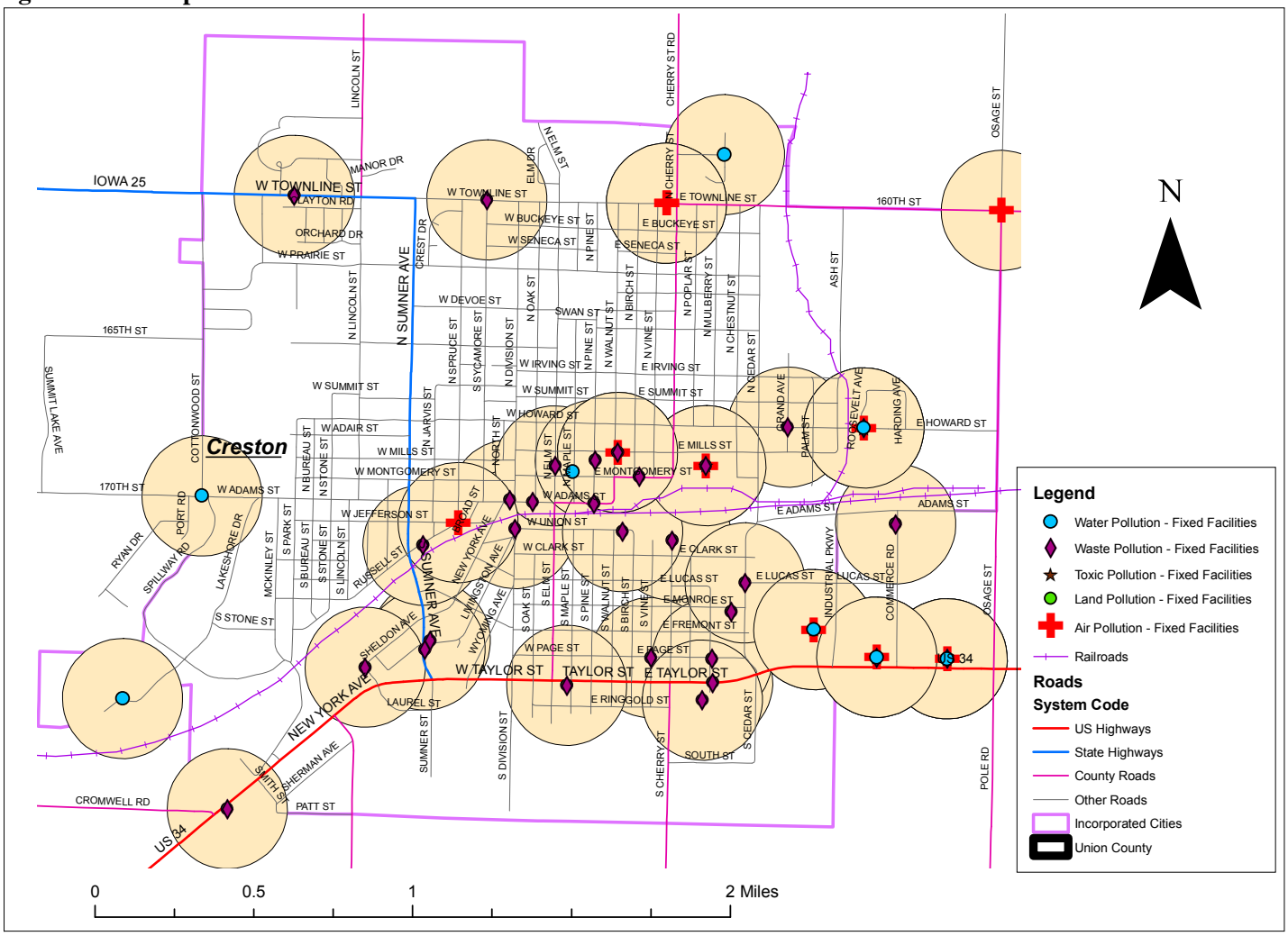
Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	1,500	40%	$215,000	$80,000	37%	3,500	1,400	40%
Commercial	300	250	83%	$69,000	$60,000	87%	1,250	1,100	88%
Industrial	12	12	100%	$13,250	$13,250	100%	1,250	1,250	100%
Ag Structures	2	0	0%	$39	$0	0%	1	0	0%
Ag Land	1,100 ac	200 ac	18%	$415	$80	19%	--	--	--
Institutional ***	50	25	50%	$50,000	$35,000	70%	750	550	73%
Government ****	35	25	71%	$50,000	$40,000	80%	250	200	80%
Education	8	4	50%	$50,000	$30,000	60%	2,500	1,500	60%
Utilities *****	15	8	53%	$15,000	$8,000	53%	25	13	52%
Totals	4,195	1,824	43%	$462,704	$266,330	58%	9,526	6,013	63%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

The many buildings located in various parts of Creston means that nearly half of the properties in town can be effected by an incident with exposure up to 1,000 feet of the fixed site. Because many of the buildings that are at

risk are highly populated, approximately 43% of properties/buildings, 58% of values, and 63% of the population are in hazard areas. The following map shows the location of fixed hazard materials EPA regulated sites.

Figure 5 – 5: Map of Creston EPA Sites



Most of the critical assets in Creston, shown in Table 5 – 21, are at direct risk due to fixed hazardous materials incidents.

Table 5 – 25: List of Critical Assets in Creston At Risk for Fixed Hazardous Materials Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Creston City Hall	116 W. Adams	X			X	10,000	$1 M	$500 K	$5 M	$2,000	100
Creston WWTP	W. edge of town	X				10 acres	$6 M	$1 M	$2 M	$10,000	10
Greater Regional Medical Center * # @	1610 W. Townline St.	X	X	X		150,000	$31 M	$3.5 M	$39 M	$65,000	550
U.C. Law Enforcement Center	302 N. Pine St.	X				25,000	$7 M	$1 M	$725 K	$5,000	30
U.C. Courthouse	300 N. Pine St.	X			X	50,000	$3 M	$2 M	$7.5 M	$1,500	250

Emergency Mgt. Ofc	208 W. Taylor	X				20,000	$2 M	$200 K	$85,000	$100	1
Dept. of Human Svcs	304 N. Pine St.	X				1,500	$50 K	$200 K	$40,000	$100	6
USDA/Farm Service	904 E. Taylor St.	X				5,000	$447 K	$250 K	$500 K	$100	10
Social Security Ofc	E. Taylor St.	X				5,000	$455 K	$500 K	$500 K	$250	15
US Post Office	300 S. Elm St.	X				10,000	$1 M	$500 K	$1 M	$500	25
McKinley Park, lake, and safe room *	S. McKinley St.	X	X		X	150 acres	$1 M	$4 M	$250 K	$250	1,000
Rainbow Park	S. Birch St.		X			5 acres	$100 K	$100 K	$25 K	$25	100
Creston High School * # @	601 W. Townline	X	X	X	X	150,000	$17.5 M	$3 M	$5 M	$10,000	730
Mayflower School, Crest Baptist Ch. #	1211 N. Poplar St.	X	X	X		15,000	$2 M	$500 K	$150 K	$1,000	200
St. Malachy School #	403 W. Clark St.	X	X	X		40,000	$4 M	$750 K	$500 K	$2,000	200
SWCC Student Center * # @	1404 Spartan Drive	X	X	X	X	75 acres	$10 M	$500 K	$2.6 M	$5,000	3,000
SWCC Student Dorms	1314 Student Dr.		X	X	X	50,000	$5.5 M	$500 K	$200 K	$5,000	200
SWCC Instructional Center	1415 Southwestern Blvd.	X	X	X	X	75,000	$20 M	$2.2 M	$4.92 M	$5,000	5,000
SWCC Admin Bldg	1311 Southwestern		X	X		10,000	$1.5 M	$400 K	$1 M	$2,000	300
SWCC Tech Center	1209 Southwestern		X	X		20,000	$3.5 M	$500 K	$390 K	$3,500	400
SWCC Allied Health Bldg	1409 Southwestern		X	X		20,000	$7.5 M	$500 K	$1.5 M	$2,500	350
SWCC Maintenance Building	1507 Spartan Dr.	X	X	X	X	20,000	$500 K	$350 K	$1 M	$2,000	1100
I Think I Can Childcare	705 S. Cherry St.		X	X		15,000	$2 M	$500 K	$250 K	$1,000	100
Discovery Kids Pre-school	701 W. Townline St.		X			2,500	$500 K	$250 K	$100 K	$500	25
Creative Beginnings Pre-school	305 W. Howard St.		X			3,000	$500 K	$250 K	$100 K	$500	25
YMCA, Performing Arts Center # @	1201 W. Townline St.	X	X		X	50,000	$3 M	$3 M	$500 K	$2,500	250
Creston Bean Processing	1310 E. Howard St.			X		50,000+	$1.5 M	$1.5 M	$1 M	$10,000	30
Gravilon DeBruce	300 N. Osage St.			X		100,000+	$5 M	$5 M	$1 M	$10,000	50
BNSF Railroad	Uptown Creston	X		X		25,000	$2 M	$1 M	$1 M	$10,000	25
Vanmark Corp.	Industrial Pkwy.		X	X		5,000	$1 M	$1 M	$1 M	$5,000	30
Bunn-O-Matic Corp	900 E. Townline		X	X		100,000	$1.6 M	$5 M	$3 M	$5,000	500
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500
Precision Optical	701 S. Oak St.		X	X		50,000	$437 K	$2 M	$1 M	$2,500	200
Alliant Energy Gas Border station	E. Townline St.	X				Half acre	$2 M	$50,000	$2 M	$10,000	1
First National Bank	101 W. Adams St.	X		X		5,000	$1 M	$1 M	$750 K	$5,000	25
Iowa State Savings Bank	401 W. Adams St.	X		X		7,500	$1 M	$2 M	$1 M	$7,500	30
First Federal Savings Bank	501 W. Taylor St.	X		X		4,000	$750 K	$750 K	$600 K	$4,000	20
State Savings Bank	602 Sheldon St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Great Western Bank	103 W. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Nishna Valley Credit Union	E. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Wal-mart Store	806 Laurel St.		X	X		75,000	$8.7 M	$8.7 M	$2 M	$5,000	500
Hy-Vee Store	600 Sheldon Ave.		X	X		40,000	$1.3 M	$1.3 M	$1 M	$2,500	250
Fareway Store	105 E. Adams St.		X	X		40,000	$0.9 M	$0.9 M	$1 M	$2,500	250
Innovative Industries	215 N. Walnut St.		X	X		25,000	$867 K	$500 K	$500 K	$2,000	130
Crest Haven Nursing Home # @	1000 E. Howard St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Creston Nursing and Rehab Center # @	1001 Cottonwood St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Prairie View Assisted	1709 W. Prairie	X	X	X		75,000	$3 M	$750 K	$500 K	$7,000	75

Living	St.										
Iowana Apartments	203 W. Montgomery St.		X		X	50,000	$4 M	$1 M	$500 K	$2,500	40
Salem Lutheran Ch. #	602 W. Townline	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
United Methodist Ch. #	400 N. Elm St.	X	X			15,000	$3 M	$500 K	$150 K	$100	250
Catholic Ch. #	107 W. Howard	X	X			15,000	$3 M	$500 K	$150 K	$100	250
United Church of Christ #	501 W. Montgomery St.	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
Central electric substation	Uptown Creston	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2
Industrial park substation	S. Osage St.	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

5.7.4: Pipeline Transportation Incident

Almost all occupiable structures in Creston are at risk of a pipeline transportation incident, which could cause an explosion and release of deadly fumes in homes and businesses. Most of Creston's homes have access to pipelines that supply natural gas. Manufacturers use natural gas for heating and production processes. A buffer of 1,000 feet is used for the main coming into town; no buffer is used for pipelines serving areas of town. These pipelines connect most properties, however, so a failure can cause energy failure to a wider area than the pipeline failure itself. The following table is the best estimate of assets at risk.

Table 5 – 26: Hazard Risk Analysis: Pipeline Transportation Incidents Affecting Creston

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	3,500	93%	$215,000	$208,000	97%	3,500	3,400	97%
Commercial	300	280	93%	$69,000	$66,000	96%	1,250	1,200	96%
Industrial	12	12	100%	$13,250	$13,250	100%	1,250	1,250	100%
Ag Structures	2	0	0%	$39	$0	0%	1	0	0%
Ag Land	1,100 ac	50 ac	5%	$415	$20	5%	--	--	--
Institutional ***	50	48	96%	$50,000	$49,000	98%	750	725	97%
Government ****	35	30	86%	$50,000	$43,000	86%	250	200	80%
Education	8	8	100%	$50,000	$50,000	60%	2,500	2,500	100%
Utilities *****	15	10	67%	$15,000	$10,000	67%	25	20	80%
Totals	4,195	3,888	93%	$462,704	$439,270	95%	9,526	9,295	98%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Pipeline transportation incidents can impact the town of Creston primarily by causing energy failure. Explosions and gas leaks can cause damage and widespread evacuations. It can damage utility infrastructures, such as other nearby pipelines, including water and sewer. Because most structures have natural gas service, approximately 93% of properties/buildings, 95% of values, and 98% of the population are in hazard areas. Because of the nature of this hazard, it is almost impossible to map the hazard areas throughout the town, especially when maps will not show which buildings are connected. In the future such data may be available if having it is of strong value.

Most of the critical assets in Creston, shown in Table 5 – 21, are at direct risk due to pipeline transportation incidents.

Table 5 – 27: List of Critical Assets in Creston At Risk for Pipeline Transportation Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Creston City Hall	116 W. Adams	X			X	10,000	$1 M	$500 K	$5 M	$2,000	100
Creston Fire Dept.	500 N. Sumner St.	X				15,000	$750,000	$2 M	$1 M	$2,000	30
Creston WWTP	W. edge of town	X				10 acres	$6 M	$1 M	$2 M	$10,000	10
Greater Regional Medical Center * # @	1610 W. Townline St.	X	X	X		150,000	$31 M	$3.5 M	$39 M	$65,000	550
U.C. Law Enforcement Center	302 N. Pine St.	X				25,000	$7 M	$1 M	$725 K	$5,000	30
U.C. Courthouse	300 N. Pine St.	X			X	50,000	$3 M	$2 M	$7.5 M	$1,500	250
Emergency Mgt. Ofc	208 W. Taylor	X				20,000	$2 M	$200 K	$85,000	$100	1
Dept. of Human Svcs	304 N. Pine St.	X				1,500	$50 K	$200 K	$40,000	$100	6
USDA/Farm Service	904 E. Taylor St.	X				5,000	$447 K	$250 K	$500 K	$100	10
Social Security Ofc	E. Taylor St.	X				5,000	$455 K	$500 K	$500 K	$250	15
US Post Office	300 S. Elm St.	X				10,000	$1 M	$500 K	$1 M	$500	25
Creston High School * # @	601 W. Townline	X	X	X	X	150,000	$17.5 M	$3 M	$5 M	$10,000	730
Creston Elem/Middle School * # @	805 Academic Ave.	X	X	X	X	100,000	$19.6 M	$3.1 M	$5 M	$10,000	1,102
Creston Early Childhood Center * #	801 N. Elm	X	X	X		100,000	$11 M	$542 K	$3 M	$5,000	291
Mayflower School, Crest Baptist Ch. #	1211 N. Poplar St.	X	X	X		15,000	$2 M	$500 K	$150 K	$1,000	200
St. Malachy School #	403 W. Clark St.	X	X	X		40,000	$4 M	$750 K	$500 K	$2,000	200
SWCC Student Center * # @	1404 Spartan Drive	X	X	X	X	75 acres	$10 M	$500 K	$2.6 M	$5,000	3,000
SWCC Student Dorms	1314 Student Dr.		X	X	X	50,000	$5.5 M	$500 K	$200 K	$5,000	200
SWCC Instructional Center	1415 Southwestern Blvd.	X	X	X	X	75,000	$20 M	$2.2 M	$4.92 M	$5,000	5,000
SWCC Admin Bldg	1311 Southwestern		X	X		10,000	$1.5 M	$400 K	$1 M	$2,000	300
SWCC Tech Center	1209 Southwestern		X	X		20,000	$3.5 M	$500 K	$390 K	$3,500	400
SWCC Allied Health Bldg	1409 Southwestern		X	X		20,000	$7.5 M	$500 K	$1.5 M	$2,500	350
SWCC Maintenance Building	1507 Spartan Dr.	X	X	X	X	20,000	$500 K	$350 K	$1 M	$2,000	1100
I Think I Can Childcare	705 S. Cherry St.		X	X		15,000	$2 M	$500 K	$250 K	$1,000	100
Trinity Lutheran Ch. & Pre-school #	800 N. Sumner St.	X	X			10,000	$1.5 M	$500 K	$250 K	$600	25
Discovery Kids Pre-school	701 W. Townline St.		X			2,500	$500 K	$250 K	$100 K	$500	25
Creative Beginnings Pre-school	305 W. Howard St.		X			3,000	$500 K	$250 K	$100 K	$500	25
YMCA, Performing Arts Center # @	1201 W. Townline St.	X	X		X	50,000	$3 M	$3 M	$500 K	$2,500	250
Creston Bean Processing	1310 E. Howard St.			X		50,000+	$1.5 M	$1.5 M	$1 M	$10,000	30
Gravilon DeBruce	300 N. Osage St.			X		100,000+	$5 M	$5 M	$1 M	$10,000	50
BNSF Railroad	Uptown Creston	X		X		25,000	$2 M	$1 M	$1 M	$10,000	25
Vanmark Corp.	Industrial Pkwy.		X	X		5,000	$1 M	$1 M	$1 M	$5,000	30
Bunn-O-Matic Corp	900 E. Townline		X	X		100,000	$1.6 M	$5 M	$3 M	$5,000	500
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500

Precision Optical	701 S. Oak St.		X	X		50,000	$437 K	$2 M	$1 M	$2,500	200
Alliant Energy Gas Border station	E. Townline St.	X				Half acre	$2 M	$50,000	$2 M	$10,000	1
First National Bank	101 W. Adams St.	X		X		5,000	$1 M	$1 M	$750 K	$5,000	25
Iowa State Savings Bank	401 W. Adams St.	X		X		7,500	$1 M	$2 M	$1 M	$7,500	30
First Federal Savings Bank	501 W. Taylor St.	X		X		4,000	$750 K	$750 K	$600 K	$4,000	20
State Savings Bank	602 Sheldon St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Great Western Bank	103 W. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Nishna Valley Credit Union	E. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Wal-mart Store	806 Laurel St.		X	X		75,000	$8.7 M	$8.7 M	$2 M	$5,000	500
Hy-Vee Store	600 Sheldon Ave.		X	X		40,000	$1.3 M	$1.3 M	$1 M	$2,500	250
Fareway Store	105 E. Adams St.		X	X		40,000	$0.9 M	$0.9 M	$1 M	$2,500	250
Innovative Industries	215 N. Walnut St.		X	X		25,000	$867 K	$500 K	$500 K	$2,000	130
Crest Haven Nursing Home # @	1000 E. Howard St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Creston Nursing and Rehab Center # @	1001 Cottonwood St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Prairie View Assisted Living	1709 W. Prairie St.	X	X	X		75,000	$3 M	$750 K	$500 K	$7,000	75
Iowana Apartments	203 W. Montgomery St.		X		X	50,000	$4 M	$1 M	$500 K	$2,500	40
Salem Lutheran Ch. #	602 W. Townline	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
United Methodist Ch. #	400 N. Elm St.	X	X			15,000	$3 M	$500 K	$150 K	$100	250
Catholic Ch. #	107 W. Howard	X	X			15,000	$3 M	$500 K	$150 K	$100	250
First Baptist Ch #	1001 N. Lincoln	X	X			20,000	$3 M	$500 K	$150 K	$100	250
United Church of Christ #	501 W. Montgomery St.	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

5.7.5: Structural Fire

Almost all occupiable structures in Creston are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonably common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. There are dozens of structural fires in Creston annually, most of them involving outbuildings and small parts of the main structure. The following table is the best estimate of assets at risk.

Table 5 – 28: Hazard Risk Analysis: Structural Fires Affecting Creston

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	3,773	100%	$215,000	$215,000	100%	3,500	3,500	100%
Commercial	300	300	100%	$69,000	$69,000	100%	1,250	1,250	100%
Industrial	12	12	100%	$13,250	$13,250	100%	1,250	1,250	100%
Ag Structures	2	2	100%	$39	$39	100%	1	1	100%
Ag Land	1,100 ac	0 ac	0%	$415	$0	0%	--	--	--
Institutional ***	50	48	96%	$50,000	$49,000	98%	750	748	99.7%
Government ****	35	30	86%	$50,000	$44,000	88%	250	225	90%
Education	8	8	100%	$50,000	$50,000	100%	2,500	2,500	100%
Utilities *****	15	10	67%	$15,000	$5,000	33%	25	10	40%
Totals	4,195	4,183	99.7%	$462,704	$445,289	96%	9,526	9,514	99.8%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Creston, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. Over 99% of structures and people are vulnerable and 96%

of values are vulnerable. Some structures, mostly government and utilities, are not combustible and are not be at significant risk.

Most of the critical assets in Creston, shown in Table 5 – 21, are at direct risk due to structural fires.

Table 5 – 29: List of Critical Assets in Creston At Risk for Structural Fires

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Creston City Hall	116 W. Adams	X			X	10,000	$1 M	$500 K	$5 M	$2,000	100
Creston Fire Dept.	500 N. Sumner St.	X				15,000	$750,000	$2 M	$1 M	$2,000	30
Creston WWTP	W. edge of town	X				10 acres	$6 M	$1 M	$2 M	$10,000	10
Greater Regional Medical Center * # @	1610 W. Townline St.	X	X	X		150,000	$31 M	$3.5 M	$39 M	$65,000	550
U.C. Law Enforcement Center	302 N. Pine St.	X				25,000	$7 M	$1 M	$725 K	$5,000	30
U.C. Courthouse	300 N. Pine St.	X			X	50,000	$3 M	$2 M	$7.5 M	$1,500	250
Emergency Mgt. Ofc	208 W. Taylor	X				20,000	$2 M	$200 K	$85,000	$100	1
Dept. of Human Svcs	304 N. Pine St.	X				1,500	$50 K	$200 K	$40,000	$100	6
USDA/Farm Service	904 E. Taylor St.	X				5,000	$447 K	$250 K	$500 K	$100	10
Social Security Ofc	E. Taylor St.	X				5,000	$455 K	$500 K	$500 K	$250	15
US Post Office	300 S. Elm St.	X				10,000	$1 M	$500 K	$1 M	$500	25
McKinley Park, lake, and safe room *	S. McKinley St.	X	X		X	150 acres	$1 M	$4 M	$250 K	$250	1,000
Rainbow Park	S. Birch St.		X			5 acres	$100 K	$100 K	$25 K	$25	100
Creston High School * # @	601 W. Townline	X	X	X	X	150,000	$17.5 M	$3 M	$5 M	$10,000	730
Creston Elem/Middle School * # @	805 Academic Ave.	X	X	X	X	100,000	$19.6 M	$3.1 M	$5 M	$10,000	1,102
Creston Early Childhood Center * #	801 N. Elm	X	X	X		100,000	$11 M	$542 K	$3 M	$5,000	291
Mayflower School, Crest Baptist Ch. #	1211 N. Poplar St.	X	X	X		15,000	$2 M	$500 K	$150 K	$1,000	200
St. Malachy School #	403 W. Clark St.	X	X	X		40,000	$4 M	$750 K	$500 K	$2,000	200
SWCC Student Center * # @	1404 Spartan Drive	X	X	X	X	75 acres	$10 M	$500 K	$2.6 M	$5,000	3,000
SWCC Student Dorms	1314 Student Dr.		X	X	X	50,000	$5.5 M	$500 K	$200 K	$5,000	200
SWCC Instructional Center	1415 Southwestern Blvd.	X	X	X	X	75,000	$20 M	$2.2 M	$4.92 M	$5,000	5,000
SWCC Admin Bldg	1311 Southwestern		X	X		10,000	$1.5 M	$400 K	$1 M	$2,000	300
SWCC Tech Center	1209 Southwestern		X	X		20,000	$3.5 M	$500 K	$390 K	$3,500	400
SWCC Allied Health Bldg	1409 Southwestern		X	X		20,000	$7.5 M	$500 K	$1.5 M	$2,500	350
SWCC Maintenance Building	1507 Spartan Dr.	X	X	X	X	20,000	$500 K	$350 K	$1 M	$2,000	1100
I Think I Can Childcare	705 S. Cherry St.		X	X		15,000	$2 M	$500 K	$250 K	$1,000	100
Trinity Lutheran Ch. & Pre-school #	800 N. Sumner St.	X	X			10,000	$1.5 M	$500 K	$250 K	$600	25
Discovery Kids Pre-school	701 W. Townline St.		X			2,500	$500 K	$250 K	$100 K	$500	25
Creative Beginnings Pre-school	305 W. Howard St.		X			3,000	$500 K	$250 K	$100 K	$500	25
YMCA, Performing	1201 W.	X	X		X	50,000	$3 M	$3 M	$500 K	$2,500	250

Arts Center # @	Townline St.										
Creston Bean Processing	1310 E. Howard St.			X		50,000+	$1.5 M	$1.5 M	$1 M	$10,000	30
Gravilon DeBruce	300 N. Osage St.			X		100,000+	$5 M	$5 M	$1 M	$10,000	50
BNSF Railroad	Uptown Creston	X		X		25,000	$2 M	$1 M	$1 M	$10,000	25
Vanmark Corp.	Industrial Pkwy.		X	X		5,000	$1 M	$1 M	$1 M	$5,000	30
Bunn-O-Matic Corp	900 E. Townline		X	X		100,000	$1.6 M	$5 M	$3 M	$5,000	500
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500
Precision Optical	701 S. Oak St.		X	X		50,000	$437 K	$2 M	$1 M	$2,500	200
Alliant Energy Gas Border station	E. Townline St.	X				Half acre	$2 M	$50,000	$2 M	$10,000	1
First National Bank	101 W. Adams St.	X		X		5,000	$1 M	$1 M	$750 K	$5,000	25
Iowa State Savings Bank	401 W. Adams St.	X		X		7,500	$1 M	$2 M	$1 M	$7,500	30
First Federal Savings Bank	501 W. Taylor St.	X		X		4,000	$750 K	$750 K	$600 K	$4,000	20
State Savings Bank	602 Sheldon St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Great Western Bank	103 W. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Nishna Valley Credit Union	E. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Wal-mart Store	806 Laurel St.		X	X		75,000	$8.7 M	$8.7 M	$2 M	$5,000	500
Hy-Vee Store	600 Sheldon Ave.		X	X		40,000	$1.3 M	$1.3 M	$1 M	$2,500	250
Fareway Store	105 E. Adams St.		X	X		40,000	$0.9 M	$0.9 M	$1 M	$2,500	250
Innovative Industries	215 N. Walnut St.		X	X		25,000	$867 K	$500 K	$500 K	$2,000	130
Crest Haven Nursing Home # @	1000 E. Howard St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Creston Nursing and Rehab Center # @	1001 Cottonwood St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Prairie View Assisted Living	1709 W. Prairie St.	X	X	X		75,000	$3 M	$750 K	$500 K	$7,000	75
Iowana Apartments	203 W. Montgomery St.		X		X	50,000	$4 M	$1 M	$500 K	$2,500	40
Salem Lutheran Ch. #	602 W. Townline	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
United Methodist Ch. #	400 N. Elm St.	X	X			15,000	$3 M	$500 K	$150 K	$100	250
Catholic Ch. #	107 W. Howard	X	X			15,000	$3 M	$500 K	$150 K	$100	250
First Baptist Ch #	1001 N. Lincoln	X	X			20,000	$3 M	$500 K	$150 K	$100	250
United Church of Christ #	501 W. Montgomery St.	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
Central electric substation	Uptown Creston	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2
Industrial park substation	S. Osage St.	X		X		1 acre	$2 M	$50,000	$1 M	6,000	2

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

5.7.6: Transportation Hazardous Materials Incident

Transportation incidents, whether involving hazardous materials or not, can impact areas only near the transportation routes where there is sufficient traffic and volume of materials to have necessary levels of risks. For the plan, the planning team has recognized the buffer within 1,000 feet of railroads and highways and streets. Streets that are used regularly for hazardous materials include Taylor Street (Highway 34), Sumner Avenue (Highway 25), Townline Street, North Cherry Street, Montgomery and Adams Streets near uptown, East Howard Street, South Chestnut/Cedar Street, South Elm Street, and Osage Street. The following table is the best estimate of assets at risk.

Table 5 – 30: Hazard Risk Analysis: Transportation Hazardous Materials Incidents Affecting Creston

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	3,773	3,000	80%	$215,000	$175,000	81%	3,500	2,900	83%
Commercial	300	300	100%	$69,000	$69,000	100%	1,250	1,250	100%
Industrial	12	12	100%	$13,250	$13,250	100%	1,250	1,250	100%
Ag Structures	2	0	0%	$39	$0	0%	1	0	0%
Ag Land	1,100 ac	500 ac	45%	$415	$0	0%	--	--	--
Institutional ***	50	45	90%	$50,000	$46,000	92%	750	725	97%
Government ****	35	30	86%	$50,000	$44,000	88%	250	225	90%
Education	8	6	75%	$50,000	$35,000	70%	2,500	1,750	70%
Utilities *****	15	12	80%	$15,000	$12,000	80%	25	20	80%
Totals	4,195	3,405	81%	$462,704	$394,250	85%	9,526	8,120	85%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Transportation HAZMAT incidents can impact a relatively large area of Creston, including most of the high-traffic areas all business areas. Therefore, 81% of properties/assets, 85% of values, and 85% of the population at a given time could be at risk.

Most of the critical assets in the Creston, shown in Table 5 – 21, are at direct risk due to transportation HAZMAT incidents.

Table 5 – 31: List of Critical Assets in Creston At Risk for Transportation Hazardous Materials Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Creston City Hall	116 W. Adams	X			X	10,000	$1 M	$500 K	$5 M	$2,000	100
Creston Fire Dept.	500 N. Sumner St.	X				15,000	$750,000	$2 M	$1 M	$2,000	30
Creston WWTP	W. edge of town	X				10 acres	$6 M	$1 M	$2 M	$10,000	10
Greater Regional Medical Center * # @	1610 W. Townline St.	X	X	X		150,000	$31 M	$3.5 M	$39 M	$65,000	550
U.C. Law Enforcement Center	302 N. Pine St.	X				25,000	$7 M	$1 M	$725 K	$5,000	30
U.C. Courthouse	300 N. Pine St.	X			X	50,000	$3 M	$2 M	$7.5 M	$1,500	250
Emergency Mgt. Ofc	208 W. Taylor	X				20,000	$2 M	$200 K	$85,000	$100	1
Dept. of Human Svcs	304 N. Pine St.	X				1,500	$50 K	$200 K	$40,000	$100	6
USDA/Farm Service	904 E. Taylor St.	X				5,000	$447 K	$250 K	$500 K	$100	10
Social Security Ofc	E. Taylor St.	X				5,000	$455 K	$500 K	$500 K	$250	15
US Post Office	300 S. Elm St.	X				10,000	$1 M	$500 K	$1 M	$500	25
McKinley Park, lake, and safe room *	S. McKinley St.	X	X		X	150 acres	$1 M	$4 M	$250 K	$250	1,000
Rainbow Park	S. Birch St.		X			5 acres	$100 K	$100 K	$25 K	$25	100
Creston High School * # @	601 W. Townline	X	X	X	X	150,000	$17.5 M	$3 M	$5 M	$10,000	730
Mayflower School, Crest Baptist Ch. #	1211 N. Poplar St.	X	X	X		15,000	$2 M	$500 K	$150 K	$1,000	200
St. Malachy School #	403 W. Clark St.	X	X	X		40,000	$4 M	$750 K	$500 K	$2,000	200
SWCC Student Dorms	1314 Student Dr.	X	X	X	X	50,000	$5.5 M	$500 K	$200 K	$5,000	200
SWCC Instructional Center	1415 Southwestern Blvd.	X	X	X	X	75,000	$20 M	$2.2 M	$4.92 M	$5,000	5,000
SWCC Admin Bldg	1311 Southwestern		X	X		10,000	$1.5 M	$400 K	$1 M	$2,000	300

SWCC Tech Center	1209 Southwestern		X	X		20,000	$3.5 M	$500 K	$390 K	$3,500	400
I Think I Can Childcare	705 S. Cherry St.		X	X		15,000	$2 M	$500 K	$250 K	$1,000	100
Trinity Lutheran Ch. & Pre-school #	800 N. Sumner St.	X	X			10,000	$1.5 M	$500 K	$250 K	$600	25
Discovery Kids Pre-school	701 W. Townline St.		X			2,500	$500 K	$250 K	$100 K	$500	25
Creative Beginnings Pre-school	305 W. Howard St.		X			3,000	$500 K	$250 K	$100 K	$500	25
YMCA, Performing Arts Center # @	1201 W. Townline St.	X	X		X	50,000	$3 M	$3 M	$500 K	$2,500	250
Creston Bean Processing	1310 E. Howard St.			X		50,000+	$1.5 M	$1.5 M	$1 M	$10,000	30
Gravilon DeBruce	300 N. Osage St.			X		100,000+	$5 M	$5 M	$1 M	$10,000	50
BNSF Railroad	Uptown Creston	X		X		25,000	$2 M	$1 M	$1 M	$10,000	25
Vanmark Corp.	Industrial Pkwy.		X	X		5,000	$1 M	$1 M	$1 M	$5,000	30
Bunn-O-Matic Corp	900 E. Townline		X	X		100,000	$1.6 M	$5 M	$3 M	$5,000	500
Ferrara Candy Co.	500 Industrial Pkwy.		X	X		100,000	$20 M	$20 M	$3 m	$5,000	500
Precision Optical	701 S. Oak St.		X	X		50,000	$437 K	$2 M	$1 M	$2,500	200
Alliant Energy Gas Border station	E. Townline St.	X				Half acre	$2 M	$50,000	$2 M	$10,000	1
First National Bank	101 W. Adams St.	X		X		5,000	$1 M	$1 M	$750 K	$5,000	25
Iowa State Savings Bank	401 W. Adams St.	X		X		7,500	$1 M	$2 M	$1 M	$7,500	30
First Federal Savings Bank	501 W. Taylor St.	X		X		4,000	$750 K	$750 K	$600 K	$4,000	20
State Savings Bank	602 Sheldon St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Great Western Bank	103 W. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Nishna Valley Credit Union	E. Taylor St.	X		X		4,000	$500 K	$500 K	$400 K	$3,000	15
Wal-mart Store	806 Laurel St.		X	X		75,000	$8.7 M	$8.7 M	$2 M	$5,000	500
Hy-Vee Store	600 Sheldon Ave.		X	X		40,000	$1.3 M	$1.3 M	$1 M	$2,500	250
Fareway Store	105 E. Adams St.		X	X		40,000	$0.9 M	$0.9 M	$1 M	$2,500	250
Innovative Industries	215 N. Walnut St.		X	X		25,000	$867 K	$500 K	$500 K	$2,000	130
Creston Nursing and Rehab Center # @	1001 Cottonwood St.	X	X	X		50,000	$3 M	$1 M	$1 M	$10,000	75
Iowana Apartments	203 W. Montgomery St.		X		X	50,000	$4 M	$1 M	$500 K	$2,500	40
Salem Lutheran Ch. #	602 W. Townline	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150
United Methodist Ch. #	400 N. Elm St.	X	X			15,000	$3 M	$500 K	$150 K	$100	250
Catholic Ch. #	107 W. Howard	X	X			15,000	$3 M	$500 K	$150 K	$100	250
First Baptist Ch #	1001 N. Lincoln St.	X	X			20,000	$3 M	$500 K	$150 K	$100	250
United Church of Christ #	501 W. Montgomery St.	X	X			10,000	$1.5 M	$250 K	$150 K	$100	150

Source: Hazard Mitigation Planning Team, local officials
** Including all assets on site # Includes kitchens available for public feeding and warming @ Includes generator(s)*

5.7.7: Other Hazards

Other Priority II and III hazards in Creston can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.8: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Cromwell

Cromwell's incorporated area is exposed to ten Priority I hazards. River flooding is a Priority III hazard that is also analyzed here. This section delineates those risks by properties and population.

5.8.1. Hazards That Can Impact All Properties

The town of Cromwell is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 32: Hazard Risk Analysis: Widespread Events Affecting All of Cromwell

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	48	48	100%	$3,010	$3,010	100%	38	38	100%
Commercial	2	2	100%	$135	$135	100%	5	5	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	0	0	--	$0	$0	--	0	0	--
Ag Land	0 ac	0 ac	--	$0	$0	--	--	--	--
Institutional ***	2	2	100%	$250	$250	100%	2	2	100%
Government ****	2	2	100%	$250	$250	100%	1	1	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	2	100%	$360	$360	100%	1	1	100%
Totals	56	56	100%	$4,005	$4,005	100%	47	47	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 56 primary structures in Cromwell. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $4,005,000. The total population in the area during the planning timeframe is approximately 47. This compares to the Census population of 107. During the daytime, many people in Cromwell travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Cromwell's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

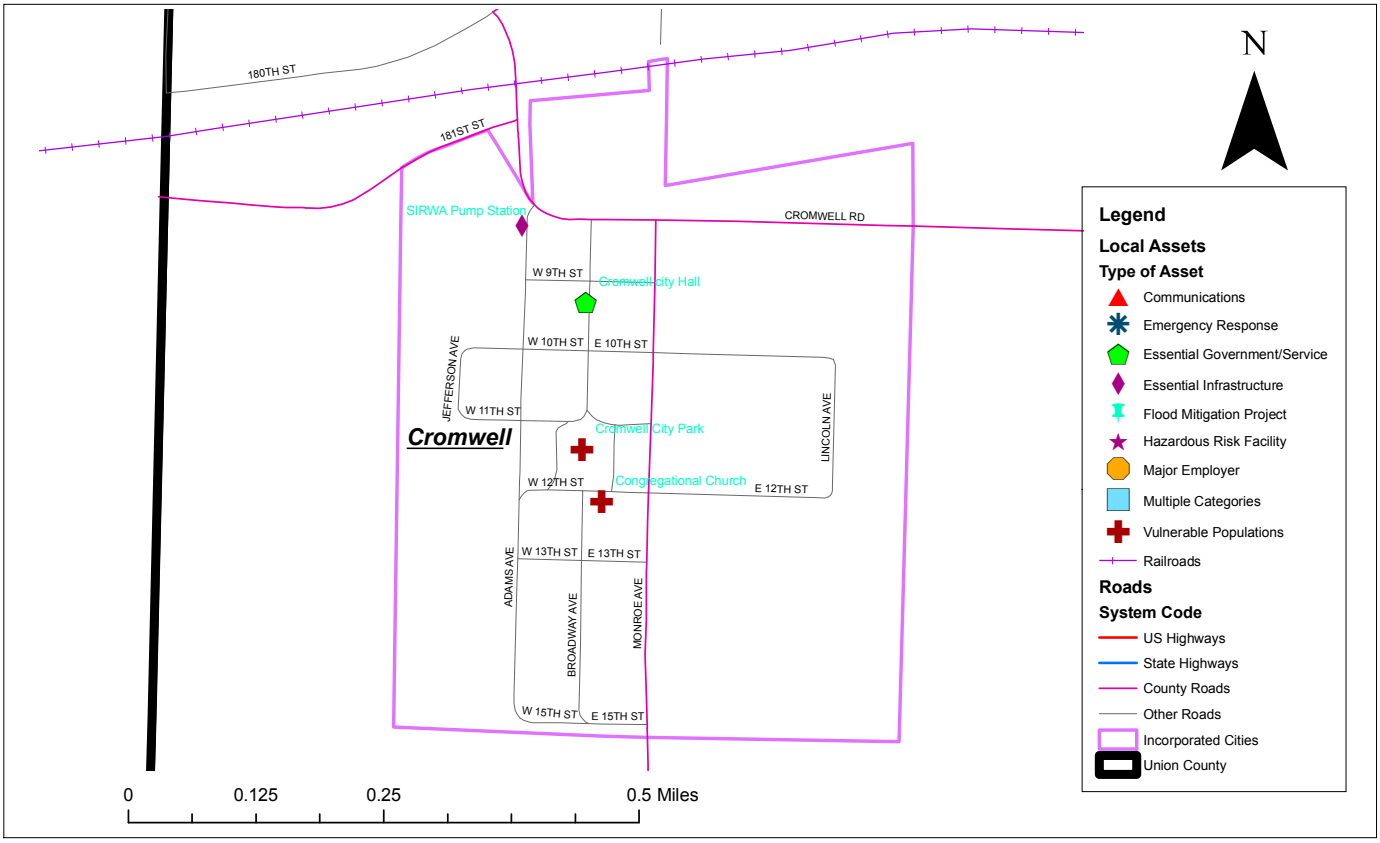
Table 5 – 33: List of Critical Assets in Cromwell At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
Cromwell City Hall	907 Broadway	X				1,000	$35 K	$20,000	$25,000	$50	7
City barn	905 Broadway	X				2,000	$50 K	$75,000	$10,000	$25	7
Cromwell city park	Broadway St.		X			2 acres	$50 K	$50 K	$2,000	$25	100
United Congregational Ch. of Christ	Broadway St.		X			5,000	$250 K	$100 K	$50 K	$100	100
SIRWA pump station	Adams St.	X				1,000	$100 K	$5,000	$5,000	$100	--

Source: Hazard Mitigation Planning Team, local officials

The map on the next page shows Cromwell's critical assets as listed in the above table.

Figure 5 – 6: Map of Cromwell Critical Assets



5.8.2: River Flood

As a Priority III hazard, river floods certainly impact Cromwell's north area of town, crossing County Road H-33 (Cromwell Road) in extreme cases. Cromwell has been mapped, but the latest FIRM map is over 30 years old; an updated map will be created in the next few years. Based on the existing map and the FEMA Community Overview, we have a good idea about how many structures are vulnerable. We have some data about the types of structures and can accurately estimate the number of homes and other buildings in river flood prone areas. The following table is the best estimate of assets at risk.

Table 5 – 34: Hazard Risk Analysis: River Floods Affecting Cromwell

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	48	0	0%	$3,010	$0	0%	38	0	0%
Commercial	2	0	0%	$135	$0	0%	5	0	0%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	0	0	--	$0	$0	--	0	0	--
Ag Land	0 ac	0 ac	--	$0	$0	--	--	--	--
Institutional ***	2	0	0%	$250	$0	0%	2	0	0%
Government ****	2	0	0%	$250	$50	20%	1	0	0%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	1	50%	$360	$100	28%	1	0	0%
Totals	56	1	2%	$4,005	$150	3%	47	0	0%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

River flooding can impact the city primarily by damaging infrastructure such as roads and culverts. Flooding can reduce or stop transportation on the county highway, thereby affecting more people than the above table indicates. Approximately 2% of properties/buildings, and 3% of values are in hazard areas. There will not likely be any

people in the hazard area or directly affected by the hazard event. This data can be updated following the provision of new flood maps and a survey of structures and properties located in flood areas.

No critical assets Cromwell, shown in Table 5 – 33, are at direct risk due to river floods.

5.8.3: Structural Fire

Almost all occupiable structures in Cromwell are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonable common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 35: Hazard Risk Analysis: Structural Fires Affecting Cromwell

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	48	48	100%	$3,010	$3,010	100%	38	38	100%
Commercial	2	2	100%	$135	$135	100%	5	5	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	0	0	--	$0	$0	--	0	0	--
Ag Land	0 ac	0 ac	--	$0	$0	--	--	--	--
Institutional ***	2	2	100%	$250	$250	100%	2	2	100%
Government ****	2	2	100%	$250	$250	100%	1	1	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	1	50%	$360	$100	28%	1	0	100%
Totals	56	55	98%	$4,005	$3,745	94%	47	46	98%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Cromwell, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. Some utility properties and values will not be at risk.

All of the critical assets in Cromwell, shown in Table 5 – 33, are at direct risk due to structural fires.

5.8.4: Other Hazards

Other Priority II and III hazards in Cromwell can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.9: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Lorimor

Lorimor's incorporated area is exposed to eleven Priority I hazards. This section delineates those risks by properties and population.

5.9.1. Hazards That Can Impact All Properties

The town of Lorimor is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 34: Hazard Risk Analysis: Widespread Events Affecting All of Lorimor

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	211	211	100%	$5,650	$5,650	100%	200	200	100%
Commercial	15	15	100%	$850	$850	100%	25	25	100%
Industrial	1	1	100%	$189	$189	100%	5	5	100%
Ag Structures	1	1	100%	$15	$15	100%	1	1	100%
Ag Land	201 ac	201 ac	100%	$114	$114	100%	--	--	--
Institutional ***	6	6	100%	$2,000	$2,000	100%	6	6	100%
Government ****	6	6	100%	$4,000	$4,000	100%	25	25	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	2	100%	$400	$400	100%	1	1	100%
Totals	242	242	100%	$13,218	$13,218	100%	263	263	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 242 primary structures in Lorimor. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $13,218,000. The total population in the area during the planning timeframe is approximately 263. This compares to the Census population of 360. During the daytime, many people in Lorimor travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Lorimor's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

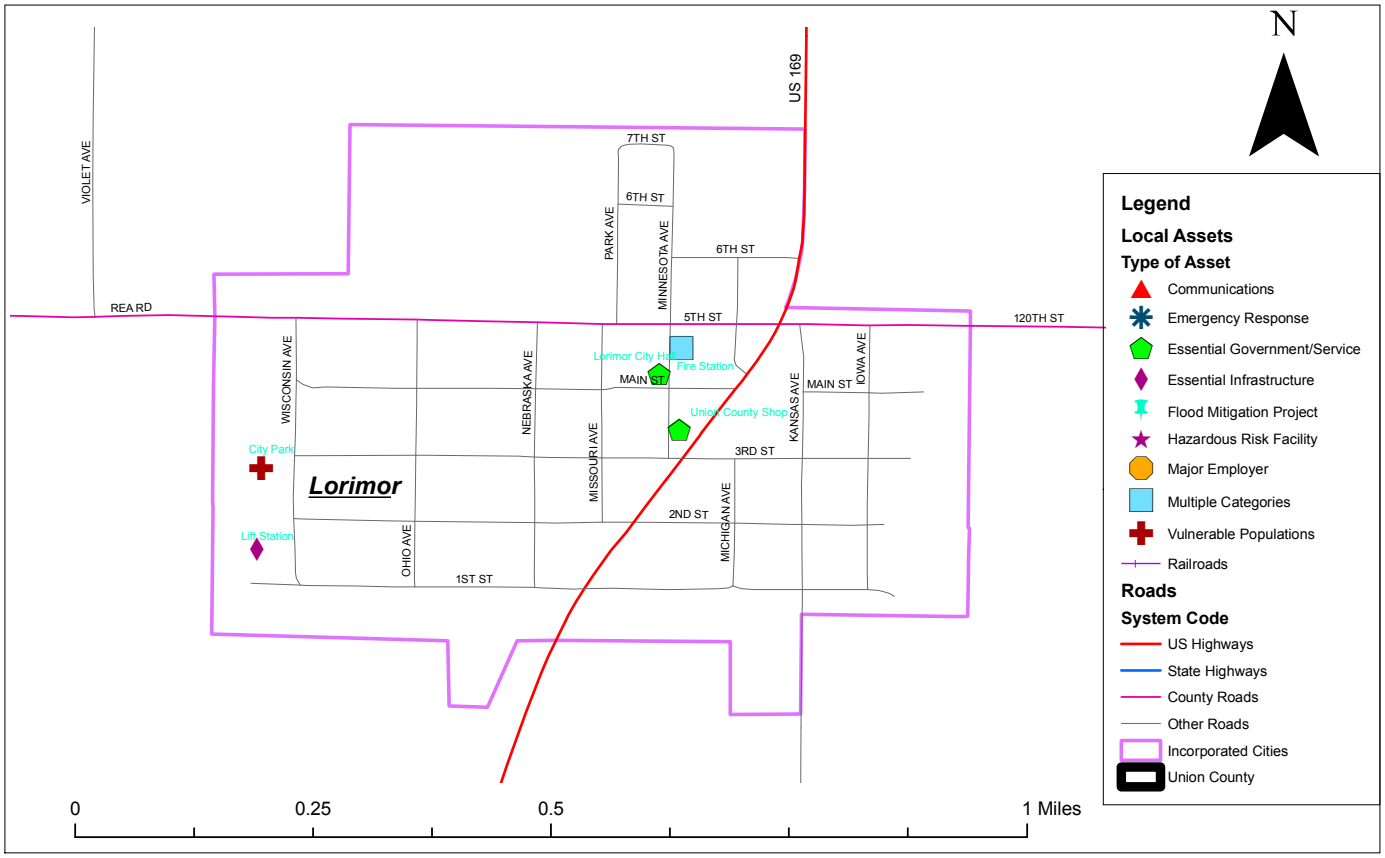
Table 5 – 35: List of Critical Assets in Lorimor At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall/community center	Main St.	X				10,000	$400 K	$50,000	$100 K	$100	75
Fire Station, siren, water tower	Minnesota Ave.	X				7,500	$1 M	$750 K	$50 K	$1,000	20
West City Park	Wisconsin Ave.		X			3 acres	$50 K	$100 K	$5,000	$25	100
Union Co. Shop	Main Street	X				2,500	$45 K	$4,000	$1,600	$20	1
West lift station	Wisconsin Ave.	X				500	$100 K	$10 K	$20 K	$1,000	1

Source: Hazard Mitigation Planning Team, local officials

The map on the next page shows Lorimor's critical assets as listed in the above table.

Figure 5 – 7: Map of Lorimor Critical Assets



5.9.2: Pipeline Transportation Incident

Almost all occupiable structures in Lorimor are at risk of a pipeline transportation incident, which could cause an explosion and release of deadly fumes in homes and businesses. Most of Lorimor's homes have access to pipelines that supply natural gas. Manufacturers use natural gas for heating and production processes. A buffer of 1,000 feet is used for the main coming into town; no buffer is used for pipelines serving areas of town. These pipelines connect most properties, however, so a failure can cause energy failure to a wider area than the pipeline failure itself. The following table is the best estimate of assets at risk.

Table 5 – 36: Hazard Risk Analysis: Pipeline Transportation Incidents Affecting Lorimor

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	211	200	95%	$5,650	$5,400	96%	200	195	98%
Commercial	15	15	100%	$850	$850	100%	25	25	100%
Industrial	1	1	100%	$189	$189	100%	5	5	100%
Ag Structures	1	0	0%	$15	$0	0%	1	0	0%
Ag Land	201 ac	50 ac	25%	$114	$28	25%	--	--	--
Institutional ***	6	6	100%	$2,000	$2,000	100%	6	6	100%
Government ****	6	4	67%	$4,000	$3,000	75%	25	22	88%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	2	100%	$400	$375	94%	1	1	100%
Totals	242	228	94%	$13,218	$11,842	90%	263	254	97%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

Pipeline transportation incidents can impact the town of Lorimor primarily by causing energy failure. Explosions and gas leaks can cause damage and widespread evacuations. It can damage utility infrastructures, such as other

nearby pipelines, including water and sewer. Because most structures have natural gas service, approximately 94% of properties/buildings, 90% of values, and 97% of the population are in hazard areas. Because of the nature of this hazard, it is almost impossible to map the hazard areas throughout the town, especially when maps will not show which buildings are connected. In the future such data may be available if having it is of strong value.

Most of the critical assets in Lorimor, shown in Table 5 – 35, are at direct risk due to pipeline transportation incidents.

Table 5 – 37: List of Critical Assets in Lorimor At Risk for Pipeline Transportation Incidents

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall/community center	Main St.	X				10,000	$400 K	$50,000	$100 K	$100	75
Fire Station, siren, water tower	Minnesota Ave.	X				7,500	$1 M	$750 K	$50 K	$1,000	20
Union Co. Shop	Main Street	X				2,500	$45 K	$4,000	$1,600	$20	1

Source: Hazard Mitigation Planning Team, local officials

5.9.3: Structural Fire

Almost all occupiable structures in Lorimor are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonable common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 38: Hazard Risk Analysis: Structural Fires Affecting Lorimor

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	211	211	100%	$5,650	$5,650	100%	200	200	100%
Commercial	15	15	100%	$850	$850	100%	25	25	100%
Industrial	1	1	100%	$189	$189	100%	5	5	100%
Ag Structures	1	1	100%	$15	$15	100%	1	1	100%
Ag Land	201 ac	0 ac	0%	$114	$0	0%	--	--	--
Institutional ***	6	6	100%	$2,000	$2,000	100%	6	6	100%
Government ****	6	5	83%	$4,000	$3,000	75%	25	23	92%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	2	1	50%	$400	$300	75%	1	1	100%
Totals	242	240	99%	$13,218	$12,004	91%	263	261	99%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Lorimor, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. Some structures, mostly government and utilities, are not combustible and would not be at significant risk.

All of the critical assets in Lorimor, shown in Table 5 – 35, are at direct risk due to structural fires that can impact all least part of the asset property.

5.9.4: Other Hazards

Other Priority II and III hazards in Lorimor can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.10: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Shannon City

Shannon City's incorporated area is exposed to ten Priority I hazards. This section delineates those risks by properties and population.

5.10.1. Hazards That Can Impact All Properties

The town of Shannon City is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 39: Hazard Risk Analysis: Widespread Events Affecting All of Shannon City

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	38	38	100%	$1,182	$1,182	100%	35	35	100%
Commercial	2	2	100%	$18	$18	100%	2	2	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$5	$5	100%	1	1	100%
Ag Land	103 ac	103 ac	100%	$112	$112	100%	--	--	--
Institutional ***	1	1	100%	$200	$200	100%	2	2	100%
Government ****	2	2	100%	$1,500	$1,500	100%	2	2	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	1	1	100%	$121	$121	100%	1	1	100%
Totals	45	45	100%	$3,138	$3,138	100%	43	43	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 44 primary structures in Shannon City. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $3,138,000. The total population in the area during the planning timeframe is approximately 43. This compares to the Census population of 66. During the daytime, many people in Shannon City travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Shannon City's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

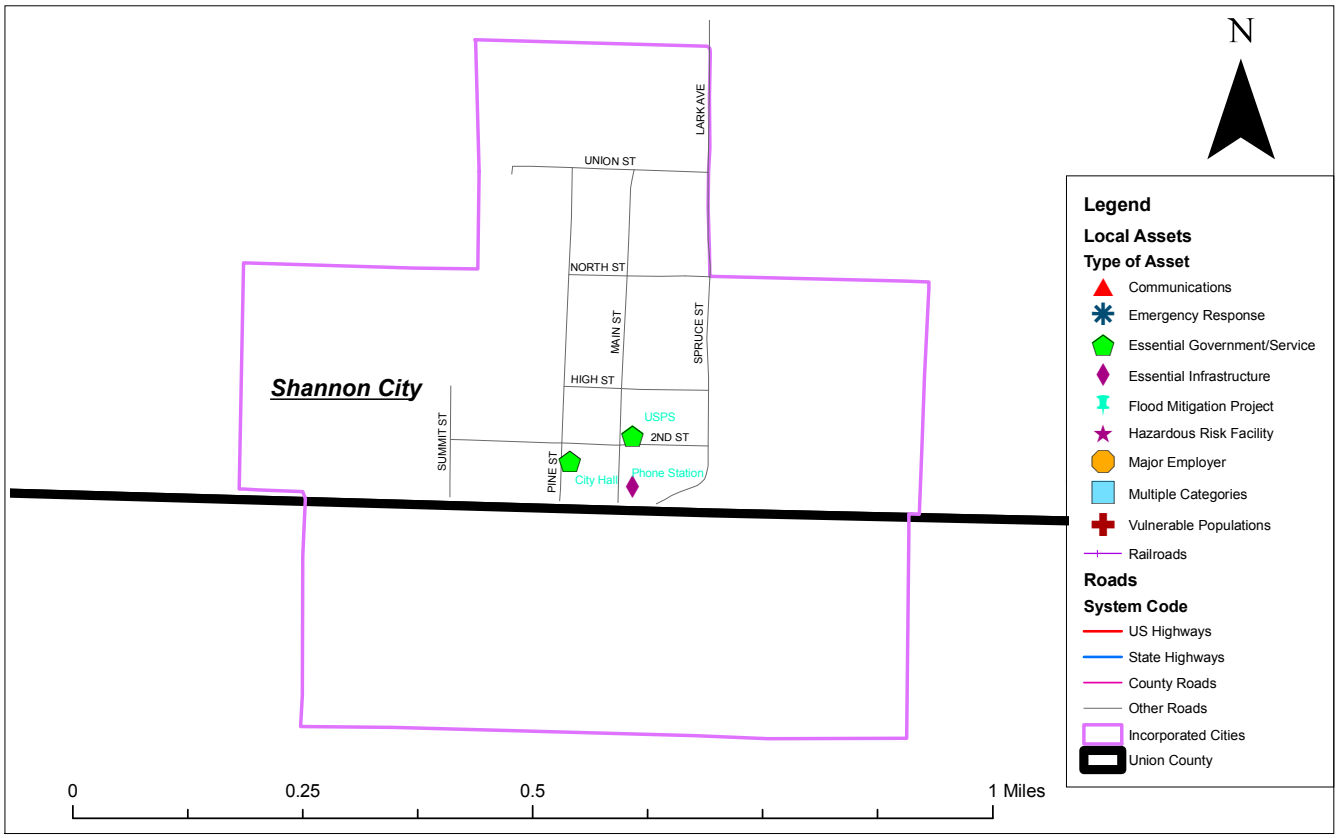
Table 5 – 40: List of Critical Assets in Shannon City At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall	Pine St.	X				1,000	$100 K	$5,000	$100 K	$100	10
Phone Station	Main St.	X				1,000	$100 K	$100 K	$100 K	$500	2
Post Office	Main St.	X				1,000	$150 K	$150 K	$100 K	$500	10

Source: Hazard Mitigation Planning Team, local officials

The following map shows Shannon City's critical assets as listed in the above table.

Figure 5 – 8: Map of Shannon City Critical Assets



5.10.2: River Flood

As a Priority III hazard, river floods certainly impact Shannon City's east and southern portions crossing County Road J-13 in extreme cases. Shannon City has been mapped, but the latest FIRM map is over 30 years old; an updated map will be created in the next few years. Based on the existing map and the FEMA Community Overview, we have a good idea about how many structures are vulnerable. We have some data about the types of structures and can accurately estimate the number of homes and other buildings in river flood prone areas. The following table is the best estimate of assets at risk.

Table 5 – 41: Hazard Risk Analysis: River Floods Affecting Shannon City

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	38	1	3%	$1,182	$40	3%	35	1	3%
Commercial	2	0	0%	$18	$0	0%	2	0	0%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	0	0%	$5	$0	0%	1	0	0%
Ag Land	103 ac	30 ac	29%	$112	$35	31%	--	--	--
Institutional ***	1	0	0%	$200	$0	0%	2	0	0%
Government ****	2	0	0%	$1,500	$10	1%	2	0	0%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	1	0	0%	$121	$5	4%	1	0	0%
Totals	45	1	2%	$3,138	$92	3%	43	1	2%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

River flooding can impact the city primarily by damaging infrastructure such as roads and culverts. Flooding can reduce or stop transportation on the county highway, thereby affecting more people than the above table indicates. Approximately 2% of properties/buildings, and 3% of values are in hazard areas. There will not likely be any people in the hazard area or directly affected by the hazard event except an average of one person at home at the time. This data can be updated following the provision of new flood maps and a survey of structures and properties located in flood areas.

No critical assets Shannon City, shown in Table 5 – 40, are at direct risk due to river floods.

5.10.3: Structural Fire

Almost all occupiable structures in Shannon City are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonable common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 42: Hazard Risk Analysis: Structural Fires Affecting Shannon City

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	38	38	100%	$1,182	$1,182	100%	35	35	100%
Commercial	2	2	100%	$18	$18	100%	2	2	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$5	$5	100%	1	1	100%
Ag Land	103 ac	0 ac	0%	$112	$0	0%	--	--	--
Institutional ***	1	1	100%	$200	$200	100%	2	2	100%
Government ****	2	2	100%	$1,500	$1,500	100%	2	2	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	1	1	100%	$121	$121	100%	1	1	100%
Totals	45	45	100%	$3,138	$3,026	96%	43	43	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Shannon City, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. As far as known, all structures listed above would be susceptible to structural fires.

All of the critical assets in Shannon City, shown in Table 5 – 40, are at direct risk due to structural fires that can impact all least part of the asset property.

5.10.3: Other Hazards

Other Priority II and III hazards in Shannon City can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.11: Vulnerability Risk Assessment By Priority I Hazards Affecting the City of Thayer

Thayer's incorporated area is exposed to ten Priority I hazards. This section delineates those risks by properties and population.

5.11.1. Hazards That Can Impact All Properties

The town of Thayer is at risk due to the following Priority I hazards that can impact all assets in the jurisdiction:

- Drought
- Extreme heat
- Hailstorm
- Severe winter storm
- Thunderstorm and lightning
- Tornado
- Windstorm
- Energy failure
- Communications failure

The following table summarizes the total number and value of structures and land and number of people in the jurisdiction that can be impacted by hazards that are locally determined to affect all properties.

Table 5 – 43: Hazard Risk Analysis: Widespread Events Affecting All of Thayer

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	29	29	100%	$514	$514	100%	27	27	100%
Commercial	2	2	100%	$46	$46	100%	2	2	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$2	$2	100%	1	1	100%
Ag Land	24 ac	24 ac	100%	$5	$5	100%	--	--	--
Institutional ***	1	1	100%	$150	$150	100%	2	2	100%
Government ****	2	2	100%	$1,000	$1,000	100%	2	2	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	1	1	100%	$193	$193	100%	1	1	100%
Totals	36	36	100%	$1,910	$1,910	100%	35	35	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

There are approximately 36 primary structures in Thayer. This does not include every bridge, culvert, backyard shed, etc. The total estimated valuation (not replacement value) is currently approximately $1,910,000. The total population in the area during the planning timeframe is approximately 35. This compares to the Census population of 59. During the daytime, many people in Thayer travel out of town to work and school, thereby reducing the rural population in the hazard area. Note that certain assets are not adequately accounted in the tables in this section, such as roads, bridges, and public utilities. Widespread events would certainly impact these assets also. The impacted population can change greatly by time of day, time of year, and day of week.

The following table shows Thayer's critical assets identified by the planning team. All these assets are at risk due to widespread hazard events.

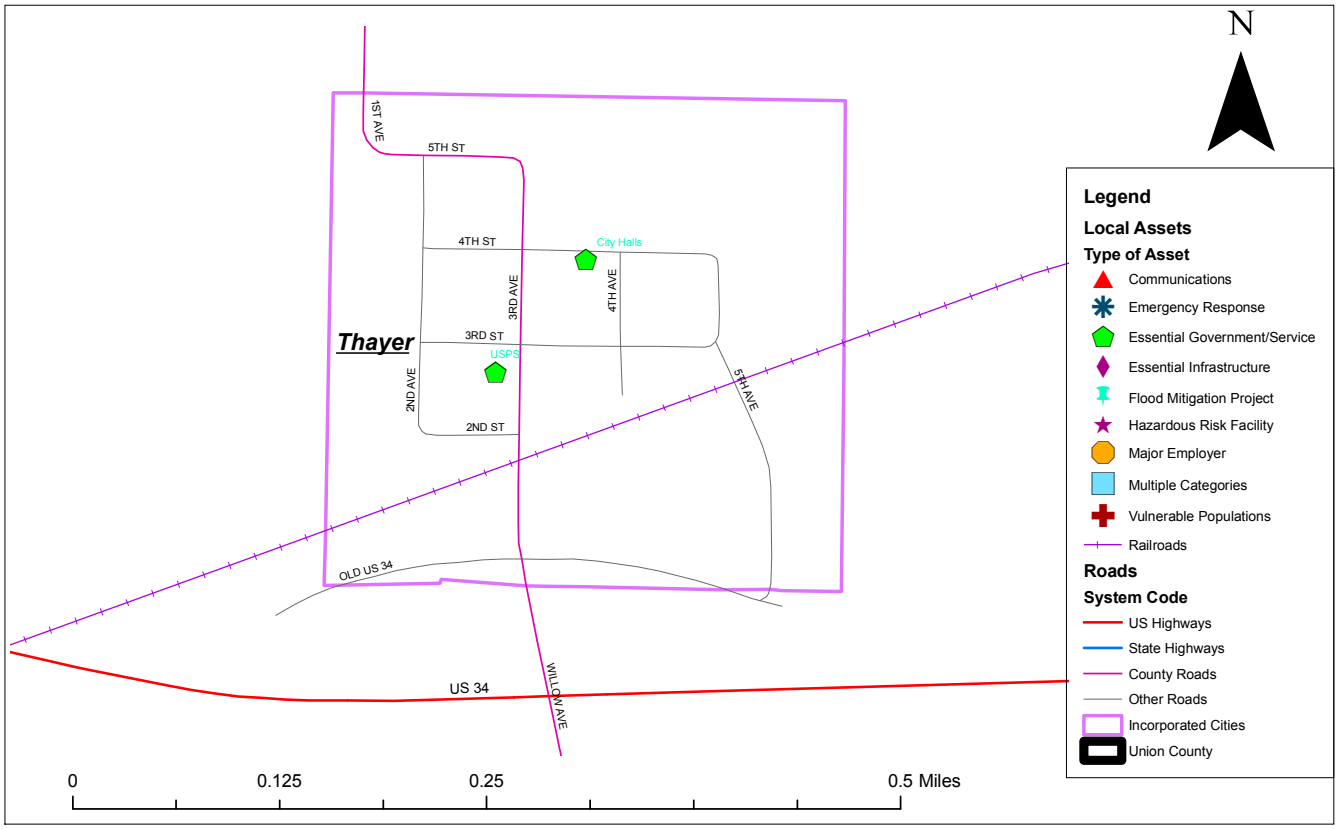
Table 5 – 44: List of Critical Assets in Thayer At Risk For Widespread Events

Name of Asset	Location	Critical Facility	Vulnerable Pop.	Economic Assets	Historic/Cultural	Size of Building (sf)	Replacement Value ($)	Contents Value ($)	Functional Use Value ($)	Displacement Cost ($/day)	Occ. Or Capacity (#)
City hall	4th St.	X				1,000	$125 K	$10,000	$100 K	$100	10
Post Office	3rd Ave.	X				500	$50 K	$75 K	$50 K	$100	2

Source: Hazard Mitigation Planning Team, local officials

The map on the next page shows Thayer's critical assets as listed in the above table.

Figure 5 – 9: Map of Thayer Critical Assets



5.11.2: Structural Fire

Almost all occupiable structures in Thayer are at risk of a structural fire, with the only exceptions being concrete and metal only structures with no combustible contents. Structural fires are reasonable common in older homes, and fire protection services are stretched due to limited funds, old equipment, and reliance upon volunteers. The following table is the best estimate of assets at risk.

Table 5 – 45: Hazard Risk Analysis: Structural Fires Affecting Thayer

Type of structure (Occupancy Class)	Number of structures			Value of structures *			Number of people **		
	# in juris.	# in hazard area	% in hazard area	$ in juris. (thousands)	$ in hazard area (thousands)	% in hazard area	# in juris.	# in hazard area	% in hazard area
Residential	29	29	100%	$514	$514	100%	27	27	100%
Commercial	2	2	100%	$46	$46	100%	2	2	100%
Industrial	0	0	--	$0	$0	--	0	0	--
Ag Structures	1	1	100%	$2	$2	100%	1	1	100%
Ag Land	24 ac	0 ac	0%	$5	$0	0%	--	--	--
Institutional ***	1	1	100%	$150	$150	100%	2	2	100%
Government ****	2	2	100%	$1,000	$1,000	100%	2	2	100%
Education	0	0	--	$0	$0	--	0	0	--
Utilities *****	1	1	100%	$193	$193	100%	1	1	100%
Totals	36	36	100%	$1,910	$1,905	99.7%	35	35	100%

Sources: US Census 2010; County Auditor tax and parcel data; planning team estimates
** See the footnotes below Table 5 – 2 for details on the above footnote items*

In Thayer, structural fires can cause extensive damages to numerous properties and can displace populations, even if people are not in the structure when the fire occurs. As far as known, all structures listed above would be susceptible to structural fires.

All of the critical assets in Thayer, shown in Table 5 – 44, are at direct risk due to structural fires that can impact all least part of the asset property.

5.11.3: Other Hazards

Other Priority II and III hazards in Thayer can impact many properties but the risks are generally at an acceptable level. Assets at risk due to these hazards are not quantified in this chapter.

5.12: Summary of Asset Risk

As can be seen, the various hazards can/will affect any or all of the population and assets in the county, depending on the nature of the impacts and locational restrictions placed on them. Natural hazards and some man-made or technological hazards that can impact the entire county likely will have the greatest effect.

The above data should be used with caution, as a higher level of impacted value does not directly imply a higher level of loss. Air transportation incidents, for example, are not likely to cause significant loss to facilities on the ground, but fatalities could be tremendous. The next chapter describes in greater detail the potential losses by jurisdiction and hazard (for only natural hazards).

The impact on assets will vary greatly by event. However, the entire county is susceptible to many hazards. More information on key assets is needed in order to determine specific impacts on each property, such as flooding base floor elevations (BFEs) and soil types. This mitigation plan provides only the basic information that is known for the area.

5.13: Expected Growth Areas – Future Assets at Risk

FEMA requires that local mitigation plans consider future development and population growth when considering mitigation strategies. As indicated in *Chapter 2*, the population is expected to continue to grow slowly countywide and many jurisdictions will lose population. The number of assets is likely to increase at the same pace or more rapidly, since average household sizes continue to decline and new construction to replace older buildings may not mean the demolition of older buildings. Growth and declines are not likely to be even throughout the county. In the rural areas, population is likely to grow slightly, along with residential property counts, especially in the northern half of the county. As commodity prices continue to rise, more land that was not farmed (CRP, forested, or pastured land) in the past may be converted to grow corn and soybeans. Rural development is most likely within a mile of paved county, state, and federal highways and outside of low-lying areas. Creston will continue to pace the county in terms of residential, industrial, and commercial development, followed by Afton. Most small towns will see population declines. Other land uses, such as institutional, educational, government, and utilities, are more difficult to project. These developments will depend on available funding but it is anticipated that growth will be limited in most parts of the county, with Creston receiving most of the investment.

Overall, the net growth in assets is likely to be as follows (next page) over the five-year life of the plan.

Table 5 – 46: Estimated Net Changes in Assets over Next Five Years By Jurisdiction

Asset Type/ Jurisdiction	Rural	Afton	Arispe	Creston **	Cromwell	Lorimor	Shannon City	Thayer	County
Residential	+15	+2	0	+20	0	+1	-2	-2	+34
Commercial	+2	+2	-1	+1	0	+1	-1	-1	+3
Industrial	0	0	0	0	0	0	0	0	0
Ag Structures	+5	0	0	0	0	0	0	0	+5
Ag Land	+100 ac	-2 ac	0 ac	-20 ac	0 ac	0 ac	0 ac	0 ac	+78 ac
Institutional	0	0	0	+1	0	0	0	0	+1
Government	+1	0	0	+1	0	0	0	0	+1
Education	0	0	0	0	0	0	0	0	0
Utilities	*	*	*	*	*	*	*	*	*
Totals	+23	+4	-1	+23	0	+2	-3	-3	+45

Source: SICOG planning staff, 9/2012
** Includes lines, poles, pipes, and other facilities that may not be structures. Unable to determine changes in these assets. It is true with roads, bridges, and other public assets.*
*** This does not include the 50 or so previously occupied structures that need to replace those destroyed by the April 2012 tornado, which are counted earlier in this chapter already.*

Of course, the above table assumes there are no city boundary changes in the next five years, such as due to annexation. New development will be very minor compared to the current composition of the county; therefore, development will not likely affect the risks in the county in a significant way. The exception may in property values as these inflate over time and fluctuate. In other words, it is not likely that new buildings and population will create appreciable new hazards that would not have occurred had the development not occurred.

Planning team members were asked to describe what new risks they could envision in the future due to new development. Some stated that the risks are no more significant than in other areas. The City of Creston indicates that the proximity of Hurley Creek at the proposed Cottonwood Subdivision on the west edge of town could be an issue, but the flooding concerns are being addressed in plans for that subdivision. SWCC indicates that continual construction of dorms on campus brings more people to campus, where there is limited alternative shelter for potentially displaced students. Green Valley leadership indicates that campground renovations will draw more people into the park beginning in 2013; this will result in greater risk because shelter is not available on site for all persons using the park, and recreational equipment and vehicles are exposed. Union County recognizes the problems with new development on dead-end roads and continued issues with septic system maintenance. Septic plans are in place to address new rural development. The rural area lacks building codes to address development quality and location.

Current mitigation policies prohibit development in known flood plains; right now many areas have not been mapped but local officials know that some of the unmapped areas are subject to flooding. Where mapped, those jurisdictions set limits on development. There are no policies for development of safe rooms and earthquake building codes or for wildland interface areas, which could be greater issues if new development occurs. With proper implementation of the mitigation plan, however, future development will not be in the risk area of any Priority I hazard except for hazards that can affect the entire county.

5.14: Summary

Specific assets will be affected by specific events, depending on the type of building materials, roofing, size of site, elevation, soils on which asset is located, slopes, quality of construction, topography, and location related to hazard zones (for fires, floods, etc.). This data is not always readily available, nor can it be created easily, and it is not often needed for a general mitigation plan. What is presented is a basis for prioritizing mitigation actions and ensuring they make sense with the data available. More detailed analysis is necessary for specific mitigation projects involving specific infrastructure. This being said, Union County has extensive assets that can be impacted by many different hazards. However, no one or two assets stand out above the remaining when it comes to potential mitigation actions.

Chapter 6: Natural Hazards Loss Estimation

The final step in the risk assessment is to determine the likely level of losses for each type of disaster event determined likely to occur in the jurisdiction or its area of influence. Because FEMA is most concerned about natural hazards and because it is difficult to measure losses from non-natural hazard events due to poor data, the Union County Hazard Mitigation Planning Team has only considered losses due to natural hazards. The loss estimation phase includes: 1) the descriptions of loss estimation techniques, 2) the losses for each hazard event, 3) the losses for each year by hazard by jurisdiction, and 4) data limitations/corrective actions. This chapter also considers future losses due to new development in the county.

6.1: Loss Estimation Techniques

To complete this process, we take the data from the asset assessment in *Chapter 5*. We use several loss formulas based on the likely damages that each asset may receive from each type of event. The following formulas can be used:

Structures: structure replacement value X percent damaged = loss to structure
Contents: contents replacement value X percent damaged = loss to contents
Functional/use: functional downtime cost (average daily operating budget X days) + displacement cost (displacement costs per day X days displaced) = functional loss
Total estimated losses to asset: structure loss + contents and inventory loss + functional loss = total

FEMA and HAZUS provide data tables to estimate the numbers used in the above formulas for certain hazards.

The following describes the level or intensity of a hazard event used in this analysis:

- Dam failure: complete failure of the largest dam in the jurisdiction.
- Drought: equal to the worst drought experienced in the area, as recorded by the NCDC.
- Earthquake: an intensity of MM IV, which is recognized as most intense likely event in this area.
- Expansive soils: events as have occurred in the area in the past 10 years.
- Extreme heat: as described in the definition of this hazard.
- Flash flood: flooding due to saturated ground followed by 5" or more of rain in 24 hours.
- Grass or wildland fire: fire of 10 acres or more of vegetation.
- Hailstorm: event with hail of 1" or larger.
- Landslide: event on developed (not heavily forested lands and river banks) involving at least 1 ton of soil.
- River flood: 100-year flood event (not necessarily occurring every 100 years)
- Severe winter storm: Snow, ice, and severe wind chills as defined in profile.
- Sinkhole: As defined in the hazard profile.
- Thunderstorm and lightning: As defined in the hazard profile.
- Tornado: Average storm of EF2 touchdown in terms of damages and area impacted
- Windstorm: 60 knots+ straight-line winds and average damages per storm.

The Union County Hazard Mitigation Planning Team *should* use GIS and other local data along with HAZUS formulas in "Understanding Your Risks" to determine losses by asset and then add impacts by each hazard. By doing this, a matrix is developed to determine total likely losses by asset by hazard. Because there is no data in the county about the losses by structure at this time, this chapter considers overall losses by event and then the probability of each applicable hazard event in a given year.

6.2: Estimate of Losses by Natural Hazard Event

The following tables describe the potential losses by natural hazard event as they can occur in modern times. This data is estimated and should not be used for official agency action.

Table 6 – 1: Estimated Losses by Hazard Event in Rural Union County (including East Union Schools)

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed. **	Util.	Totals	Dths.
Dam failure	$200,000	$0	$0	$400,000	$500 K	$50,000	$1 M	$0	$500,000	$2.65 M	0-3
Drought	$125,000	$13,000	$20,550	$49,800	$1.6 M	$20,000	$150,000	$40,000	$48,900	$2.067 M	0
Earthquake	$12,350	$665	$1,370	$1,660	$1,600	$2,000	$50,000	$4,000	$24,450	$98,095	0
Expansive soils	$50,000	$4,000	$5,480	$13,280	$5,000	$6,000	$45,000	$2,000	$40,000	$179,760	0
Extreme heat	$125,000	$13,000	$20,550	$33,200	$320 K	$10,000	$50,000	$20,000	$390,000	$981,750	0-2
Flash flood	$500,000	$10,000	$13,700	$49,800	$400 K	$30,000	$250,000	$20,000	$195,000	$1.469 M	<=1
Grass/wildland fire	$200,000	$10,000	$13,700	$125,000	$450 K	$10,000	$200,000	$8,000	$240,000	$1.257 M	<=1
Hailstorm	$500,000	$33,000	$27,400	$83,000	$800 K	$30,000	$250,000	$10,000	$24,500	$1.87 M	<=1
Landslide	$250	$100	$50	$250	$10,000	$100	$10,000	$0	$5,000	$25,750	0
River flood	$100,000	$10,000	$5,000	$200,000	$300 K	$0	$3 M	$0	$1 M	$4.615 M	<=1
Severe winter storm	$500,000	$150,000	$200 K	$15,000	$200 K	$60,000	$500,000	$25,000	$450,000	$2.1 M	0-3
Sink hole	$24,700	$1,300	$1,400	$3,300	$32,000	$2,000	$20,000	$4,000	$10,000	$98,700	<=1
Thunderstorm	$247,000	$13,000	$10,000	$33,000	$120 K	$20,000	$250,000	$2,000	$300,000	$995,000	<=1
Tornado	$370,000	$20,000	$20,500	$49,800	$320 K	$30,000	$150,000	$60,000	$244,000	$1.26 M	0-7
Windstorm	$200,000	$13,000	$13,700	$33,000	$750 K	$20,000	$100,000	$40,000	$390,000	$1.56 M	<=1
Totals	$3.27 M	$291,065	$353 K	$1.09 M	$5.8 M	$290 K	$6.03 M	$235 K	$3.86 M	$21.2 M	0-18

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*
*** East Union Schools assets*

The natural hazards considered are estimated to have an impact of $21.226 million total per event as well as up to but no more than 18 fatalities in rural parts of Union County.

Table 6 – 2: Estimated Losses by Hazard Event in Afton

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--	--	--	--
Drought	$17,500	$6,000	$1,350	$100	$1,000	$20,000	$24,000	$0	$1,000	$70,950	0
Earthquake	$1,700	$300	$90	$10	$10	$2,000	$8,000	$0	$500	$12,610	0
Expansive soils	$35,000	$4,500	$650	$30	$50	$15,000	$16,000	$0	$1,000	$72,320	0
Extreme heat	$17,500	$6,000	$1,250	$70	$200	$10,000	$8,000	$0	$8,000	$51,020	<=1
Flash flood	$140,000	$24,000	$3,600	$100	$600	$60,000	$64,000	$0	$8,000	$300,300	<=1
Grass/wildland fire	$52,500	$6,000	$900	$700	$5,250	$20,000	$24,000	$0	$5,000	$114,350	<=1
Hailstorm	$87,500	$15,000	$1,800	$200	$5,250	$30,000	$40,000	$0	$500	$180,250	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	--	--	--	--	--	--	--	--	--	--	--
Severe winter storm	$140,000	$90,000	$13,500	$50	$300	$60,000	$80,000	$0	$20,000	$403,850	<=1
Sink hole	$14,000	$1,200	$180	$10	$20	$2,000	$3,200	$0	$200	$20,810	<=1
Thunderstorm	$35,000	$6,000	$650	$70	$100	$20,000	$40,000	$0	$7,000	$108,820	<=1
Tornado	$350,000	$60,000	$9,000	$700	$2,100	$200 K	$160,000	$0	$20,000	$801,800	0-7
Windstorm	$52,000	$9,000	$1,350	$100	$700	$30,000	$24,000	$0	$8,000	$125,150	<=1
Totals	$942,700	$228 K	$34,320	$2,140	$15,580	$469 K	$491,200	$0	$79,200	$2,262 K	0-12

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $2,262,140 total per event as well as up to but no more than 12 fatalities in Afton.

Table 6 – 3: Estimated Losses by Hazard Event in Arispe

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--	--	--	--
Drought	$2,050	$750	$0	$30	$1,200	$1,000	$1,500	$0	$150	$6,680	0
Earthquake	$200	$50	$0	$10	$10	$100	$500	$0	$70	$940	0
Expansive soils	$4,100	$550	$0	$10	$60	$750	$1,000	$0	$150	$6,620	0
Extreme heat	$2,000	$750	$0	$20	$240	$500	$500	$0	$1,200	$5,210	<=1
Flash flood	$16,400	$3,100	$0	$30	$720	$3,000	$4,000	$0	$1,200	$28,450	<=1

Grass/wildland fire	$6,150	$750	$0	$200	$6,000	$1,000	$1,500	$0	$750	$16,350	<=1
Hailstorm	$10,250	$1,900	$0	$50	$6,000	$1,500	$2,500	$0	$70	$22,270	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	--	--	--	--	--	--	--	--	--	--	--
Severe winter storm	$16,400	$11,500	$0	$10	$360	$3,000	$5,000	$0	$3,000	$39,270	<=1
Sink hole	$1,600	$150	$0	$10	$20	$100	$200	$0	$30	$2,110	<=1
Thunderstorm	$4,100	$750	$0	$20	$120	$1,000	$2,500	$0	$1,000	$9,490	<=1
Tornado	$41,000	$7,650	$0	$200	$2,400	$10,000	$10,000	$0	$3,000	$74,250	0-5
Windstorm	$6,150	$1,150	$0	$30	$840	$1,500	$1,500	$0	$1,200	$12,370	<=1
Totals	$110,400	$29,050	$0	$620	$17,970	$23,450	$30,700	$0	$11,820	$224,010	0-11

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $224,010 total per event as well as up to but no more than 11 fatalities in Arispe.

Table 6 – 4: Estimated Losses by Hazard Event in Creston (including Creston Schools, GRMC, SWCC)

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	$2 M	$25,000	$0	$25,000	$25,000	$25,000	$2 M	$3 M	$1 M	$8.1 M	0-3
Drought	$215,000	$138 K	$39,750	$100	$4,150	$100 K	$150 K	$100 K	$15,000	$762,000	0
Earthquake	$21,500	$6,900	$2,650	$10	$10	$10,000	$50,000	$10,000	$7,500	$108,570	0
Expansive soils	$430,000	$103 K	$20,000	$30	$200	$75,000	$100 K	$50,000	$15,000	$793,230	0
Extreme heat	$215,000	$138 K	$39,750	$80	$830	$50,000	$50,000	$50,000	$120 K	$663,600	0-2
Flash flood	$1.29 M	$414 K	$79,500	$120	$2,100	$250 K	$350 K	$400 K	$105 K	$2.89 M	0-2
Grass/wildland fire	$215,000	$69,000	$13,250	$780	$20,750	$50,000	$100 K	$25,000	$60,000	$553,780	<=1
Hailstorm	$645,000	$207 K	$33,000	$120	$12,500	$150 K	$200 K	$50,000	$15,000	$1.31 M	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	$250 K	$0	$0	$0	$5,000	$0	$250 K	$100 K	$100 K	$705,000	<=1
Severe winter storm	$1 M	$600 K	$198 K	$40	$1,200	$300 K	$500 K	$350 K	$300 K	$3.25 M	0-2
Sink hole	$21,500	$13,800	$2,650	$10	$80	$10,000	$20,000	$10,000	$3,000	$81,040	<=1
Thunderstorm	$430,000	$138 K	$20,000	$80	$400	$100 K	$250 K	$5,000	$10,500	$953,980	<=1
Tornado	$2.5 M	$828 K	$159 K	$450	$4,980	$600 K	$600 K	$600 K	$180 K	$5.47 M	0-10
Windstorm	$645,000	$207 K	$39,750	$120	$2,900	$150 K	$150 K	$150 K	$120 K	$1.46 M	<=1
Totals	$9.88 M	$2.9 M	$647 K	$26,940	$80,100	$1.9 M	$4.8 M	$4.9 M	$2.1 M	$27.1 M	0-18

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $27,111,040 total per event as well as up to but no more than 18 fatalities in Creston.

Table 6 – 5: Estimated Losses by Hazard Event in Cromwell

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--	--	--	--
Drought	$3,000	$270	$0	$0	$0	$500	$750	$0	$360	$4,880	0
Earthquake	$300	$10	$0	$0	$0	$50	$250	$0	$180	$790	0
Expansive soils	$6,000	$200	$0	$0	$0	$370	$500	$0	$360	$7,430	0
Extreme heat	$3,000	$270	$0	$0	$0	$250	$250	$0	$2,880	$6,650	<=1
Flash flood	$24,000	$1,000	$0	$0	$0	$1,500	$2,000	$0	$2,880	$31,380	<=1
Grass/wildland fire	$9,000	$270	$0	$0	$0	$500	$750	$0	$1,800	$12,320	<=1
Hailstorm	$15,000	$670	$0	$0	$0	$750	$1,250	$0	$180	$17,850	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	$0	$0	$0	$0	$0	$0	$15,000	$0	$10,000	$25,000	<=1
Severe winter storm	$24,000	$4,000	$0	$0	$0	$1,500	$2,500	$0	$7,200	$39,200	<=1
Sink hole	$2,400	$50	$0	$0	$0	$50	$100	$0	$70	$2,670	<=1
Thunderstorm	$6,000	$270	$0	$0	$0	$500	$1,250	$0	$2,500	$10,520	<=1
Tornado	$60,200	$2,700	$0	$0	$0	$5,000	$5,000	$0	$7,200	$80,100	0-5
Windstorm	$9,000	$400	$0	$0	$0	$750	$750	$0	$2,880	$13,780	<=1
Totals	$161,900	$10,110	$0	$0	$0	$11,720	$30,350	$0	$38,490	$252,570	0-11

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.

** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $267,570 total per event as well as up to but no more than 11 fatalities in Cromwell.

Table 6 - 6: Estimated Losses by Hazard Event in Lorimor

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--		--	--
Drought	$5,000	$1,700	$550	$40	$1,140	$4,000	$12,000	$0	$400	$24,830	0
Earthquake	$550	$80	$40	$10	$10	$400	$4,000	$0	$200	$5,290	0
Expansive soils	$11,300	$1,250	$280	$10	$50	$3,000	$8,000	$0	$400	$24,290	0
Extreme heat	$5,600	$1,700	$550	$30	$220	$2,000	$4,000	$0	$3,200	$17,300	<=1
Flash flood	$45,200	$6,800	$1,500	$40	$680	$12,000	$32,000	$0	$3,200	$101,420	<=1
Grass/wildland fire	$16,950	$1,700	$350	$300	$5,700	$4,000	$12,000	$0	$2,000	$43,000	<=1
Hailstorm	$28,250	$4,250	$750	$70	$5,700	$6,000	$20,000	$0	$200	$65,220	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	--	--	--	--	--	--	--	--	--	--	<=1
Severe winter storm	$45,200	$25,500	$5,670	$10	$340	$12,000	$40,000	$0	$8,000	$136,720	<=1
Sink hole	$4,500	$300	$80	$10	$23	$400	$1,600	$0	$80	$6,993	<=1
Thunderstorm	$11,300	$1,700	$280	$30	$110	$4,000	$20,000	$0	$2,800	$40,220	<=1
Tornado	$113,000	$17,000	$3,780	$300	$2,280	$40,000	$80,000	$0	$8,000	$264,360	0-6
Windstorm	$16,950	$2,500	$550	$40	$800	$6,000	$12,000	$0	$3,200	$42,683	<=1
Totals	$303,800	$64,480	$14,380	$890	$17,053	$93,800	$245,600	$0	$31,680	$771,683	0-12

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $771,683 total per event as well as up to but no more than 12 fatalities in Lorimor.

Table 6 – 7: Estimated Losses by Hazard Event in Shannon City

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--	--	--	--
Drought	$1,150	$40	$0	$10	$1,100	$400	$4,500	$0	$120	$7,200	0
Earthquake	$110	$10	$0	$10	$10	$40	$1,500	$0	$60	$1,680	0
Expansive soils	$2,350	$30	$0	$10	$50	$300	$3,000	$0	$120	$5,740	0
Extreme heat	$1,182	$40	$0	$10	$220	$200	$1,500	$0	$950	$3,152	<=1
Flash flood	$9,450	$150	$0	$20	$670	$1,200	$12,000	$0	$950	$23,490	<=1
Grass/wildland fire	$3,550	$40	$0	$100	$5,600	$400	$4,500	$0	$600	$14,190	<=1
Hailstorm	$5,910	$90	$0	$20	$5,600	$600	$7,500	$0	$60	$19,720	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	$10,000	$0	$0	$0	$500	$0	$20,000	$0	$1,000	$30,500	<=1
Severe winter storm	$9,450	$540	$0	$10	$330	$1,200	$15,000	$0	$2,400	$36,530	<=1
Sink hole	$950	$10	$0	$10	$20	$40	$600	$0	$20	$1,630	<=1
Thunderstorm	$2,360	$40	$0	$10	$110	$400	$7,500	$0	$850	$10,420	<=1
Tornado	$23,600	$360	$0	$100	$2,240	$4,000	$30,000	$0	$2,400	$60,300	0-5
Windstorm	$3,550	$40	$0	$10	$780	$600	$4,500	$0	$950	$9,480	<=1
Totals	$73,612	$1,390	$0	$320	$17,230	$9,380	$112,100	$0	$10,480	$214,032	0-11

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $214,032 total per event as well as up to but no more than 11 fatalities in Shannon City.

Table 6 – 8: Estimated Losses by Hazard Event in Thayer

Event	Res.	Com.	Ind.	Ag. Str.	Ag. Land	Instit.	Gov. *	Ed.	Util.	Totals	Dths.
Dam failure	--	--	--	--	--	--	--	--	--	--	--
Drought	$510	$90	$0	$10	$50	$300	$3,000	$0	$190	$4,150	0

Earthquake	$50	$10	$0	$10	$10	$30	$1,000	$0	$100	$1,210	0
Expansive soils	$1,030	$70	$0	$10	$10	$225	$2,000	$0	$190	$3,535	0
Extreme heat	$510	$90	$0	$10	$10	$150	$1,000	$0	$1,500	$3,270	<=1
Flash flood	$4,100	$370	$0	$10	$30	$900	$8,000	$0	$1,500	$14,910	<=1
Grass/wildland fire	$1,540	$90	$0	$40	$250	$300	$3,000	$0	$970	$6,190	<=1
Hailstorm	$2,570	$230	$0	$10	$250	$450	$5,000	$0	$100	$8,610	<=1
Landslide	--	--	--	--	--	--	--	--	--	--	--
River flood	--	--	--	--	--	--	--	--	--	--	--
Severe winter storm	$4,100	$1,380	$0	$10	$10	$900	$10,000	$0	$3,860	$20,260	<=1
Sink hole	$410	$20	$0	$10	$10	$30	$400	$0	$40	$920	<=1
Thunderstorm	$1,030	$90	$0	$10	$10	$300	$5,000	$0	$1,350	$7,790	<=1
Tornado	$10,280	$920	$0	$40	$100	$3,000	$20,000	$0	$3,860	$38,200	0-5
Windstorm	$1,540	$140	$0	$10	$30	$450	$3,000	$0	$1,500	$6,670	<=1
Totals	$27,670	$3,500	$0	$180	$770	$7,035	$61,400	$0	$15,160	$115,715	0-10

Losses are based on data from NCDC, local officials, FEMA, and the State of Iowa Hazard Mitigation Plan.
-- Hazard cannot occur in jurisdiction or does very little or no notable damage.
** Includes public streets and bridges and public water/sewer lines as much as possible.*

The natural hazards considered are estimated to have an impact of $115,715 total per event as well as up to but no more than 10 fatalities in Thayer.

The above estimated data provides us a picture of the damages that could be sustained if a given event of each hazard type occurs in each jurisdiction. It is more relevant to project the annual losses by hazard by jurisdiction.

6.3: Estimate of Losses by Hazard Per Year

A reasonable estimate of losses can be obtained per calendar year, which would be more useful than by event, for each hazard in each jurisdiction. When using the formula, Damage per Event X (multiplied by) Number of Events Per Year, we can come up with the total losses in one year. Doing this provides a clearer picture of which hazards are likely to impact the community in a given year in terms of expected losses in today's dollars.

Table 6 – 9: Estimated Losses Per Year By Jurisdiction

	Rural *		Afton		Arispe		Creston *		Cromwell	
Hazard	#/Yr	$/Yr	#/Yr	$/Yr	#/Yr	$/Yr	#/Yr	$/Yr	#/Yr	$/Yr
Dam failure	0.005	$13,250	0	$0	0	$0	0.003	$24,300	0	$0
Drought	0.2	$413,450	0.2	$14,190	0.2	$1,336	0.2	$152,400	0.2	$976
Earthquake	0.005	$490	0.005	$63	0.005	$5	0.005	$543	0.005	$4
Expansive soils	0.2	$34,152	0.1	$7,232	0.1	$662	0.15	$118,985	0.1	$743
Extreme heat	0.6	$589,050	0.6	$30,612	0.6	$3,126	0.6	$398,160	0.6	$3,990
Flash flood	0.45	$660,825	0.2	$60,060	0.2	$5,690	0.35	$1,011,500	0.2	$6,276
Grass or wildland fire	0.8	$1,005,600	0.05	$5,718	0.05	$818	0.05	$27,689	0.03	$370
Hailstorm	0.6	$1,124,940	0.5	$90,125	0.4	$8,908	0.5	$655,000	0.3	$5,355
Landslide	0.2	$5,150	0	$0	0	$0	0	$0	0	$0
River flood	0.2	$923,000	0	$0	0	$0	0.05	$35,250	0.05	$1,250
Severe winter storm	0.6	$1,260,000	0.6	$242,310	0.6	$23,562	0.6	$1,950,000	0.6	$23,520
Sink hole	0.1	$9,870	0.03	$624	0.03	$63	0.05	$4,052	0.03	$80
Thunderstorm/Lightning	1.2	$1,194,000	1.1	$119,702	1.1	$10,439	1.1	$1,049,378	1.1	$11,572
Tornado (EF2 Avg.)	0.5	$632,150	0.1	$80,180	0.08	$5,940	0.12	$656,400	0.08	$6,408
Windstorm	0.65	$1,013,805	0.4	$50,060	0.4	$4,948	0.4	$584,000	0.4	$5,512
Totals		$8,879,492		$700,876		$65,497		$6,667,656		$66,056

Note: #/Yr is the total projected number of events in the jurisdiction per year, often corresponding to the probability of one event plus a second event plus additional events per year. $/Yr is the total losses per event per year and the total losses. D/Yr is the total fatalities per year as a range.
** Includes local schools in these jurisdictions*

	Lorimor		Shannon City		Thayer		Entire County	
Hazard	#/Yr	$/Yr	#/Yr	$/Yr	#/Yr	$/Yr	$/Yr	D/Yr
Dam failure	0	$0	0	$0	0	$0	$37,550	<=1
Drought	0.2	$4,966	0.2	$1,400	0.2	$830	$598,588	0
Earthquake	0.005	$26	0.005	$8	0.005	$6	$1,146	0

Expansive soils	0.1	$2,429	0.1	$574	0.1	$354	$165,130	0
Extreme heat	0.6	$10,380	0.6	$1,891	0.6	$1,962	$1,039,171	0-2
Flash flood	0.2	$20,284	0.2	$4,698	0.2	$2,982	$1,772,315	0-2
Grass or wildland fire	0.05	$2,150	0.03	$426	0.03	$186	$1,042,715	<=1
Hailstorm	0.4	$26,088	0.3	$5,916	0.3	$2,583	$1,918,915	0
Landslide	0	$0	0	$0	0	$0	$5,150	0
River flood	0	$0	0.05	$1,525	0	$0	$961,025	<=1
Severe winter storm	0.6	$82,032	0.6	$21,918	0.6	$12,156	$3,615,498	0-2
Sink hole	0.03	$210	0.03	$49	0.03	$28	$14,976	0
Thunderstorm/Lightning	1.1	$44,242	1.1	$11,462	1.1	$8,569	$2,449,364	0-2
Tornado (EF2 Avg.)	0.08	$21,149	0.08	$4,824	0.08	$3,056	$1,410,107	0-2
Windstorm	0.4	$17,073	0.4	$3,792	0.4	$2,668	$1,681,858	<=1
Totals		$231,029		$58,523		$35,379	$16,704,508	0-6

While not perfect, the loss estimation tables give us an idea what to expect in terms of losses by jurisdiction and hazard, even though we do not know exactly which buildings will be damaged the most. By estimating losses and annualizing the results for natural disasters, we have a means to prioritize hazards and mitigation actions beyond the basic profile results. Using this methodology, we find that the total annual loss to natural disasters in today's dollars is approximately $16.7 million dollars. This would include land, buildings, infrastructure, livestock, crops, and identifiable economic and personal property losses. This figure is higher than what has been reported as losses in the average year because it is likely that many of the losses are not reported to appropriate officials.

It is much more difficult to project annualized fatalities. The potential for losses is great in a given year, but fatalities vary greatly from year to year and from event to event. The data showing up to 6 fatalities in one year is simply a benchmark.

The State Mitigation Plan adopted in 2010 includes loss estimations models and processes for 11 natural hazards and one man-made hazard: flooding, drought, crop loss, tornado, hail, thunderstorm, extreme cold, snow and ice, windstorm, earthquake, lightning, and extreme heat. For each hazard the State plan has a description of an estimation methodology and historical loss data used in the models.

Table 6 – 10: State Hazard Mitigation Plan Loss Information

Juris.	Flood	Drought	Crop Loss	Extreme Heat	Extreme Cold	Hail
Marion	$9,119,058.82	$2,986,433.93	$562,958.91	$3,000.00	$283,375.00	$80,875.00
Iowa	$1,054,733,588.24	$177,000,000.00	$75,668,861.11	$390,062.50	$17,672,437.50	$32,404,937.50
Percent	0.86%	1.69%	0.74%	0.77%	1.60%	0.25%

Juris.	Snow & Ice	Tornado	Lightning	Thunderstorm	Windstorm	Total
Marion	$262,066.17	$508,833.33	$3,235.29	$79,294.12	$64,818.21	$13,953,948.79
Iowa	$9,916,799.62	$37,230,550.00	$730,117.65	$23,169,429.41	$4,249,224.34	$1,433,166,007.86
Percent	2.64%	1.37%	0.44%	0.34%	1.53%	0.97%

Source: State of Iowa Hazard Mitigation Plan, 2010

It is very difficult to compare the State's loss estimates to those presented in this plan because the hazards are categorized differently. For example flooding is not separated by type, lightning is separated from thunderstorms, and extreme cold and snow & ice are expanded from winter storms. However, if we were to utilize this data in its current form, we'd find that the State of Iowa's loss estimate for these hazards to be three-quarters as high as the total loss estimate found in this plan. Some hazards are reasonably similar in losses per the estimations, but other hazards, such as flooding and drought are given higher values by State planners and extreme, severe winter storm, thunderstorm and lightning, tornado, and windstorm have much lower State values. This does not suggest that the State values are inaccurate, but that the process is relatively subjective, that it is difficult to forecast precise losses when hazard events vary so much across the entire state, that data sources differ, and that there are many more assets to consider at the state level.

6.4: Data Limitation and Corrective Actions

The value and population tables in *Chapter 5* helped to develop reasonable estimates, but more precise study in the future will be needed– likely after a national loss estimation table is made for each of the above hazards. It should be noted that these losses are based on current mitigation strategies.

The above tables only represent natural hazards. This does not mean that no other hazards will damage the communities and the county. Certainly, highway transportation incidents and structural fires can and will cause deaths almost every year in Union County. Other incidents, such as terrorism events and structural failure, could cause mass casualties, but cannot be predicted with any real certainty. As a baseline figure, it may be useful to assume that the annual loss estimate due to non-natural hazards is approximately equal to the total natural hazard loss level. This assumption would indicate that the total hazard-related losses would be up to 12 deaths and $33 million in damages per year. If FEMA provides more guidance for the estimation of losses for non-natural hazards in the future, the plan update could include such estimates.

The above loss tables are not for insurance purposes or detailed planning and budgeting. At best, the tables should be used for comparison purposes when developing goals and objectives. Losses that cannot be included in such tables are considerations such as emotional anguish, losses of records and unique items, losses to pristine forests, water quality deterioration, and pollution creation. For many hazards a large area is at risk, but damage to any property will be very limited, and hazard effects would be mostly economic and operational. Most natural hazard events will impact individual buildings rather than all properties, and the percentages indicate the approximate impact to property. Items like water and sewer systems may or may not be damaged by an event, and it may be difficult to determine whether the deterioration of underground systems is due simply to age or from hazard events over the years.

6.5 Land Use Trends, Development Plans, and Losses

We have previously discussed (*Chapter 5*) the specific growth, land use and population trends in the community. The above loss analysis doesn't consider new development. Therefore, an additional 0.5% could be added to the countywide loss estimation table for each year due to new construction in the county and certain jurisdictions in the county. Special consideration in this assumption should be given to wildland fires, as they are more likely to impact new construction on the fringe of forest and agricultural areas. The percentage impact of wildfires would be higher, and losses by wildfires in new development areas could be more than 5% greater than the losses experienced in other areas of the county over the next 20 years. Most of the area impacted would be agricultural land that was taken out of production and would be subject to more losses due to the increased value of new structures on the property. Most small towns, some older neighborhoods of the larger towns, and the remote parts of the county are not expected to experience notable levels of development, and would not be included in such estimates.

6.6: Summary

The hazard mitigation planning team indicates that the main disaster losses over the past five years have been outbuildings, terraces, some grain bins and silos, overhead power lines, and many roads and bridges. Roads have sometimes been closed for days at a time when bridges have been destroyed, causing significant economic losses.

No single hazard event has potential impacts that are expected to cause extraordinary damage in the county, with the exception of a rare large tornado or a complete dam failure of one of the larger public lakes. The impacts per event, and thus per year, could be reduced if mitigation measures are in place.

Priority mitigation actions can and should be based upon relative loss data, but we should not place too much emphasis on these criteria and should carefully to consider hazard profile information and total assets at risk as well.

Chapter 7: Hazard Mitigation Goals and Objectives

The third major step in the FEMA Hazard Mitigation Planning Process is the development of the mitigation strategy for each jurisdiction, which begins with the development of mitigation goals and objectives.

The Union County Hazard Mitigation Planning Team at its fifth meeting reviewed the assessment and other planning documents drafted to date. The intent of the review of the data was to develop goals and objectives that would be fiscally feasible and yet highly beneficial. During the fifth meeting, the goals and objectives were created and initially evaluated.

The hazard goals are based on a four-pronged approach to emergency response, recognizing that mitigation actions affect all elements:

- Preparedness activities ensure the community and its residents are ready for a disaster and that they respond effectively. Preparedness involves determining what the community will do if essential services break down, developing a plan for contingencies, and practicing the plan.
- Response activities begin as soon as the disaster threatens. Response includes access control, search and rescue, mass care, medical services, and restoring essential services.
- Recovery activities help the community to return to pre-disaster condition. They include rebuilding services, infrastructure (utilities, communications, and transportation systems), facilities, operations, and the lives affected by the disaster.
- Mitigation activities are sustained actions that reduce the long-term risk of disasters. They reduce threats to the public health and safety, reduce or eliminate damages caused by disaster, and reduce the burden placed on local, state, and federal preparedness, response and recovery activities.

The following points summarize the mitigation strategy portion of the document:

- Mitigation Issue Statements (*Chapter 7*)
- Mitigation Goals and Objectives (*Chapter 7*)
- Capability Assessment (*Chapter 2*)
- Alternative Measures (*Chapter 8*)
- Alternative Measures Evaluation (*Chapter 8*)
- List of Approved Actions by Goal and Objective (*Chapter 9*)
- Multi-jurisdictional Implementation Strategy (*Chapters 9, 10*)

7.1: Benefits and Hindrances of Mitigation Planning

Hazard mitigation planning is a tool communities use to:

- Reduce future risks of death, injury and property losses.
- Identify specific problems and appropriate solutions.
- Achieve multiple objectives in a sustainable and efficient manner.
- Prioritize post-disaster projects.
- Enhance funding opportunities through Federal, State, and local programs.
- Promote public participation and ownership of solutions.

Early in the planning process, planning team members were asked why they were interested in hazard mitigation and why they wanted to complete a plan. The following are the results of that discussion:

- Help prepare us for both natural and man-made hazards
- Formalize thoughts and help obtain funding
- To have a plan in place and be more prepared
- Business continuity
- To be able to help protect areas against disasters and help if they do happen
- Planning for severe weather is necessary to reduce losses
- Address the lack of funding for unexpected damages
- Keep people safe, including staff, residents, workers, students

Planning team members were asked to consider a list of possible hindrances to hazard mitigation planning and implementation of projects. Fifteen members participated. The following provides the general results of the discussion:

- While not all agreed, the highest rated hindrance to hazard mitigation was the lack of funding or incompatible funding.
- The second highest rated hindrance was the lack of staffing, equipment, or other capabilities.
- The third highest rated hindrance was the lack of awareness of the need for hazard mitigation.
- Two lower scoring but not unimportant hindrances were other priorities and problems are more important and lack of authority or other regulatory interference.

In summary, hindrances to hazard mitigation at the local level is hindered by limited funding, limited capabilities, excessive regulation, and lack of awareness, the latter causing misappropriation of local priorities.

7.2: Mitigation Issue Statements

The following is a list of issue statements related to each of the Priority I hazards, as summarized from the HARA in *Chapters 4* through *6*, plus river flooding, which is a high priority for FEMA assistance and program compliance. Generally these are listed in overall priority order.

7.2.1: Severe Winter Storm Issue Statements

1. This hazard is a high-ranking Priority I hazard in all participating jurisdictions.
2. Ice, heavy snow, and severe wind chills from severe winter storms cause loss of life and damages averaging over $3.6 million per year in Union County, the highest of all hazards. Older homes, which are numerous in all parts of the county, are very susceptible to damage due to the ice and heavy snow.
3. Various jurisdictions in Union County have received FEMA assistance to clean up, power line repair, and street repairs after ice storms and heavy snow.
4. SWCC suffers an average of $10,000 to $15,000 in direct losses due to severe winter weather annually.
5. Union County Conservation has suffered thousands of dollars in FEMA-paid losses to trees in parks in an early 2008 ice storm. Green Valley State Park has suffered tree loss and extended power outages.
6. Union County has difficulty providing food and shelter and protecting agricultural assets due to winter storms.
7. Education on the need for sheltering, location of sheltering, and adequate insurance are issues.
8. Humans are very susceptible to severe winter weather, especially frail individuals who live in homes that lose power or that go outside when it is slippery, or those that travel on slick highways. Locally, one or more persons die annually due to the direct impact of severe winter weather, including auto accidents and exposure.
9. Union County has many homes built before insulation was used. These homes can be very cold and can pose a hazard to infants, elderly, and sick persons. Weatherization programs are available but cannot possibly meet all the need with funding limitations.
10. Ice and snow cause many highway transportation incidents in the county each year, some of them fatal.
11. Smaller towns and remote rural areas are affected more because of the lack of alternative power sources and emergency services. Emergency services have difficulty traveling and working in severe winter weather.
12. Early and late season storms can cause extensive crop loss.
13. School and work cancellations cause economic and functional use losses each year. In 2009/10, when 72” of snow fell, many school days were missed.
14. Ditches can be blocked, and ice and snow can be a major hurdle on unpaved roads long after the storm passes.

7.2.2: Windstorm Issue Statements

1. This hazard is a high-ranking Priority I hazard in all participating jurisdictions.
2. At over $1.6 million in projected annual losses in the county along with possible deaths, windstorms are considered the fifth most damaging in the county.
3. Damaging and dangerous winds can occur when people are unprepared because it can be a sunny day or clear night.
4. Windstorms cause damage to homes, businesses, and public facilities. Almost annually, dozens of structures,

mostly accessory uses, are damaged by high winds during any season. Winds make travel difficult and can be very dangerous in winter cold. SWCC suffers wind damage to campus buildings almost every year.

5. Farms and older homes in each jurisdiction are most vulnerable because they are subjected to higher winds or cannot withstand winds due to deterioration. Over 50% of homes, farms, and commercial properties in Union County are at least 50 years old.
6. Windstorms have caused numerous power outages in the county over the past five years.
7. Secondary roads are covered with debris and rural highway signs are damaged.
8. An August 2011 windstorm blew over several thousand acres of mature corn north and northeast of Creston.
9. Campers at county and state parks have been blown over by high winds.

7.2.3: Thunderstorm and Lightning Issue Statements

1. This hazard is a high-ranking Priority I hazard in all participating jurisdictions.
2. At over $2.4 million in annual losses along with up to two deaths per year, thunderstorms and lighting ranks second of all assessed hazards for annual estimated losses.
3. Severe thunderstorms with dangerous lighting occur more often than any other natural hazard assessed.
4. Structural damage and death are possible, and the cascading events can be numerous, including tornadoes, flash and river flooding, hailstorms, and windstorms.
5. Severe thunderstorms and lightning occur annually in each jurisdiction and cause energy failure lasting more than one day in some occasions. Critical population areas, such as retirement housing, nursing homes, and schools, and critical assets, such as water treatment facilities, cannot operate and thus endanger lives. Lightning puts out power to all but the very few critical assets that have reliable fixed back-up power. High thunderstorm winds also cause power failure regularly.
6. The county and each jurisdiction lack the human resources to make repairs quickly in the event of a storm-related power outage. It is possible that a widespread thunderstorm event could cut power in rural areas for days.
7. Communications equipment can and has failed due to lightning and heavy rain events. Some emergency services have secondary or redundant equipment or systems that can take over during emergency situations, but resources are limited.
8. The lack of alert systems in the rural part of the county, namely in rural subdivisions and campgrounds puts people at risk of injury and death due to thunderstorms. The county lacks funding to supply all homes and businesses with weather radio.
9. Creston Schools and rural areas have suffered extensive damages due to thunderstorms.
10. People at Union County parks and lakes are in unique danger due to water and other outdoor exposures.

7.2.4: Energy Failure Issue Statements

1. This hazard is a high-ranking Priority I hazard in all participating jurisdictions.
2. Energy failure affects every facet of our modern life because we rely upon so much technology today to live, work, and play. There are few, if any, redundant energy systems in the county and most power supplies are exposed to weather.
3. Even a few minutes of energy failure can cause casualties in populations of elderly, sick, or others in special care. Approximately 20% of the population meets this description.
4. Severe thunderstorms, windstorms, and winter storms take out power lines all over the county almost every year.
5. Due to the lack of fixed generators at a most critical facilities, such as water and sewer plants and sewer lift stations, people could be out of water and could have sewer back-flowing issues for hours or even a day or two. This would cause enormous economic and potential health loss.
6. There is a lack of human resources (staff or volunteers) in event of major event that causes extensive power line damage throughout the county. This is only partially offset by employee sharing among utility providers.
7. The county has very limited local power generation compared to needs of county facilities.
8. Some jurisdictions have regular outages due to the age of the system that is not designed to withstand hazards events. Very few of the utility lines are buried in Union County.
9. Energy failure slows local emergency response time and affects communications facilities.

10. It is difficult for energy suppliers to keep up with the increasing demand for energy and the issues surrounding the aging infrastructure.

7.2.5: Extreme Heat Issue Statements

1. This hazard is a Priority I hazard in all participating jurisdictions.
2. Extreme heat is responsible for a high level of losses, just over $1 million, per year. The effects of extreme heat include loss of life, up to 2 per year, illness, and significant economic losses. Heat indices can reach 110 degrees F with very high humidity for several days at a time.
3. Energy failure is very common due to extreme heat, both because of line failures and because the demand regionally or nationally exceeds the supply. People in buildings without proper ventilation, the elderly, or the ill can suffer quickly if cooling systems are lost due to energy failure. Healthcare facilities, nursing homes, assisted living housing, apartments, and individual homes are affected.
4. There is not enough back-up generation capacity for critical facilities or for extended outages caused by long periods of extreme heat.
5. Extreme heat damages rural highways, asphalt roads, and city streets, causing thousands of dollars in damages throughout the county.
6. Extreme heat has caused excessive attrition among emergency response workers, especially firefighters in their heavy protective equipment.
7. Not all areas are served by a designated cooling shelter and not all people know where they can go even when available. Those playing and working outside may not notice they are being overcome with heat.
8. Extreme heat can contribute to fires, droughts, and deaths of farm animals.
9. Most public facilities in Union County are air conditioned, but many homes and other buildings lack the facilities. EMS calls spike during these events.
10. Public awareness of risks seems to be a major local concern. Hot sunny days seem harmless because they don't look severe, like an approaching storm does.

7.2.6: Tornado Issue Statements

1. This hazard is a Priority I hazard in all participating jurisdictions.
2. At over $1.4 million in projected annual losses in the county along with up to two deaths per year, tornadoes are considered very damaging. An extreme, though rare, event could be very catastrophic.
3. Tornado-force winds and flying projectiles could destroy or severely damage any structure in the county, as none are designed to withstand 250 MPH winds.
4. The lack of alert systems in the rural part of the county, namely in rural subdivisions and campgrounds puts people at risk of injury and death due to tornadoes. The county lacks funding to supply all homes and businesses with weather radio. Some towns have too few or very old warning sirens.
5. Codes lack adequate provision for safe rooms (that can withstand 250 MPH winds) in mobile home parks;
6. Large gatherings of people and population centers are at risk, as well as highway travelers. There is not enough mass casualty medical assistance and equipment available in the county. The planning team raised concern about the ability to respond to a tornado event such as in Joplin, Missouri, in 2011. At that scale, people will have no place to live or work and there are not enough resources to temporarily handle the influx of aid workers and help those who are displaced. Food storage would be very difficult.
7. Many older homes lack basements or lack accessible basements for handicapped or frail persons.
8. Union County leaders and partners are still learning from the April 2012 tornado that cost over $5 in damages in Creston and northern Union County. Due to the amount of insured losses, FEMA did not make funding available. One clear problem is the lack of rent's insurance held by many renters, which still suffer months later due to the losses they suffered.
9. The lack of alert systems in the rural part of the county, namely in rural subdivisions and some recreational areas puts people at risk of injury and death due to tornadoes. The county lacks funding to supply all homes and businesses with weather radio.
10. Campers and outdoor rural park users are not protected at this time. Shelters are not suitable and close to populated areas.

7.2.7: Drought Issue Statements

1. This hazard is a Priority I hazard in most jurisdictions and a Priority II hazard in the remaining.
2. The annual loss estimate for drought is just under $600,000, without knowing the full value of crops lost. Economic losses, such as loss of crops, loss of recreation (due to lowered lake and river levels), and loss of livestock would be traumatic for a rural county heavily dependent on agriculture and water supplies.
3. The State of Iowa Mitigation Plan's drought loss estimate for Union County is significantly higher. It may consider these economic impacts more accurately.
4. Union County relies upon surface water sources for much of its potable water. Three Mile and Twelve Mile Lakes are large water sources, but any drought affecting Union County would affect the surrounding counties where fewer water sources are found. The County has one operational water production plant.
5. The effects of the loss of water supply include loss of safe drinking water to nearly 13,000 residents, loss of production water to approximately 10 major industries, loss of water for crops and animals on farms, and diminished water for firefighting needs. In past drought events, since rural water systems have been built, rationing has had to occur but doing so has hurt the local economy without entirely mitigating the risks.
6. Drought conditions affect the high-clay soils in the county, thereby causing damage to water, sewer, and gas pipelines. While incidents have been minor in the past, the threat of major losses exists.
7. Union County is largely covered by cropland, CRP ground that is idled and often covered with dense grasses, and forests, including nearly 10,000 acres of public and private forestlands. Droughts create conditions for rapidly progressing fires.

7.2.8: Hailstorm Issue Statements

1. This hazard is a Priority I hazard in most participating jurisdictions and a Priority II hazard in the remaining.
2. Hailstorms are responsible for nearly $2 million in damages each year, the third highest among natural hazards. No deaths are attributed to hail in the loss estimation but they are possible.
3. Hailstorms in southern Iowa have caused the destruction of hundreds of shingled roofs in the past five years.
4. While crop and homeowners insurance cover most hail events, they can be very damaging to uninsured property and can cause injuries and death. Large amounts of crop losses can impact local or even international economic impacts in crop markets.
5. Hailstorms are often signs of impending tornadoes, which hinder emergency response.
6. Anything outdoors during a hailstorm is at risk of significant damage. Campers and other outdoor users of local parks and campgrounds are at unique risk.

7.2.9: Communications Failure Issue Statements

1. This hazard is a Priority I hazard in most jurisdictions and a Priority II hazard in the remaining.
2. The hilly rural areas and remote areas of the county present difficulties communicating via wireless and are subject to excessive communications failure. Law enforcement, EMS, and fire vehicles in particular lack necessary mobile equipment that keeps up with modern interoperability standards and that can communicate in remote locations.
3. Being a rural county, resources for communications equipment and towers are limited and volunteers trained in the latest technologies are difficult to secure.
4. Communications failures result from many hazards and can directly relate to failures to properly respond, thereby exacerbating the impacts of disasters on the public.
5. Union County has plans for communications failures; however, regulations and costs continue to change and grow. Both land lines and cell services can be lost at the same time. We rely too much on seemingly invincible technology. Social media can help if Internet services are not lost.

7.2.10: Flash Flood Issue Statements

1. This hazard is a Priority I hazard in many jurisdictions and is a Priority II hazard in all other jurisdictions.
2. At just under $1.7 million in projected annual losses in the county along with up to two deaths per year, flash floods are rated as the second most damaging annual hazard, particularly to developed areas and transportation routes.
3. Flash flooding causes extensive inflow and infiltration in the sewer systems of all towns in the county that have

sewers. These problems result in extensive damages to local cities each year.

4. Sewer backflow devises are not available in some systems. When a heavy rainfall occurs, wastewater can back up onto homes, causing thousands of dollars in damage each to hundreds of buildings with basements. Creston is addressing this issue with projects, incentives, and city code updates.
5. Underground systems are often poorly maintained and older than their designed lifespan. Storm water systems are inadequate in larger populated areas and almost nonexistent in smaller towns. Water is not controlled and quickly overruns yards, parking areas, and culverts. Many culverts have been washed out in the rural areas because too much water flows too quickly through them.
6. There are no maps or technological monitors in the storm water systems to inform officials when systems are damaged, clogged, or nearing capacity.
7. Local officials have no inventory of locations where reoccurring flash flood event are located. Therefore, warnings to the public and mitigation projects cannot be properly targeted.
8. Flash flooding causes the most damage to rural roads, bridges, and culverts of any hazard type. A significant part of the annual Secondary Roads budget is responsible for addressing losses due to flash flooding.
9. SWCC and other assets and jurisdictions have suffered repeated flash flood losses that seem to be difficult to mitigate.
10. Water wells in Union County have been contaminated. SIRWA's construction of regional water supplies addresses most human concerns, but farm animals do not have adequate access.

7.2.11: Structural Fire Issue Statements

1. This hazard is a Priority I hazard in many jurisdictions and is a high Priority II hazard in all other jurisdictions.
2. Structural fires consume much of the county's mitigation resources on an annual basis in Union County, including the bulk of firefighter training and department operating costs.
3. Structural fires affect dozens of properties each year. Fire departments report dozens of house fires each year along with dozens of fires in outbuildings, businesses, offices, vehicles, and farm buildings. The direct loss of human life and personal property due to structural fires is likely more than any other hazard in the average year in Union County, except perhaps highway transportation incidents.
4. There is poor or unreliable water supply and pressure in some rural areas and small towns that are served by rural water agencies. There are dry hydrants in the county, but there are insufficient for a very large fire because they may be located miles from the fire.
5. All fire departments struggle financially to make upgrades and meet new mandates; equipment and vehicles are aging, and all departments need volunteers, increased training, and equipment. Budget shortfalls exist due to the current economy and rapid fuel cost increases.
6. Some fire departments lack adequate room for storage of modern vehicles and for modern training.
7. Some local fire stations do not have backup fixed generators. Without these, power equipment could be rendered useless, communications may not function, and bay doors may not open.
8. Most departments are well trained and mutual aid compacts are in place.

7.2.12: Various Forms of Terrorism Issue Statements

1. Conventional terrorism is a Priority I hazard in several jurisdictions. Bioterrorism is a Priority I hazard in schools. Other terrorism events are of concern.
2. Schools as a whole are the most susceptible jurisdictions, but local government and larger business facilities are also more likely targets within larger jurisdictions.
3. Incidents in Union County are likely to be limited to relatively simple or small domestic terrorism incidents, such as bomb threats, suspicious powders, and pipe bombs in mailboxes, but the fear and economic problems created could be significant.

7.2.13: Transportation Hazardous Materials Incident Issue Statements

1. Transportation HAZMAT is a Priority I hazard in a few jurisdictions. This is a hazard in other jurisdictions where highways and rail exist.
2. Union County has few trained and certified responders; no fire departments are certified; the county is not part of a formal response team, mostly due to cost.

3. Some departments do not have adequate foam and hazardous substance firefighting capabilities, despite the existence of hazardous materials in the county and ethanol plants in neighboring areas.
4. Creston and rural areas near Creston have industries that handle large volumes of chemicals.
5. US Highway 34 and the BNSF Railroad handle hazardous materials from all over the state and Midwest. Local responders are not prepared for some incidents that may occur.
6. Union County lacks the personnel to undertake and coordinate an evacuation and traffic control.

7.2.14: Pipeline Transportation Incident Issue Statements

1. This hazard is a Priority I hazard in some jurisdictions and is a Priority II hazard in any other jurisdiction where pipelines are found, except rural areas, where it is a Priority III hazard.
2. In larger towns and others with primary use of natural gas, pipeline events are seen as a unique concern. These cities have border stations located where vandals can access them. Larger towns have larger retail and manufacturing facilities that rely upon natural gas for heating and manufacturing processes.
3. Rural areas through the central part of the county have underground pipes with surface valve systems. These areas are vulnerable to human impact and natural hazards.
4. Natural gas heats homes in several of the cities of the county in the winter.
5. Union County lacks the personnel to undertake and coordinate an evacuation and traffic control.
6. Mapping is a concern; this is mitigated to some degree with One Call before digging.

7.2.15: Grass and Wildland Fire

1. This hazard is a Priority I hazard in the rural part of Union County, a Priority II hazard in several other jurisdictions, and a Priority III hazard in some jurisdictions.
2. An estimated $1 million in annual losses and up to 1 fatality is anticipated in Union County. The losses can be higher if a conflagration results that traps firefighters. Changes in weather, such as sudden high winds, can cause such instances.
3. In the rural area, notable losses are sustained every year due to grass and wildland fires. Because of the topography, mixture of vegetation, and the large tracts of unmanaged forestlands in many areas, many wildfires can occur in one day. This has occurred in Union and surrounding counties in the past ten years.
4. There is a poor or unreliable water supply and pressure in some rural areas and small towns. There are dry hydrants in the county, but they are scattered in a few locations.
5. All fire departments struggle financially to make upgrades and meet new mandates; responding to rural wildland fires with proper clothing for the weather in adequate numbers is very difficult. Budget shortfalls exist due to the current economy and rapid fuel cost increases.
6. Many departments have old protective clothing that is very heavy and difficult to wear on hot days or during rain events.
7. Signs and bridges have been damaged by rural ditch fires.

7.2.16: River Flood Issue Statements

1. This hazard is a Priority II hazard in several other jurisdictions, and a Priority III hazard in some jurisdictions.
2. Just under $1 million in damages occurs annually due to river floods. The State of Iowa Mitigation Plan indicates much higher loss levels. It is likely that wear to bridges and roads may be understated in this plan.
3. Most losses are in rural areas, including roads, bridges, crops, farmland, culverts, and even some outbuildings. Homes can be damaged in some locations.
4. Hurley Creek in the middle of Creston poses unique problems due to the number of roads, bridges, culverts, and homes in the area. A school is in the path of this stream, which is tunneled under the school property.
5. Water and sewer plants are downstream from dams that can fail due to flooding or are in flood plains.
6. Mapping is not current and the rural area is not even mapped at all.
7. Many need to be educated on the benefits of flood insurance. Much of the county's recreation is in the flood plain areas, and people may take unnecessary risks to "have fun" in these areas when water levels are too high.

7.2.17: Fixed HAZMAT Issue Statements

1. Fixed HAZMAT is a Priority I hazard in Creston. This is a Priority II hazards in other jurisdictions.

2. Some departments do not have adequate foam and hazardous substance firefighting capabilities, despite the existence of hazardous materials in the county and ethanol plants in neighboring areas.
3. Creston and surrounding rural areas have industries that handle large volumes of chemicals.
4. The several four-lane highways handle hazardous materials from all other the state and Midwest. Local responders are not prepared for some incidents that may occur.
5. No communities are ready for ruptured anhydrous tank failures.
6. Union County lacks the personnel to undertake and coordinate an evacuation and traffic control.

Certainly, there are risks and problems related to other hazards on the identified hazard list, and some of them are profound. They should not be ignored but rather should be addressed as necessary outside of or incidental to the implementation of this plan. Thankfully, most of the issues caused by other hazards are addressed by other existing plans and mitigation efforts.

7.3: Mitigation Goals and Objectives in the Previous Plan

The plan adopted in 2006 contained numerous goals and subsequent objectives related to specific hazards: "Reduce losses due to….hazard." Since that time, due to additional experience with hazard mitigation planning and the use of a more hands-on approach, the number of goals and objectives have declined and the quality of them have improved in terms of identifying and classifying appropriate actions.

7.4: Mitigation Goals and Objectives

The planning team, with assistance from the public, the consultant, current local plans, elected officials, and FEMA/IHSEMD guidance, established the following goals, generally in order of significance, to make the county and all jurisdictions safer and more disaster resilient. The goals were created as part of the fifth planning team meeting using a survey process where the team members ranking language suggestions for numerous goals and objectives. These goals and objectives apply to all the currently participating and future participating jurisdictions in the countywide multi-jurisdictional plan.

Goal 1: Reduce the extent of fatalities and injuries due to hazards.

Objective 1: Improve warning capabilities against hazards.
Objective 2: Implement structural projects that will result in protection of life and safety.
Objective 3: Heighten public awareness of natural hazards.

Goal 2: Improve public response to hazards and make recovery easier.

Objective 1: Enhance the continuity of local government.
Objective 2: Prepare plans and identify resources to facilitate government operations after a disaster.

Goal 3: Improve coordination and communication with other relevant organizations.

Objective 1: Enhance cross-agency and intra- and inter-county communications.
Objective 2: Maximize utilization of the best technology.

Goal 4: Build and support local capacity and commitment to become continuously less vulnerable to hazards.

Objective 1: Improve education and training to increase public and responder awareness.
Objective 2: Review and then either continue, enhance, expand, or end response capabilities, protocols, and training efforts.
Objective 3: Ensure the hazard mitigation plan is reviewed regularly and is updated as needed.
Objective 4: Maximize property owner participation in hazard mitigation.

Goal 5: Be as efficient as possible with government funding.

Objective 1: Maximize the use of outside sources of funding.
Objective 2: Prioritize mitigation projects, based on true costs and benefits, annually and with each budget.

Goal 6: Protect existing and future properties.

Objective 1: Improve public assets and infrastructure and provide back-up systems in hazard impact areas.
Objective 2: Use appropriate mitigation actions to protect properties from site-specific hazards.
Objective 3: Ensure that current and future owners have the means to maintain and improve their properties.
Objective 4: Create and/or update maps, ordinances, and regulations affecting new development.

Please note that the above goals and objectives were created by planning team members with consideration of the goals and objectives included in other plans in the area.

The next chapter details the proposed mitigation actions for each jurisdiction consistent with the issue statements and goals and objectives listed in this chapter.

Chapter 8: Alternative Mitigation Actions and Strategies by Jurisdiction

The real meat of the hazard mitigation plan is the development of a wide range of alternative mitigation actions, the evaluation of the actions, and the plan for their implementation in each jurisdiction. Because need and hazards vary by jurisdiction, the strategy is organized by jurisdiction.

The following topics compose the mitigation plan portion of the document:

- Categories of mitigation measures
- Alternative mitigation measures by jurisdiction
- Alternative measures evaluation by jurisdiction
- Mitigation action matrix by jurisdiction *(Chapter 9)*
- Listing of mitigation actions by goal and objectives *(Chapter 9)*
- Unfounded data and conclusions *(Chapter 9)*
- Mitigation plan implementation methodology (*Chapter 10*)

All the jurisdictions were involved in the identification of possible mitigation actions, as outlined in the handouts used in *Appendix E* and the descriptions of methodology in this chapter. The local planning efforts included review of possible actions using the "Union County MJ Mitigation Plan Potential Hazard Mitigation Measures—Jurisdiction" worksheet. This worksheet helped to categorize possible mitigation actions as a) definite need, b) possible need, c) already underway or completed, or d) unnecessary. The jurisdictions covered in the plan also helped with the evaluation of mitigation alternatives listed in this chapter.

The effectiveness of mitigation actions is described in greater detail as part of the "evaluation of mitigation actions" later in this chapter. However, categories of current actions, capabilities, policies, and programs are considered briefly in the following matrix.

Figure 8 - 1: Summary of Capability Assessment for Union County

Policies and Programs	Document Reference	Effectiveness for Mitigation	Rationale for Effectiveness Rating
General jurisdiction ordinances	City, county, and school policies affecting landowners & properties	Medium to high	Would be high if there are resources and staff to enforce; losses can be limited if the codes and ordinances are in place to reduce exposure
Multi-hazard emergency operations plan	Union County EOP and annexes	Medium to high	Meetings among agencies are common. The EOP does not have a FEMA-compliant Hazard Analysis and Risk Assessment (HARA) section.
Floodplain and land use management	FEMA floodplain maps; IDNR floodplain management text; local land use plans	High	If a rural floodplain map can be made and ordinances are passed, future losses can decline. Management of land uses can greatly reduce unnecessary exposure to many hazards.
Storm water regulations	Maps, ordinances	Limited to medium	Most jurisdictions have regulations in place and new development will have storm sewers. A larger issue is funding to upgrade old systems.
Building regulations	Building code adopted by jurisdictions	Limited to high	The status of building regulations varies greatly by jurisdiction; small jurisdictions with limited staff would benefit little from adopting regulations, especially when many homes and buildings would be grandfathered into existing zoning. Building regulations in growth areas could have high impact, especially where zoning and subdivision regulations exist.
Flood insurance	FEMA floodplain maps	Medium	Numerous private properties are located in mapped or possible floodplains. Many refuse to purchase insurance.
Back-up facilities and services	City plans and maps on file	Medium	Few true Capital Improvements Programs. Limited local funds for back-up facilities. Limited secession plans. Transit systems and busses are available for evacuation and transportation.

Authorization measures	Protocols approved by state, federal, and local officials	Medium	Limited funding and staffing makes it difficult to stay abreast of measures handled down from higher levels of governments; there is a hierarchy of government that must be followed.
Mitigation projects	This hazard mitigation plan Chapters 3 and 9	Medium to high	Can be expensive, but projects will mitigate hazards when completed in known hazard areas. Union County has limited resources that can be delivered to any mitigation action. With proper FEMA and other agency funding and oversight, the impact on targeted well-planned projects could be high.
Public education	This hazard mitigation plan Chapters 2 and 8	Medium	Most of the time this low-cost measure will have limited results because what is learned is easily forgotten until the hazard occurs. However, these actions sometimes result in fundamental change in a community and will help build support for a more expensive project.
Dedicated hazard mitigation staff	Research data from FEMA and others	Medium to high	Staff can help ensure the plan is implemented, including the other elements above. Would be high if the staff is well supported.
Community organizations	Information about local organizations that would be created	Limited to high	Depending on size and responsiveness of the organizations, the effectiveness could vary widely. If they volunteer on programs and projects
Federal and state rating programs	Data from the federal and state programs	Medium	Simply having a certain rating, such as ISO, CRS, Weather Ready, Firewise, or other does not make the community safer; the training, education, planning, and investment to reach those standards could.
Updated maps (FEMA, State, and local GIS)	As the maps are made available and GIS capabilities are started	Medium to high	Mapping is a major issue right now, on a jurisdictional and watershed level; FEMA, IDNR, and other officials are updating/creating maps for GIS capabilities; County is working on local GIS capabilities and will hopefully include hazard maps in the GIS database.

The following sections of this chapter details the alternative actions that build upon current capabilities, staffing, funding, and actions that are ongoing. Final mitigation actions selected for each jurisdiction are done with consideration of capabilities to implement them with the proper staffing and funding.

8.1: Categories of Mitigation Measures

Mitigation includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Efforts by Federal, State, and local governments can restrict development in vulnerable areas, direct new development to less vulnerable areas, and promote ways to safeguard existing development in hazard-prone areas. Individuals can also participate through practicing sound personal safety and property prevention measures. There are six major categories of mitigation actions:

- Prevention tools can include regulatory methods such as planning and zoning, building regulations, open space planning, land development regulations, and storm water management.
- Property protection measures reduce the risk of building damage through acquisition of land, relocation of buildings, modifying at-risk structures, and flood proofing at-risk structures.
- Natural resource protection measures include erosion and sediment control or wetlands protection.
- Emergency service measures include warning, response capacity, critical facilities protection, periodic risk analysis, and health and safety maintenance.
- Structural mitigation controls natural hazards through projects such as reservoirs, levees, diversions, channel modifications, and storm sewers.
- Public information includes providing hazard maps and route information, outreach programs, real estate disclosure, technical assistance, and education.

8.2: Mitigation Alternatives Considered

Mitigation alternatives that are plausible to address Priority I hazards for each jurisdiction and that are not already underway, ongoing, or complete (as identified in *Chapter 2*) are considered in this chapter as a possible mitigation

alternative. At the sixth planning meeting, the planning team reviewed each alternative for further discussion. The following sections provide a matrix for each jurisdiction. The applicable mitigation category(s) is(are) to the right of each measure.

The individual jurisdictions went through the proposed actions created for each jurisdictions at this phase and some were eliminated from further consideration in some jurisdictions simply because they made no sense with the demographics and capabilities of the area.

The following matrices of measures are those that have been listed locally for further consideration AND that affect and potentially mitigate one or more of the Priority I hazards, where investments of time and other resources would be expected to make the greatest impact on protecting each jurisdiction. Some strategies are applicable to more than one hazard and may be applicable to the moderate- and acceptable-risk hazards as well. Already adequately undertaken mitigation actions are previously listed (*Chapter 2*) and are not included in these matrices. The following actions are intended to be comprehensive, but this process does not limit the community from undertaking other mitigation actions. Note that the following matrices of actions are relevant for the next five years. The next plan update should include possible changes and amendments to the mitigation action lists.

8.2.1: Union County (including Rural) Alternative Mitigation Measures

Union County officials and staff, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation measures. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 2: Union County List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1 and River Flooding												
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Flash flood	Grass and wildland fire	Hailstorm	River flood	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure	Transportation HAZMAT
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X	X	X
Install hazard signs in area campgrounds, parks, and open spaces	Public education	Prevention			X	X	X			X	X	X			
Adopt building codes to address various natural hazards	Prevention	Property protect.			X	X	X		X	X	X	X	X	X	
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education			X	X	X	X	X	X	X	X	X	X	X	X
Adopt manufactured home development storm shelter ordinances	Prevention	Property protect.			X	X	X		X	X	X	X	X	X	
Adopt tree trimming ordinances	Prevention	Property protect.	X		X	X			X	X	X	X	X	X	
Work with FEMA and IDNR to develop quality flood maps	Prevention	Property protect., public education			X			X							
Assure jurisdictional plans are	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X	X	X	X

in place and current															
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X	X	X
Designate/enforce area HAZMAT transportation routes	Prevention	Property protect.				X									X
Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program	Prevention	Property protect.			X			X							
Enforce OSHA regulations on hazardous materials	Prevention	Property protect.				X								X	X
Enforce burning restrictions	Prevention	Property protect.	X	X		X									
Enforce multi-family housing extinguisher laws	Prevention	Property protect.													
Implement/update and enforce zoning ordinances	Prevention	Property protect.	X	X	X	X		X	X				X	X	X
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X	X	X			X			X	X	X	
Restricted access procedures	Prevention				X	X		X	X		X	X	X	X	X
Special needs/oxygen user registration program	Prevention			X		X								X	X
Subdivision ordinances to address hazard interface areas	Prevention	Property protect.	X	X	X	X		X	X			X	X	X	X
Encourage private insurance purchase	Property protect.	Public awareness	X	X		X	X		X	X	X	X	X	X	
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X		X		X	X	X	X	X	X	
Develop/implement flood assessments related to rural road assets	Property protect.	Prevention			X			X							X
Install windbreaks	Property protect.	Prevention				X			X			X			X
Integrate tornado safe room retrofits into critical assets and facilities	Property protect.	Structural project					X			X	X	X			
Lightning protection of tall buildings and towers	Property protect.	Prevention								X			X	X	
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X	X	X		X	X	X	X	X	X	
Remove asbestos from public buildings	Property protect.	Prevention													
Post “no dumping” signs	Nat. Res. protect.	Public education				X					X	X			X
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X		X	X	X	X	X	X	
Remove unused chemical containers	Nat. Res. protect.	Prevention		X	X	X	X	X		X	X	X			X
Tree planting programs on public property and ROW	Nat. Res. protect.	Prevention	X	X			X		X			X			
Undertake stream modifications	Nat. Res. protect.	Prevention			X			X							
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X											
Develop search and rescue teams	Emerg. response				X	X		X	X		X				X
Develop volunteer base – trained and stand-by groups	Emerg. response			X	X	X	X	X	X	X	X	X	X	X	X
Establish HAZMAT decontamination sites	Emerg. response														X
Implement bomb squad program	Emerg. response					X							X	X	X
Install computers in emergency	Emerg. response			X	X	X	X	X	X	X	X	X	X	X	X

vehicles															
Install GPS units in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X	X
Maintain Emergency Operations Center with 24-hour capability	Emerg. response						X	X	X	X	X	X	X	X	
Participate in a regional HAZMAT team agreement	Emerg. response	Property protect.				X									X
Participate new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	Emerg. response	Prevention		X	X	X	X	X	X	X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X	X	X		X	X		X	X	X	X	X
Purchase snow trucks, plows, and sanders	Emerg. response	Prevention							X						
Build highway or rail overpasses to reduce intersection accidents	Structural proj.	Prevention													X
Increase rural intersection lighting	Structural proj.	Prevention													X
Bury utility lines in existing development areas	Structural proj.	Prevention		X	X	X	X	X	X	X	X	X	X	X	X
Clear and deepen ditches on right-of-ways	Structural proj.	Prevention, property protect.			X			X							X
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural proj.	Prevention					X			X	X	X			
Construct or repair dams	Structural proj.	Prevention, property protect.			X			X					X	X	X
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural proj.	Prevention, nat. resource protect.			X			X					X	X	X
Demolish abandoned properties	Structural proj.	Prevention			X	X	X	X	X	X	X	X			
Develop reservoirs/lakes (flood control, water source)	Structural proj.	Prevention	X	X	X	X		X							
Harden public buildings	Structural proj.	Prevention					X		X	X	X	X	X	X	
Improve roads (resurface, pave, widen, etc.)	Structural proj.	Prevention		X	X				X						X
Promote the construction of private in-home tornado safe rooms	Structural proj.	Property protect., public education					X			X	X	X			
Replace bridges and culverts	Structural proj.	Prevention			X	X		X	X		X	X			X
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Prevention	Property protect.				X							X	X	X
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X	X	X	X
GIS mapping system – implementation of hazard maps	Property protect.	Prevention, public education			X	X		X	X	X	X	X	X	X	X
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Nat. res. protect.	Prevention, property protect.			X			X							X
Install chain link fences around certain chemical tanks	Prevention	Property protect.				X									
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural proj.		X					X	X	X	X	X	X	
Investigate and implement alternative energy sources	Prevention	Structural proj.		X					X	X	X	X	X	X	

The planning team members provided details about the need for the above projects and where there were shortcomings in services or problems that resulted.

8.2.2: City of Afton Alternative Mitigation Measures

The City of Afton, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 - 3: City of Afton List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1											
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Flash flood	Hailstorm	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure	Pipeline trans. incident
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X	X
Initial community briefings immediately after events	Public education	Prevention			X	X	X	X	X	X	X	X	X	X
Install hazard signs in area campgrounds, parks, and open spaces	Public education	Prevention			X	X			X	X	X			
Acquire modern chemicals and equipment for firefighting	Prevention	Property protect.					X						X	X
Adopt building codes to address various natural hazards	Prevention	Property protect.			X	X	X	X	X	X	X	X	X	X
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education			X	X	X		X	X	X	X	X	X	X
Adopt manufactured home development storm shelter ordinances	Prevention	Property protect.			X	X		X	X	X	X	X	X	
Work with FEMA and IDNR to develop quality flood maps *	Prevention	Property protect., public education			X									
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X	X	X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X	X
Conduct study on possible illegal use of sump pumps	Prevention	Property protect.			X									X
Designate/enforce area HAZMAT transportation routes	Prevention	Property protect.												X
Enforce OSHA regulations on hazardous materials	Prevention	Property protect.					X						X	X
Enforce multi-family housing extinguisher laws	Prevention	Property protect.					X							
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X				X	X	X	X		X	X
Implement/update and enforce zoning ordinances	Prevention	Property protect.	X	X	X		X	X				X	X	X

Investigate alternative water sources for fire suppression	Prevention	Property protect.					X							X
Map past chemical contamination sites	Prevention	Property protect.					X						X	X
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X	X			X			X	X	X	
Special needs/oxygen user registration program	Prevention			X			X						X	X
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention					X							
Encourage private insurance purchase	Property protect.	Public awareness	X	X		X	X	X	X	X	X	X	X	X
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X	X		X	X	X	X	X	X	X
Integrate tornado safe room retrofits into critical assets and facilities	Property protect.	Structural project				X			X	X	X			
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X	X		X	X	X	X	X	X	
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X	X	X	X	X	X	X		X	X
Install backflow devises	Property protect.	Prevention			X									X
Post "no dumping" signs	Nat. Res. protect.	Public education								X	X			
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X	X	X	X	X	X	X	
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education			X	X	X	X	X	X	X	X	X	X
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X										
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X				X	X	X	X	X	X	
Develop/update/publicize city evacuation plans	Emerg. response	Public education			X		X			X			X	X
Emergency response guidebooks in all emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X
Establish HAZMAT decontamination sites	Emerg. response													X
Implement bomb squad program	Emerg. response						X					X	X	X
Install computers in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X
Install GPS units in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X
Participate in a regional HAZMAT team agreement	Emerg. response	Property protect.												X
Purchase new fire trucks and ambulances	Emerg. response	Property protect.		X	X	X	X	X	X	X	X			X
Participate new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	Emerg. response	Prevention		X	X	X	X	X	X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X	X		X	X		X	X	X	X	X
Purchase SCBA (self-contained breathing apparatus)	Emerg. response	Prevention					X						X	X
Purchase thermal imaging system for fire department	Emerg. response	Prevention			X		X	X		X	X		X	X
Purchase vehicle extrication equipment	Emerg. response	Prevention												
Bury utility lines in existing and	Structural project	Prevention		X	X	X	X	X	X	X	X	X	X	X

new development areas														
Clean sewage lagoons and install rock	Structural project	Prevention			X									
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.			X									X
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention				X			X	X	X			
Construct or elevate wastewater lift stations	Structural project	Prevention, property protect.			X									X
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.			X							X	X	X
Demolish abandoned properties	Structural project	Prevention			X	X	X	X	X	X	X			
Harden public buildings	Structural project	Prevention				X	X	X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X	X			X						
Install water impervious manhole covers	Structural project	Prevention			X									X
Promote the construction of private in-home tornado safe rooms	Structural project	Property protect., public education				X			X	X	X			
Raise grade to eliminate backup flooding	Structural project	Prevention			X									
Redundant systems and looping (water, sewer, electric, gas)	Structural project	Prevention	X	X	X	X		X	X	X	X	X	X	X
Replace bridges and culverts	Structural project	Prevention			X			X		X	X			X
Replace, expand, or improve water and sewer lines	Structural project	Prevention	X	X	X		X							X
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X	X	X	X	X	X	X	X	X	
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Prevention	Property protect.					X					X	X	X
Expand law enforcement capabilities	Emergency services	Prevention, property protect.												
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X	X	X
GIS mapping system – implementation of hazard maps	Property protect.	Prevention, public education			X		X	X	X	X	X	X	X	X
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Nat. res. protect.	Prevention, property protect.			X									X
Install new fire hydrants	Structural project	Property protect.					X							
New or upgrade fire station	Structural project	Emerg. services					X	X	X	X	X	X	X	X
Investigate and implement alternative energy sources	Prevention	Structural project		X				X	X	X	X	X	X	X
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X				X	X	X	X	X	X	
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services		X	X		X	X	X	X	X	X	X	X

* If flood hazards are found in the area, the City will join and participate actively in the NFIP program.

8.2.3: City of Arispe Alternative Mitigation Measures

The City of Arispe, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 4: City of Arispe List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1									
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Hailstorm	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X
Install hazard signs in area campgrounds, parks, and open spaces	Public education	Prevention			X			X	X	X		
Promote/provide tornado safe room design education for builders and developers	Public education				X			X	X	X		
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education			X	X		X	X	X	X	X	X
Adopt manufactured home development storm shelter ordinances	Prevention	Property protect.			X		X	X	X	X	X	X
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X
Designate/enforce area HAZMAT transportation routes	Prevention	Emergency svcs				X						
Develop electronic directory of local and other resources	Public education	Emergency svcs	X	X	X	X	X	X	X	X	X	X
Develop/enforce snow removal policies	Public education	Emergency svcs					X					
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	Emergency svcs	Prevention; property protect.				X						X
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X			X	X	X	X		X
Implement/update and enforce zoning ordinances	Prevention	Property protect.	X	X		X	X				X	X
Install speed limit signs	Prevention	Emergency svcs		X	X		X	X	X	X		
Make all public facilities handicap accessible	Structural project			X	X	X	X	X	X	X		
Map past chemical contamination sites	Prevention	Property protect.				X						X
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X			X			X	X	X
Encourage private insurance purchase	Property protect.	Prevention	X	X	X	X	X	X	X	X	X	X
Restricted access procedures	Prevention	Emergency svcs			X	X	X	X	X	X	X	X
Special needs/oxygen user registration program	Prevention			X								X
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention				X						
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X		X	X	X	X	X	X
Install windbreaks	Nat. res. protect.	Property protect.					X	X		X	X	X
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X		X	X	X	X	X	X
Remove asbestos from public buildings	Structural project	Prevention				X						
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X	X	X	X	X	X		X
Post "no dumping" signs	Nat. Res. protect.	Public education							X	X		

Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X	X	X	X	X	X
Remove unused chemical containers	Nat. Res. protect.	Prevention		X	X	X	X	X	X	X		
Tree planting projects on public properties and ROW areas	Prevention	Property protect.	X	X								
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan	Emergency svcs	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education			X	X	X	X	X	X	X	X
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X								
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X			X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X		X	X		X	X	X	X
Bury utility lines in existing and new development areas	Structural project	Prevention		X	X	X	X	X	X	X	X	X
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.					X	X				
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention			X			X	X	X		
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.									X	X
Demolish abandoned properties	Structural project	Prevention			X	X	X	X	X	X		
Harden public buildings	Structural project	Prevention			X	X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X			X					
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X	X	X	X	X	X	X	X
Develop local debris disposal sites	Structural project				X	X	X	X	X	X		
Expand law enforcement capabilities	Emergency services	Prevention, property protect.									X	X
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X
GIS mapping system – implementation of hazard maps	Property protect.	Prevention, public education				X	X	X	X	X	X	X
Install chain link fencing around certain chemical tanks	Property protect.	Prevention										
Install new fire hydrants	Structural project	Property protect.				X						
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X			X	X	X	X	X	X
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services		X		X	X	X	X	X	X	X

8.2.4: City of Creston Alternative Mitigation Measures

The City of Creston, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 - 5: City of Creston List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1 and River Flooding												
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	River Flood	Extreme heat	Flash flood	Hailstorm	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Fixed HAZMAT	Energy failure	Pipeline trans. incident
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X	X	X
Install hazard signs in area campgrounds, parks, and open spaces	Public education	Prevention			X	X			X	X	X				
Promote/provide tornado safe room design education for builders and developers	Public education	Property protect.				X			X	X	X				
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education		X	X	X	X		X	X	X	X	X	X	X	X
Adopt manufactured home development storm shelter ordinances	Prevention	Property protect.			X	X		X	X	X	X	X		X	
Work with FEMA and IDNR to update flood maps	Prevention	Property protect., public education	X		X										
Discourage/prohibit development in flood hazard areas – Continue to actively participate in the program	Prevention	Property protect.	X		X										
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X	X	X	X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X	X	X
Establish partnerships with other jurisdictions to control storm water	Prevention	Property protect.	X		X									X	X
Hire a Certified Flood Manager and provide training	Property protect.	Prevention	X		X										
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X	X			X			X	X		X	
Restricted access procedures	Prevention	Emerg. services	X		X	X	X	X		X	X	X	X	X	X
Special needs/oxygen user registration program	Prevention			X			X						X	X	X
Flood structure elevation projects	Prevention	Property protect., Structural project	X		X										
Flood structure relocation projects	Prevention	Property protect., Structural project	X		X										
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention					X						X		
Encourage private insurance purchase	Property protect.	Public awareness		X		X	X	X	X	X	X	X	X	X	X
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X	X		X	X	X	X	X		X	X

Integrate tornado safe room retrofits into critical assets and facilities	Property protect.	Structural project				X			X	X	X				
Maintain sandbags in dry storage	Property protect.	Prevention, emerg. services	X		X										
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X	X		X	X	X	X	X		X	
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X	X	X	X	X	X	X			X	X
Develop soil erosion stabilization projects	Nat. Res. protect.	Prevention, property protect.	X		X									X	X
Install backflow devises	Property protect.	Prevention			X										X
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X	X	X	X	X	X		X	
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education	X		X	X	X	X	X	X	X	X	X	X	X
Develop/update/publicize city evacuation plans	Emerg. response	Public education	X		X		X			X			X	X	X
Develop volunteer base – trained and standby groups	Emerg. response	Public education	X	X	X	X	X	X	X	X	X	X	X	X	
Establish backup communications center or facilities	Emerg. response	Prevention		X			X	X	X	X	X	X		X	
Implement bomb squad program	Emerg. response						X					X		X	X
Install computers in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X	X
Install GPS units in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X	X	X
Participate in a regional HAZMAT team agreement	Emerg. response	Property protect.					X						X		X
Purchase new fire trucks	Emerg. response	Property protect.		X	X	X	X	X	X	X	X		X		X
Purchase thermal imaging system for fire department	Emerg. response	Prevention	X		X		X	X		X	X		X	X	X
Bury utility lines in existing development areas	Structural project	Prevention	X	X	X	X	X	X	X	X	X	X		X	X
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.			X										X
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention				X			X	X	X				
Inspect, construct, or repair dams	Structural project	Prevention	X		X		X						X		
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.				X			X			X	X	X	X
Demolish abandoned properties	Structural project	Prevention			X	X	X	X	X	X	X				
Harden public buildings	Structural project	Prevention				X	X	X	X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention	X	X	X			X							
Install water impervious manhole covers	Structural project	Prevention	X		X										X
Promote the construction of private in-home tornado safe rooms	Structural project	Property protect., public education				X			X	X	X				
Raise grade to eliminate backup flooding	Structural project	Prevention	X		X										
Redundant systems and looping (water, sewer, electric, gas)	Structural project	Prevention		X	X	X		X	X	X	X	X		X	X
Replace bridges and culverts	Structural project	Prevention	X		X			X		X	X				X
Replace, expand, or improve	Structural project	Prevention	X	X	X		X						X		X

water and sewer lines															
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X	X	X	X	X	X	X	X		X	
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Prevention	Property protect.					X					X	X	X	X
Expand law enforcement capabilities	Emergency services	Prevention, property protect.											X		
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X	X	X	X
Install new fire hydrants	Structural project	Property protect.					X						X		
New or upgrade fire station	Structural project	Emerg. services					X	X	X	X	X	X	X	X	X
Investigate and implement alternative energy sources	Prevention	Structural project		X				X	X	X	X	X		X	X
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X				X	X	X	X	X		X	
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services	X	X	X		X	X	X	X	X	X	X	X	X

8.2.5: City of Cromwell Alternative Mitigation Measures

The City of Cromwell, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 6: City of Cromwell List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1 and River Flooding										
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Hailstorm	River Flood	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X
Establish alert systems for vulnerable populations	Public education	Prevention		X	X	X	X	X	X	X	X		X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X
Promote/provide tornado safe room design education to builders/developers	Public education				X				X	X	X		
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education			X	X	X		X	X	X	X	X	X
Work with FEMA and IDNR to update flood maps	Prevention	Property protect., public education				X							
Discourage/prohibit development in flood hazard areas – Actively participate in the program	Prevention	Property protect.				X							
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X	X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X				X	X	X	X		X

Implement/update and enforce zoning ordinances	Prevention	Property protect.	X	X		X	X	X				X	X
Investigate alternative water sources for fire suppression	Prevention	Property protect.					X						
Install speed limit signs	Prevention	Property protect.		X		X		X		X	X		
Make public facilities handicap accessible	Structural project	Prevention		X			X	X	X	X	X		
Special needs/oxygen user registration program	Prevention			X									X
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention					X						
Encourage private insurance purchase	Property protect.	Public awareness	X	X	X		X	X	X	X	X	X	X
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X			X	X	X	X	X	X
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X			X	X	X	X	X	X
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X		X	X	X	X	X		X
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X		X	X	X	X	X	X	X
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education			X		X	X	X	X	X	X	X
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X									
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X				X	X	X	X	X	X
Develop/update/publicize city evacuation plans	Emerg. response	Public education					X			X			X
Develop volunteer base – trained and stand-by groups	Emerg. response	Public education		X	X	X	X	X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X		X	X	X		X	X	X	X
Bury utility lines in existing and new development areas	Structural project	Prevention		X	X		X	X	X	X	X	X	X
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.				X							
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention			X				X	X	X		
Demolish abandoned properties	Structural project	Prevention			X		X	X	X	X	X		
Harden public buildings	Structural project	Prevention			X		X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X		X		X					
Install water impervious manhole covers	Structural project	Prevention				X							
Promote the construction of private in-home tornado safe rooms	Structural project	Property protect., public education			X				X	X	X		
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X		X	X	X	X	X	X	X
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X	X
GIS mapping system – implementation of hazard maps	Property protect.	Prevention, public education				X	X	X	X	X	X	X	X
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Nat. res. protect.	Prevention, property protect.				X							
Investigate and implement alternative energy sources	Prevention	Structural project		X				X	X	X	X	X	X
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X				X	X	X	X	X	X
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services		X		X	X	X	X	X	X	X	X

8.2.6: City of Lorimor Alternative Mitigation Measures

The City of Lorimor, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 7: City of Lorimor List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1										
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Hailstorm	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Pipeline trans. incident	Energy failure
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X
Initial community briefings immediately after events	Public education	Prevention			X	X	X	X	X	X	X	X	X
Install hazard signs in area campgrounds, parks, and open spaces	Public education	Prevention			X			X	X	X			
Promote NOAA weather radio – citizen purchase (rebate incentive/giveaway)	Public education			X	X		X	X	X	X		X	X
Acquire modern chemicals and equipment for firefighting	Prevention	Property protect.				X						X	X
Adopt manufactured home development storm shelter ordinances	Prevention	Property protect.	X	X	X	X	X	X	X	X		X	X
Work with FEMA and IDNR to develop quality flood maps (if flood hazard areas found) *	Prevention	Property protect., public education											
Develop electronic directory of local and other resources	Public education	Prevention, property proect.	X	X	X	X	X	X	X	X	X	X	X
Enforce OSHA's regulations on hazardous materials	Prevention	Property protect.										X	X
Backup jurisdictional files and records – store in alternative locations	Prevention	Property protect.			X	X	X	X	X	X	X		X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X
Enforce burning restrictions	Prevention	Property protect.	X	X		X						X	
Enforce multi-family housing extinguisher laws	Prevention	Property protect.				X							
Implement/update and enforce zoning ordinances	Prevention	Property protect.	X	X		X	X				X	X	X
Investigate alternative water sources for fire suppression	Prevention	Property protect.				X						X	
Investigate alternative water sources for fire suppression	Property protect.	Prevention	X	X		X						X	
Install and/or update anti-virus software	Prevention	Property protect.									X		X
Map past chemical contamination sites	Prevention	Property protect.				X							X
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X			X			X	X		X
Restricted access procedures	Emerg. Response	Prevention			X	X	X	X	X	X		X	X
Special needs/oxygen user registration program	Prevention			X								X	X
Subdivision ordinances to address hazard interface areas	Prevention	Property protect.	X	X		X	X	X	X	X	X	X	X

Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention				X						X	
Encourage private insurance purchase	Property protect.	Public awareness	X	X	X	X	X	X	X	X	X	X	X
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X		X	X	X	X	X	X	X
Install windbreaks	Property protect.	Prevention					X	X	X	X			
Integrate tornado safe room retrofits into critical assets and facilities	Property protect.	Structural project			X			X	X	X			
Lightning protection to tall buildings and towers	Property protect.	Prevention				X		X			X		X
Maintain sandbags in dry storage	Prevention	Property protect.											
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X		X	X	X	X	X		X
Remove underground fuel storage tanks	Nat. res. Protect.	Prevention				X						X	
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X	X	X	X	X	X			X
Develop soil erosion stabilization projects	Nat. res. Protect.	Prevention								X		X	
Install backflow devises	Property protect.	Prevention										X	
Post "no dumping" signs	Nat. res. Protect.	Prevention							X	X			
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X	X	X	X	X		X
Remove unused chemical containers	Property protect.	Prevention		X	X	X	X	X	X	X		X	
Tree planting programs on public property	Prevention			X			X			X			
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education			X	X	X	X	X	X	X	X	X
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X									
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X			X	X	X	X	X	X	X
Develop/update/publicize city evacuation plans	Emerg. response	Public education				X			X			X	X
Develop volunteer base of trained and stand-by groups	Emerg. Response	Public education		X	X	X	X	X	X	X	X	X	X
Emergency response guidebooks in all emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X		X
Establish backup communications center or facilities	Emerg. Response	Prevention									X		X
Establish HAZMAT decontamination sites	Emerg. response											X	
Install computers in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X	X	X
Install GPS units in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X		X
Hire or designate a public information officer	Emerg. response	Public education	X	X	X	X	X	X	X	X	X	X	X
Participate in a regional HAZMAT team agreement	Emerg. response	Property protect.				X						X	
Participate new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	Emerg. response	Prevention		X	X	X	X	X	X	X	X	X	X
Purchase SCBA (self-contained breathing apparatus)	Emerg. response	Prevention				X						X	X
Bury utility lines in existing and new development areas	Structural project	Prevention		X	X	X	X	X	X	X	X		X
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.										X	
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention			X			X	X	X			
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.									X		X

Demolish abandoned properties	Structural project	Prevention			X	X	X	X	X	X			
Harden public buildings	Structural project	Prevention			X	X	X	X	X	X	X		X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X			X					X	
Install water impervious manhole covers	Structural project	Prevention										X	
Replace bridges and culverts	Structural project	Prevention					X		X	X			
Replace, expand, or improve sewer lines	Structural project	Prevention	X	X		X						X	
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X	X	X	X	X	X	X		X
Community drills	Emerg. Response	Public education		X	X	X	X	X	X	X	X	X	X
Develop local debris disposal sites	Structural project				X	X	X	X	X	X		X	
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	Prevention	Property protect.				X					X		X
Expand law enforcement capabilities	Emergency services	Prevention, property protect.											
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X	X
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Nat. res. protect.	Prevention, property protect.	X	X								X	
Install new fire hydrants	Structural project	Property protect.				X						X	
Investigate and implement alternative energy sources	Structural project	Prevention		X			X	X	X	X	X		X
New or upgrade fire station	Structural project	Emerg. services				X	X	X	X	X	X	X	X
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X			X	X	X	X	X		X
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services		X		X	X	X	X	X	X	X	X

8.2.7: City of Shannon City Alternative Mitigation Measures

The City of Shannon City, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 8: City of Shannon City List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1 and River Flooding										
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Hailstorm	River Flood	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X	X
Initial community briefings after events	Public education	Emerg. services			X	X	X	X	X	X	X	X	X
Work with FEMA and IDNR to update flood maps	Prevention	Property protect., public education				X							
Adopt tree trimming ordinance	Prevention	Property protect.			X		X	X	X	X	X	X	X
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X	X

Discourage/prohibit development in flood hazard areas – Actively participate in the program	Prevention	Property protect.				X							
Backup jurisdictional files and records – store in alternative locations	Prevention				X		X	X	X	X	X	X	X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X	X
Develop electronic directory of local and outside resources	Prevention	Public education, emerg. services	X	X	X	X	X	X	X	X	X	X	X
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X				X	X	X	X		X
Make public facilities handicap accessible	Structural project	Prevention		X			X	X	X	X	X		
Special needs/oxygen user registration program	Prevention			X									X
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention					X						
Encourage private insurance purchase	Property protect.	Public awareness	X	X	X		X	X	X	X	X	X	X
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Property protect.	Public awareness		X	X			X	X	X	X	X	X
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X			X	X	X	X	X	X
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X		X	X	X	X	X		X
Install backflow devises on sewer lines	Nat. res. protect.	Property protect.				X							
Post "no dumping" signs	Nat. res. protect.	Property protect., Prevention		X	X	X	X		X	X	X		
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X		X	X	X	X	X	X	X
Remove unused chemical containers	Nat. res. protect.	Prevention		X	X	X	X			X	X		
Tree planting programs on public property and ROW areas	Nat. res. protect.	Prevention	X	X	X						X		
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X				X	X	X	X	X	X
Develop/update/publicize city evacuation plans	Emerg. response	Public education					X			X			X
Develop volunteer base – trained and stand-by groups	Emerg. response	Public education		X	X	X	X	X	X	X	X	X	X
Hire or designate a public information officer	Emerg. response	Public education	X	X	X	X	X	X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X		X	X	X		X	X	X	X
Bury utility lines in existing and new development areas	Structural project	Prevention		X	X		X	X	X	X	X	X	X
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention			X				X	X	X		
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.				X		X		X	X		
Demolish abandoned properties	Structural project	Prevention			X		X	X	X	X	X		
Harden public buildings	Structural project	Prevention			X		X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X		X		X					
Promote the construction of private in-home tornado safe rooms	Structural project	Property protect., public education			X				X	X	X		
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X		X	X	X	X	X	X	X
GIS mapping system – implementation of hazard maps	Property protect.	Prevention, public education				X	X	X	X	X	X	X	X
Install alternative or sustainable storm	Nat. res. protect.	Prevention,				X							

water control options such as buffer strips, bioswales, and rain gardens		property protect.											
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X				X	X	X	X	X	X

8.2.8: City of Thayer Alternative Mitigation Measures

The City of Thayer, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 9: City of Thayer List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1									
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Extreme heat	Hailstorm	Structural fire	Severe winter storm	Thunderstorm/lightning	Tornado	Windstorm	Communications failure	Energy failure
Availability of cable or satellite with weather advisory overrides	Public education			X	X		X	X	X	X		
Develop annual leadership awareness campaign about the HMP	Public education		X	X	X	X	X	X	X	X	X	X
Establish alert systems for vulnerable populations	Public education	Emerg. Response		X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X
Initial community briefings immediately after events	Public education	Prevention			X	X	X	X	X	X	X	X
Promote NOAA weather radio and continue rebate incentive for citizen purchase	Public education			X	X		X	X	X	X	X	X
Work with FEMA and IDNR to develop quality flood maps (survey area to determine if hazards exist)	Prevention	Property protect., public education										
Adopt tree trimming ordinances	Prevention	Property protect.			X	X	X	X	X	X	X	X
Assure jurisdictional plans are in place and current	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X
Backup jurisdictional files and records – store in alternate locations & electronically	Prevention	Property protect.				X	X	X	X	X		X
Business and residential preparedness programs	Prevention	Public education	X	X	X	X	X	X	X	X	X	X
Develop electronic directory of local and other resources	Public education	Emerg. Response	X	X	X	X	X	X	X	X	X	X
Develop/enforce snow removal policies	Prevention	Emerg. Response				X	X			X		
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X			X	X	X	X		X
Formulate partnerships to gain legislation	Prevention	Property protect.	X	X	X	X	X	X	X	X	X	X
Install speed limit signs	Prevention	Emerg. Response		X	X		X			X	X	X
Promote good landscaping practices among property owners	Prevention	Property protect., public education	X	X			X			X	X	X
Special needs/oxygen user registration program	Prevention			X		X	X					X
Encourage citizen purchase/use of smoke detectors	Property protect.	Public education, prevention				X						
Encourage private insurance purchase	Property protect.	Public awareness	X	X	X	X	X	X	X	X	X	X
Establish neighbor watch programs for	Property protect.	Public awareness		X	X		X	X	X	X	X	X

vulnerable populations during winter storms, extreme heat, etc.												
Integrate tornado safe room retrofits into critical assets and facilities	Property protect.	Structural project			X			X	X	X		
Promote tree and vegetation maintenance on private properties	Property protect.	Prevention, pubic education	X	X	X		X	X	X	X	X	X
Repair structurally weak homes and do weatherization	Property protect.	Prevention		X	X	X	X	X	X	X		X
Remove dead vegetation on public properties and nuisance areas	Nat. Res. protect.	Property protect.	X	X	X	X	X	X	X	X	X	X
Tree planting programs on public property	Nat. Res. protect.	Prevention		X						X		
Create a continuity of operations & succession plan for jurisdiction	Emerg. response	Prevention, public education			X	X	X	X	X	X	X	X
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention		X								
Develop/implement a thorough recovery plan for power failure	Emerg. response	Prevention		X			X	X	X	X	X	X
Develop/update/publicize city evacuation plans	Emerg. response	Public education				X			X			X
Develop volunteer base of trained and stand-by groups	Emerg. Response	Public education		X	X	X	X	X	X	X	X	X
Purchase road closure barricades	Emerg. response	Prevention, property protect.		X		X	X		X	X	X	X
Build highway or rail overpass or improve existing overpass as a secondary emergency vehicle route into town	Emerg. Response	Structural project		X	X	X	X	X	X	X		X
Bury utility lines in existing and new development areas	Structural project	Prevention		X	X	X	X	X	X	X	X	X
Clear and deepen ditches on right-of-ways	Structural project	Prevention, property protect.							X	X		
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	Structural project	Prevention			X			X	X	X		
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	Structural project	Prevention, nat. resource protect.									X	X
Demolish abandoned properties	Structural project	Prevention			X	X	X	X	X	X		
Harden public buildings	Structural project	Prevention			X	X	X	X	X	X	X	X
Improve roads (resurface, pave, widen, etc.)	Structural project	Prevention		X			X					
Replace bridges and culverts	Structural project	Prevention					X		X	X		
Retrofit/harden existing overhead utility lines	Structural project	Prevention, property protect.		X	X	X	X	X	X	X	X	X
Full review of policy, procedure, and codes to include mitigation	Property protect.	Prevention, public education	X	X	X	X	X	X	X	X	X	X
Purchase/install backup fixed power generators and pumps	Property protect.	Prevention, structural project		X			X	X	X	X	X	X
Purchase stand-by portable pumps and generators	Property protect.	Emerg. services		X		X	X	X	X	X	X	X

8.2.9: Creston Community School District Alternative Mitigation Measures

The Creston Community School District, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 10: Creston Community School District List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1 and River Flooding									
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Windstorm	Thunderstorm/lightning	Severe winter storm	Extreme heat	Energy failure	Tornado	Conventional terrorism	Bioterrorism	River flood
NOAA weather radio in schools and on school property	Public education	Prevention		X	X	X	X		X			X
Purchase stand-by portable pumps	Property protect.	Prevention	X				X	X	X		X	X
Realign Hurley Creek and protect building floor from Hurley Creek flooding	Prevention	Property protect., structural project										X
Construct public safe rooms in school and school property (Burton R. Jones facility)	Structural project			X	X				X			
Develop annual leadership awareness campaign about the plan	Public awareness	Emergency services	X	X	X	X	X	X	X	X	X	X
Emergency response guidebooks in key school buildings	Public awareness	Emergency services		X	X	X	X	X	X	X	X	X
School participate in an emergency operations plan (county update)	Emergency services	Property protection	X	X	X	X	X	X	X	X	X	X

8.2.10: East Union Community School District Alternative Mitigation Measures

The East Union Community School District, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 11: East Union Community School District List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1								
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Windstorm	Thunderstorm/lightning	Severe winter storm	Extreme heat	Energy failure	Tornado	Conventional terrorism	Bioterrorism
Develop an annual local leadership awareness campaign about the hazard mitigation plan	Public education	Prevention	X	X	X	X	X	X	X	X	X
Improve public awareness of hazard risks – written and presentation instruments	Public education	Prevention	X	X	X	X	X	X	X	X	X
Install NOAA weather radio in school	Public education	Emergency svcs		X	X	X	X	X	X		
Rail and highway safety education program for youth	Public education	Prevention		X	X	X			X		
Assure jurisdictional plans are in use and updated	Prevention	Property protection	X	X	X	X	X	X	X	X	X
Backup jurisdictional files – store electronically and at alternative locations	Prevention	Property protection		X	X	X		X	X	X	
Develop electronic directory of local and	Public education	Emergency svcs	X	X	X	X	X	X	X	X	X

other resources											
Develop/maintain hazardous materials inventories on school campus	Emergency svcs	Prevention		X	X		X	X	X	X	X
Formally designate and stock community post-disaster shelter (food and lodging)	Emergency svcs			X	X	X	X	X	X	X	X
Remove asbestos from public buildings	Structural project	Prevention								X	X
Tree planting programs on school property	Property protect.	Prevention	X				X				
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan	Emergency svcs	Property protection	X	X	X	X	X	X	X	X	X
Create a jurisdictional continuity of operations and succession plan	Emergency svcs								X	X	X
Develop/implement an extreme event medical response plan	Emergency svcs						X	X			
Develop/implement a thorough recovery plan for power failure	Emergency svcs	Prevention		X	X	X	X	X	X		
Emergency response guidebooks in district vehicles	Emergency svcs	Prevention		X	X	X	X	X	X	X	X
Participate in a regional HAZMAT team agreement	Emergency svcs	Property protection								X	X
Harden public buildings	Structural project	Property protect.		X	X	X	X		X	X	
Redundant systems and looping (water, sewer, electric, gas)	Structural project	Prevention	X	X	X	X	X	X	X		
Full review of policy, procedure, and codes to include mitigation	Emergency svcs	Prevention	X	X	X	X	X	X	X	X	X
GIS mapping system implementation and digital hazard maps	Emergency svcs	Property protect.		X	X	X	X	X	X		
Install alternative/sustainable storm water control options such as buffer strips, bioswales, and rain gardens	Nat. res. protect.	Prevention			X						
Investigate and implement alternative energy sources	Prevention	Property protect.		X	X	X	X	X	X		
Purchase/install backup fixed generators	Property protect.	Prevention		X	X	X	X	X	X		
Purchase standby portable pumps and generators	Emergency svcs.	Property protect.	X	X	X	X	X	X	X	X	X
Install air quality monitors	Prevention	Emergency svcs					X	X		X	X

8.2.11: Southwestern Community College Alternative Mitigation Measures

Southwestern Community College, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 - 12: Southwestern Community College List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1									
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Windstorm	Thunderstorm/lightning	Severe winter storm	Extreme heat	Energy failure	Tornado	Conventional terrorism	Bioterrorism	Flash flood
Promote/provide tornado safe room design education for builders and developers	Public education	Property protect.		X	X				X			
Adopt building codes to address various natural hazards	Prevention	Property protect.		X	X	X	X		X			X
Business and residential preparedness programs	Public education	Prevention, property protect.	X	X	X	X	X	X	X	X	X	X

Develop electronic directory of local and other resources	Public education	Prevention	X	X	X	X	X	X	X	X	X	X
Install windbreaks	Property protect.	Nat. res. protect.		X	X	X		X		X	X	
Integrate tornado safe room retrofits into critical assets/facilities	Property protect.	Structural project		X	X				X			
Seminars and demonstrations on retrofitting (site visits)	Public education			X	X	X	X		X			X
Tree planting programs on public properties and nuisance areas	Nat. res. protect.	Property protect.	X			X						X
Install GPS units in emergency vehicles	Prevention				X	X			X	X	X	X
Raise grade to eliminate backup flooding	Property protect.	Structural project, prevention										X
Redundant systems and looping (water, sewer, electric, gas)	Structural project	Prevention	X	X	X	X	X	X	X			X
Construct public safe rooms on campus	Structural project			X	X				X			
Develop annual leadership awareness campaign about the plan	Public awareness	Emergency services	X	X	X	X	X	X	X	X	X	X
Investigate and implement alternative energy sources	Public awareness	Prevention, nat. res. protection						X		X		
College participate in an emergency operations plan (county update)	Emergency services	Property protection	X	X	X	X	X	X	X	X	X	X

8.2.12: Greater Regional Medical Center Alternative Mitigation Measures

The Greater Regional Medical Center, with the assistance of the countywide planning team, participated in the creation of a list of alternative mitigation actions. Using FEMA and State of Iowa guidance publications, the planning team was able to develop a list of alternative mitigation actions that relate to the hazards and vulnerabilities experienced by the community. Others were added during discussion with local officials.

Figure 8 – 13: Greater Regional Medical Center List of Alternative Mitigation Actions

			Primary Hazards Addressed by Mitigation Action – Priority Group 1								
Mitigation Action	Primary Type of Measure	Secondary Type of Measure	Drought	Windstorm	Thunderstorm/lightning	Severe winter storm	Extreme heat	Energy failure	Tornado	Conventional terrorism	Bioterrorism
Develop annual leadership awareness campaign about the plan	Public awareness	Emergency services	X	X	X	X	X	X	X	X	X
Increase public awareness on household hazardous materials	Public education	Prevention		X	X	X	X		X	X	X
Promote/provide tornado safe room design education for buildings and developers	Public education	Property protect.		X	X				X		
Backup jurisdictional files and records - store in alternative locations	Prevention			X	X	X		X	X	X	
Develop/implement watershed studies and plans for possible flood prone areas	Prevention	Public education, property protect.									
Formally designate and stock community shelters (food and lodging, proper support)	Prevention	Property protect.		X	X	X	X	X	X	X	X
Special needs/oxygen user registration program	Emerg. response	Public education		X	X	X	X	X	X	X	X
Integrate tornado safe room retrofits into critical assets/facilities	Property protect.	Structural project		X	X				X		
Develop/implement an extreme heat event medical response plan	Emerg. response	Prevention					X	X			
Develop/update evacuation plans and sheltering in place plans after renovation	Emerg. response	Prevention		X	X				X	X	X
Install computers in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X

Install GPS units in emergency vehicles	Emerg. response			X	X	X	X	X	X	X	X
GIS mapping system implementation and digital hazard maps	Public education	Prevention									X
Install water impervious manhole covers	Prevention	Property protect.									
Construct public safe rooms on campus	Structural project	Property protect.		X	X				X		
Investigate and implement alternative energy sources	Structural project	Prevention		X	X	X	X	X	X		

8.3: Evaluation Processes for Alternatives Mitigation Measures

Using FEMA and State of Iowa guidance publications, the planning committee during the sixth meeting evaluated each of the proposed alternatives to determine which ones to remove from further consideration and to prioritize the remaining actions or measures.

Each action was reviewed according to STAPLE-E criteria. **STAPLE-E criteria include: social, technical, administrative, political, legal, economic, and environmental considerations**. The planning team has reviewed each of the proposed hazard mitigation alternatives and scored them on several factors for each STAPLE-E criteria, using a methodology from FEMA's "Understanding Your Risks." The planning team created approximately 20 questions that are designed to comprehensively evaluate each mitigation action in terms of costs and benefits. Each alternative action is evaluated on a plus, neutral, or minus score. Questions are designed to ensure a yes, no, or not applicable answer.

A plus score in a given box in the matrix means the planning team members representing the jurisdiction believe the answer to the question is a yes. For example, if a jurisdiction is asked "Will the residents/users of the jurisdiction accept the project?," the answer would be a plus score if the jurisdiction believes that the public would support the installation of a warning siren. If the same project, the installation of a warning siren, would, in the planning team's opinion, have no impact on "Will the project help potentially eliminate the threat of a lawsuit?," the score would be zero. If the same team members decided the answer is no to "Does the jurisdiction have funding capacity to do this project?," the answer would be negative.

A plus score is converted to a numerical value of +1 to +3, depending on the level of positive result, with +3 being the greatest, a neutral score is converted to 0, and a negative score is converted to -1 to -3, depending on the level of impact, with -3 being a very negative result. The sums of each individual score are along the bottom of the tables in *Appendix E* and are carried over into the scoring tables in the following pages.

The evaluation process does not necessarily pit two similar mitigation actions for one hazard and then selects one over the other. This is mainly because most mitigation measures impact many different hazards. The planning team wanted to the scores to be independent of one another, with all projects being evaluated on their own merit.

8.4: Evaluation Results of Alternative Mitigation Measures

The following tables provide the summary of the analysis of the proposed mitigation actions by jurisdiction, which will be used for selecting relevant and effective projects and prioritizing them into the list of projects by jurisdiction in the next chapter. Please note that the local evaluation of actions means that an action may have differing scores for varying jurisdictions. For example, in one jurisdiction, the initiation and updating of zoning may be considered more administratively feasible and politically acceptable than another community, even though the need in terms of hazard mitigation for zoning may be equal in both communities.

Figure 8 – 14: Rural Union County Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE -E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	43	13	56	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	40	13	53	Low-cost option that can be based at EMA office	Yes

Install hazard signs in area campgrounds, parks, and open spaces	6	6	12	Low-cost but not deemed effective	No
Adopt building codes to address various natural hazards	-2	9	7	Difficult to implement; little political will	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	26	12	38	Have been done in the past; champions exist	Yes
Adopt manufactured home development storm shelter ordinances	-30	9	-21	Difficult to implement; little political will	No
Adopt tree trimming ordinances	-16	9	-7	Not really needed on private property	No
Work with FEMA and IDNR to develop quality flood maps	14	2	16	Needed but County desires no role	No
Assure jurisdictional plans are in place and current	42	13	55	Needed; low-cost; good benefits; champions	Yes
Business and residential preparedness programs	42	13	55	Low-cost and framework in place	Yes
Designate/enforce area HAZMAT transportation routes	-26	2	-24	Generally a low-benefit option in rural areas	No
Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program	20	2	22	FEMA requirement once hazards identified/mapped	Yes
Enforce OSHA regulations on hazardous materials	-8	3	-5	Difficult to implement with limited benefits	No
Enforce burning restrictions	8	3	11	Already done through fire departments	No
Enforce multi-family housing extinguisher laws	0	0	0	State law covers this; local fire enforces; few MF housing units	No
Implement/update and enforce zoning ordinances	-13	9	-4	Might be beneficial but no political will	No
Promote good landscaping practices among property owners	16	8	24	EMA/EMC along with environmental groups can do	Yes
Restricted access procedures	-13	9	-4	Few benefits due to limited number of large gathering areas	No
Special needs/oxygen user registration program	27	4	31	Low cost project that could have high benefits	Yes
Subdivision ordinances to address hazard interface areas	-9	10	1	Might be beneficial but no political will	No
Encourage private insurance purchase	18	10	28	EMA/EMC along with insurance industry can do	Yes
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	32	9	41	Team in place so it would not be difficult to promote	Yes
Develop/implement flood assessments related to rural road assets	2	3	5	Difficult to implement; no local staff; costly; will allow IDNR/FEMA to address	No
Install windbreaks	0	4	4	Benefits in the terrain available not worth costs	No
Integrate tornado safe room retrofits into critical assets and facilities	2	4	6	Few critical assets suitable to be retrofitted	No
Lightning protection of tall buildings and towers	19	3	22	Costly and few properties need help	No
Promote tree and vegetation maintenance on private properties	24	11	35	EMA/EMC along with environmental groups can do	Yes
Remove asbestos from public buildings	0	0	0	Need is very limited	No
Post “no dumping” signs	2	4	6	Few problem areas; difficult to enforce	No
Remove dead vegetation on public properties and nuisance areas	3	11	14	Done as needed; no formal program needed	No
Remove unused chemical containers	38	9	47	County and abandoned properties contain hazards; expensive	Yes
Tree planting programs on public property and ROW	-8	5	-3	No notable true benefits; costly to maintain	No
Undertake stream modifications	17	2	19	Very costly due to the mileage	No

				involved; leaving streams natural is better; other options underway	
Develop/implement an extreme heat event medical response plan	22	1	23	Low-cost project; increasing benefits due to age of population	Yes
Develop search and rescue teams	12	6	18	High cost; limited capabilities; not convinced of high benefits	No
Develop volunteer base – trained and stand-by groups	44	12	56	Moderate to high cost but vital in rural county	Yes
Establish HAZMAT decontamination sites	18	1	19	Needed at fire department level; not county level	No
Implement bomb squad program	-35	4	-31	High cost; limited capabilities; not convinced of high benefits	No
Install computers in emergency vehicles	16	12	28	Limited true mitigation benefit; costly	No
Install GPS units in emergency vehicles	23	12	35	Moderate cost; benefit in remote parts of county	Yes
Maintain Emergency Operations Center with 24-hour capability	24	8	32	EMC champions project; is needed to meet industry changes and standards	Yes
Participate in a regional HAZMAT team agreement	41	2	43	Costly but is standard; more and more chemicals used	Yes
Purchase new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	24	12	36	Costly but is needed to meet industry changes and standards; champions	Yes
Purchase road closure barricades	39	10	49	Moderate cost but essential for emergency response	Yes
Purchase snow trucks, plows, and sanders	23	1	24	Need is negligible in next five years at county	No
Build highway or rail overpasses to reduce intersection accidents	15	1	16	Costly and limited benefits as most major intersections are complete	No
Increase rural intersection lighting	16	1	17	Very costly; relatively limited benefits	No
Bury utility lines in existing development areas	25	12	37	Costly but beneficial and funding is available	Yes
Clear and deepen ditches on right-of-ways	20	3	23	Costly but necessary in areas; need to evaluate reported problem areas	Yes
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	22	4	26	Costly but benefits to campgrounds and recreation are significant	Yes
Construct or repair dams	19	5	24	No new dams needed; existing dams are adequate for five years	No
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	35	5	40	Costly but needed in some developed areas	Yes
Demolish abandoned properties	1	8	9	Costly with minimal true mitigation benefits	No
Develop reservoirs/lakes (flood control, water source)	13	5	18	Local lakes meet the need within the county	No
Harden public buildings	22	7	29	Costly but beneficial for some structures	Yes
Improve roads (resurface, pave, widen, etc.)	30	4	34	Costly but essential for emergency response and to prevent some hazards	Yes
Promote the construction of private in-home tornado safe rooms	19	4	23	Low-cost but county is not equipped to implement; EMC is gaining awareness	Yes
Replace bridges and culverts	49	7	56	Costly but essential for emergency response and to	Yes

				prevent some hazards	
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	19	4	23	Costly; limited benefits based on past crime rates	No
Full review of policy, procedure, and codes to include mitigation	43	13	56	Time-consuming but essential to meet new standards and to include new best practices	Yes
GIS mapping system – implementation of hazard maps	38	10	48	Working on at this time; not too difficult to add hazard maps	Yes
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	-6	3	-3	Limited benefit in rural applications	No
Install chain link fences around certain chemical tanks	5	1	6	Costly; conflicting laws; County rather not interfere	No
Purchase/install backup fixed power generators and pumps	28	7	35	County and utility providers see significant need	Yes
Investigate and implement alternative energy sources	4	7	11	Adequate sources are available for basic mitigation needs	No

Figure 8 – 15: City of Afton Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE -E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	23	12	35	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	2	12	14	Low-cost option that can be based at city hall but little political will to carry out effort	No
Initial community briefings immediately after events	37	10	47	Low-cost but vital response that can be joint City and EMA	Yes
Install hazard signs in area campgrounds, parks, and open spaces	20	5	25	Low-cost option; increased participation in recreation warrants effort	Yes
Acquire modern chemicals and equipment for firefighting	42	3	45	Fire department is seeking at this time but funding is limited	Yes
Adopt building codes to address various natural hazards	8	10	18	Difficult to implement; little political will	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	37	10	47	Have been done in the past; champions exist	Yes
Adopt manufactured home development storm shelter ordinances	-14	8	-6	Difficult to implement; little political will	No
Work with FEMA and IDNR to develop quality flood maps	50	1	51	Needed; city wants to be updated on this issue	Yes
Assure jurisdictional plans are in place and current	49	12	61	Beginning to work on; low-cost; good benefits; champions	Yes
Business and residential preparedness programs	24	12	36	Low-cost and framework in place	Yes
Conduct study on possible illegal use of sump pumps	14	2	16	Minimal benefit for the cost	No
Designate/enforce area HAZMAT transportation routes	39	1	40	City does not have great need that is not addressed in other ways	No
Enforce OSHA regulations on hazardous materials	14	3	17	Difficult to implement with limited benefits	No
Enforce multi-family housing extinguisher laws	-18	1	-17	State law covers this; local fire enforces	No
Formally designate and stock community shelters (food and lodging, proper support)	-9	7	-2	Difficult to fully implement at city's scale; facilities exist with some capabilities; Creston meets further needs	No
Implement/update and enforce zoning ordinances	1	8	9	Zoning in place but city lacks will to make major changes	No
Investigate alternative water sources for fire suppression	5	2	7	Not really needed for the City	No

Map past chemical contamination sites	13	3	16	Minimal benefits perceived	No
Promote good landscaping practices among property owners	40	7	47	City, EMA/EMC along with environmental groups can do	Yes
Special needs/oxygen user registration program	26	4	30	Low cost project that could have high benefits	Yes
Encourage citizen purchase/use of smoke detectors	16	1	17	Fire department handles well	No
Encourage private insurance purchase	15	11	26	EMA/EMC along with insurance industry can do; city does not desire a role	No
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	11	10	21	Not perceived as an unmet mitigation need in Afton	No
Integrate tornado safe room retrofits into critical assets and facilities	13	4	17	Few critical assets suitable to be retrofitted	No
Promote tree and vegetation maintenance on private properties	6	10	16	City lacks will to address this issue more than already done	No
Repair structurally weak homes and do weatherization	-2	10	8	City has had programs in past; no interest in this costly effort	No
Install backflow devises	-3	2	-1	Costly with limited known need for flood mitigation in Afton	No
Post “no dumping” signs	14	2	16	Limited benefits; no major problems exist	No
Remove dead vegetation on public properties and nuisance areas	25	11	36	Can be costly but better than costly cleanup after disasters	Yes
Create a continuity of operations & succession plan for jurisdiction	20	10	30	Low-cost with potential for strong benefits	Yes
Develop/implement an extreme heat event medical response plan	21	1	22	Low-cost but limited benefit in city perceived; little city political will to do project	No
Develop/implement a thorough recovery plan for power failure	38	7	45	Low-cost plan although implementing it may be costly	Yes
Develop/update/publicize city evacuation plans	19	5	24	Not costly but need is limited in Afton; people generally know what to do	No
Emergency response guidebooks in all emergency vehicles	39	11	50	Low-cost that can help city’s small staff	Yes
Establish HAZMAT decontamination sites	11	1	12	Limited facilities in city to make this work	No
Implement bomb squad program	35	4	39	High cost; limited capabilities; not convinced of high benefits	No
Install computers in emergency vehicles	18	11	29	Costly but can be helpful for one-person police force	Yes
Install GPS units in emergency vehicles	-10	11	1	Moderate cost; limited true benefit to the small city	No
Participate in a regional HAZMAT team agreement	47	1	48	Costly but is standard; more and more chemicals used	Yes
Purchase new fire trucks and ambulances	40	9	49	Costly but a high priority for fire department	Yes
Participate new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	46	11	57	Costly but is needed to meet industry changes and standards; champions	Yes
Purchase road closure barricades	2	9	11	Moderate cost but not essential at Afton’s scale	No
Purchase SCBA (self-contained breathing apparatus)	31	3	34	Moderate cost but a high priority for fire department	Yes
Purchase thermal imaging system for fire department	53	7	60	Moderate cost but a high priority for fire department	Yes
Purchase vehicle extrication equipment	45	0	45	High cost but a high priority for fire department	Yes
Bury utility lines in existing and new development areas	21	11	32	Costly for burial; less costly when no development; City owned utility so this is simpler	Yes
Clean sewage lagoons and install rock	47	1	48	Existing lagoons need attention;	Yes

				cleaning now is less costly than digging new lagoons	
Clear and deepen ditches on right-of-ways	51	2	53	Ditches in town lead to flash flooding in some areas that can be prevented	Yes
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	29	4	33	Costly but benefits to residents in many older homes and in recreation and fairgrounds are significant	Yes
Construct or elevate wastewater lift stations	29	2	31	Several in place; elevating and retrofitting may reduce expensive losses	Yes
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	20	4	24	Lack of these causes flash flooding in some areas that can be prevented	Yes
Demolish abandoned properties	40	7	47	Is a major priority of the city; can mitigate several hazards	Yes
Harden public buildings	24	9	33	Costly but some buildings need improved in order to be safe	Yes
Improve roads (resurface, pave, widen, etc.)	54	3	57	Many roads are deteriorated; costly but many benefits	Yes
Install water impervious manhole covers	53	2	55	Can be a low cost option as part of needed street and sewer improvements	Yes
Promote the construction of private in-home tornado safe rooms	29	4	33	Low-cost but county is not equipped to implement; EMC is gaining awareness	Yes
Raise grade to eliminate backup flooding	25	1	26	Can be costly but some infrastructure and structures would see notable benefits	Yes
Redundant systems and looping (water, sewer, electric, gas)	28	11	39	Afton relies on outside sources; costly but vital to local needs	Yes
Replace bridges and culverts	46	5	51	Culverts in the city have been neglected; some are undersized, causing back-ups	Yes
Replace, expand, or improve water and sewer lines	38	5	43	Is a major priority of the city; can mitigate several hazards	Yes
Retrofit/harden existing overhead utility lines	45	10	55	Costly but funding is available; made easier because city owns its own utility	Yes
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	51	4	55	Is a priority due to the small size of police force; less expensive than hiring officers	Yes
Expand law enforcement capabilities	40	0	40	Expensive to hire officers but equipment and changes in policies may increase efficiency	Yes
Full review of policy, procedure, and codes to include mitigation	44	12	56	Time-consuming but essential to meet new standards and to include new best practices	Yes
GIS mapping system – implementation of hazard maps	51	9	60	Working on at this time; not too difficult to add hazard maps	Yes
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	23	2	25	Low cost and beneficial but not a city priority	No
Install new fire hydrants	41	1	42	Not expensive if part of water system upgrade	Yes
New or upgrade fire station	50	8	58	Existing station is a steel building; slightly undersized	Yes
Investigate and implement alternative energy sources	20	8	28	Adequate sources are available for basic mitigation needs	No
Purchase/install backup fixed power generators and pumps	38	7	45	City and facility owners (private and non-profit) have need	Yes
Purchase stand-by portable pumps and generators	38	10	48	City and service providers, such as fire and water, have need for	Yes

				response; moderate cost	

Figure 8 – 16: City of Arispe Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	31	10	41	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	16	10	26	Low-cost option that can be based at city hall but little political will to carry out effort	No
Install hazard signs in area campgrounds, parks, and open spaces	16	4	20	Low-cost measure but limited benefit due to relatively few people using recreational facilities	No
Promote/provide tornado safe room design education for builders and developers	21	4	25	May be a minimal cost, but the benefits are limited at Arispe's scale, and city lacks capability to do its own meaningful effort	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	31	8	39	Have been done in the past; champions exist	Yes
Adopt manufactured home development storm shelter ordinances	28	7	35	As this is a common affordable housing option in town, this should be pursued	Yes
Assure jurisdictional plans are in place and current	22	10	32	Beginning to work on; low-cost; good benefits; champions	Yes
Business and residential preparedness programs	22	10	32	Low-cost and framework in place	Yes
Designate/enforce area HAZMAT transportation routes	25	1	26	No enforced routes are truly needed; Hwy 169 is only logical route	No
Develop electronic directory of local and other resources	17	10	27	A good affordable project but difficult for Arispe to maintain	No
Develop/enforce snow removal policies	28	1	29	Common for all cities; not expensive as long as equipment is available or can be purchased	Yes
Develop/maintain hazardous materials inventories and list of critical facilities with hazardous materials	19	2	21	Limited hazardous materials in town; not a high priority hazard	No
Formally designate and stock community shelters (food and lodging, proper support)	21	6	27	Town is not really large enough to accommodate; a church now has a fixed generator and serves this purpose unofficially	No
Implement/update and enforce zoning ordinances	35	6	41	Controversial and not really effective for the size and growth potential of the city.	No
Install speed limit signs	39	6	45	People tend to speed through town; greater signage and enforcement might assist.	Yes
Make all public facilities handicap accessible	44	7	51	City hall is an old building that provides limited protection to vulnerable handicapped persons	Yes
Map past chemical contamination sites	24	2	26	Likely a limited need; already handled by the IDNR	No
Promote good landscaping practices among property owners	24	6	30	Low cost and moderate benefits; worth doing with county/regional assistance	Yes
Encourage private insurance purchase	26	10	36	Low cost and moderate benefits; worth doing with county/regional assistance	Yes
Restricted access procedures	15	8	23	Not politically popular and difficult to enforce	No
Special needs/oxygen user registration program	10	2	12	No local fire and utility companies to implement	No

Encourage citizen purchase/use of smoke detectors	34	1	35	Low cost and high benefits; worth doing with fire dept assistance	Yes
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	12	8	20	Low-cost but difficult to implement on formal level; informal effort is sufficient.	No
Install windbreaks	14	5	19	Limited direct benefits as much of Hwy 169 in town is protected to west/NW	No
Promote tree and vegetation maintenance on private properties	19	9	28	Low cost and moderate benefits; worth doing with county/regional assistance – limited local enforcement	Yes
Remove asbestos from public buildings	17	1	18	Unsure if there is a real need	No
Repair structurally weak homes and do weatherization	27	8	35	City has limited resources; with outside grants it can be done.	Yes
Post "no dumping" signs	22	2	24	Problem not deemed significant; limited enforcement	No
Remove dead vegetation on public properties and nuisance areas	27	10	37	Needed but can be costly; will need to add resources	Yes
Remove unused chemical containers	25	7	32	Considered a safety issue with all the agricultural facilities in the area; may be costly and difficult to enforce.	Yes
Tree planting projects on public properties and ROW areas	22	2	24	Not a significant need compared to cost	No
Adopt a thorough EOP addressing multiple hazards and inc1luding a mass casualty plan	38	10	48	City has shown increased interest in planning to protect its limited but important assets.	Yes
Create a continuity of operations & succession plan for jurisdiction	23	8	31	City has shown increased interest in planning.	Yes
Develop/implement an extreme heat event medical response plan	33	1	34	City has shown increased interest in planning.	Yes
Develop/implement a thorough recovery plan for power failure	33	7	40	City has shown increased interest in planning.	Yes
Purchase road closure barricades	19	7	26	No place to house them; limited City of Arispe need	No
Bury utility lines in existing and new development areas	20	9	29	Desired but City of Arispe does not have authority.	No
Clear and deepen ditches on right-of-ways	24	2	26	Generally not a significant need; town is relatively flat with low density development	No
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	25	4	29	Costly but direct mitigation benefits; no safe rooms in town; could make sense for new city hall or in park.	Yes
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	26	2	28	Culvert upgrades might make sense and may be needed in a few locations – engineering study should be completed.	Yes
Demolish abandoned properties	26	6	32	Is a major priority of the city; can mitigate several hazards	Yes
Harden public buildings	15	8	23	Existing public buildings are not in a condition where hardening would be possible.	No
Improve roads (resurface, pave, widen, etc.)	24	2	26	Is needed but is very costly and will have limited direct mitigation value; all roads meet basic needs.	No
Retrofit/harden existing overhead utility lines	14	9	23	Desired somewhat but City of Arispe does not have authority.	No
Develop local debris disposal sites	17	6	23	Costly and difficult to maintain; IDNR regulations are concern; Afton and County have sites.	No
Expand law enforcement capabilities	26	2	28	Strongly desired but City has	No

				no capabilities.	
Full review of policy, procedure, and codes to include mitigation	18	10	28	Moderately desired but City recognizes the need in order to efficiently mitigate hazards.	Yes
GIS mapping system – implementation of hazard maps	23	7	30	City to cooperate with County and SICOG; minimal need due to small town size.	No
Install chain link fencing around certain chemical tanks	30	0	30	Desired but no primary hazards affected; legal issues and enforcement might make difficult.	No
Install new fire hydrants	28	1	29	Desired but SIRWA does not have a plans to improve this, in large part due to cost.	No
Purchase/install backup fixed power generators and pumps	30	7	37	Good project for a new city hall building; costly; would need grant funding	Yes
Purchase stand-by portable pumps and generators	20	8	28	Moderate cost and would require storage in a city building.	Yes

Figure 8 – 17: City of Creston Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	23	13	36	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	15	13	28	Low-cost option that can be based at EMA office	Yes
Install hazard signs in area campgrounds, parks, and open spaces	29	5	34	Low-cost and would reduce city need to respond to areas	Yes
Promote/provide tornado safe room design education for builders and developers	5	4	9	Limited need seen; contractors are increasingly aware	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	22	12	34	Have been done in the past; champions exist	Yes
Adopt manufactured home development storm shelter ordinances	22	8	30	Somewhat low cost; city has modest ability to enforce	Yes
Work with FEMA and IDNR to update flood maps	17	2	19	Low cost and great need in the city	Yes
Discourage/prohibit development in flood hazard areas – Continue to actively participate in the program	10	2	12	Not a significant local priority but is a FEMA requirement	Yes
Assure jurisdictional plans are in place and current	12	13	25	Many plans are in need of attention	Yes
Business and residential preparedness programs	15	13	28	Low cost overall; champions exist	Yes
Establish partnerships with other jurisdictions to control storm water	18	4	22	Low cost and a priority with landowners, school, industry	Yes
Hire a Certified Flood Manager and provide training	-5	2	-3	Not seen as needed; costly	No
Promote good landscaping practices among property owners	20	7	27	Low cost; people in place to assist	Yes
Restricted access procedures	3	10	13	Difficult to enforce beyond what is done now at city level	No
Special needs/oxygen user registration program	14	5	19	Fire department has capabilities; low cost	Yes
Flood structure elevation projects	21	2	23	FEMA priority; need to determine which properties	Yes
Flood structure relocation projects	21	2	23	FEMA priority; need to determine which properties	Yes
Encourage citizen purchase/use of smoke detectors	32	2	34	Fire department has capabilities; low to moderate	Yes

				cost	
Encourage private insurance purchase	13	11	24	EMA/EMC along with insurance industry can do	Yes
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	23	10	33	Team in place so it would not be difficult to promote	Yes
Integrate tornado safe room retrofits into critical assets and facilities	18	4	22	Could integrate some properties; costly but effective	Yes
Maintain sandbags in dry storage	12	2	14	Limited need versus the flood risk	No
Promote tree and vegetation maintenance on private properties	10	10	20	EMA/EMC along with environmental groups can do	Yes
Repair structurally weak homes and do weatherization	19	10	29	Costly but economic and social benefits to project	Yes
Develop soil erosion stabilization projects	6	4	10	Somewhat underway with Hurley Creek/McKinley Lake projects	No
Install backflow devises	44	2	46	Very high local priority but expensive; looking at multiple funding sources	Yes
Remove dead vegetation on public properties and nuisance areas	18	11	29	Done as needed but funding would increase impact	Yes
Create a continuity of operations & succession plan for jurisdiction	10	12	22	Not a significant local priority but low cost and importance of action is becoming clearer	Yes
Develop/update/publicize city evacuation plans	7	7	14	People generally know what to do; EOP addresses decently	No
Develop volunteer base – trained and standby groups	14	12	26	Constantly a need; good volunteers are essential	Yes
Establish backup communications center or facilities	3	8	11	Working on this issue; to be part of EOC when built	No
Implement bomb squad program	-28	4	-24	Costly; no local capabilities; limited perceived need	No
Install computers in emergency vehicles	10	12	22	In place where needed; not high priority for other vehicles	No
Install GPS units in emergency vehicles	11	12	23	In place where needed; not high priority for other vehicles	No
Participate in a regional HAZMAT team agreement	13	3	16	County authority; city might be able to contribute to cost	No
Purchase new fire trucks	16	10	26	Costly but city continues to budget for need; fire dept responds to hundreds of calls	Yes
Purchase thermal imaging system for fire department	16	9	25	Moderate cost; fire dept has these but upgrades will be needed	Yes
Bury utility lines in existing development areas	8	12	20	Expensive but high benefits; unlikely to proceed because no local jurisdiction	No
Clear and deepen ditches on right-of-ways	-4	2	-2	Few ditches; most privately owned; limited need in city	No
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	11	4	15	Low local priority due to expense and one already in place; will always consider as long as FEMA funding	Yes
Inspect, construct, or repair dams	5	4	9	Inspections occur as needed; no new dams desired or needed	No
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	16	6	22	Needed due to age and deterioration but costly	Yes
Demolish abandoned properties	24	7	31	Significant need and priority in Creston for non-mitigation reasons	Yes
Harden public buildings	-1	10	9	Limited need or benefits perceived	No
Improve roads (resurface, pave, widen,	20	4	24	Costly but street conditions	Yes

etc.)				mandate improvements	
Install water impervious manhole covers	11	3	14	Already part of sewer upgrades	No
Promote the construction of private in-home tornado safe rooms	7	4	11	Low cost alternative or supplement to public safe rooms	Yes
Raise grade to eliminate backup flooding	2	2	4	Unsure where need is sufficient	No
Redundant systems and looping (water, sewer, electric, gas)	5	10	15	High cost exceeds benefits; city does not have jurisdiction	No
Replace bridges and culverts	17	6	23	Costly; needed in some areas for mitigation and economic development	Yes
Replace, expand, or improve water and sewer lines	19	6	25	Costly but a significant ongoing need in Creston	Yes
Retrofit/harden existing overhead utility lines	8	10	18	Costly; beneficial but City lacks jurisdiction	No
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	7	5	12	Generally this is seen as a low benefit option, especially at initial and ongoing cost	No
Expand law enforcement capabilities	12	1	13	City has good equipment and adequate staffing compared to cost of hiring more	No
Full review of policy, procedure, and codes to include mitigation	12	13	25	Increasing need for this is seen; will rely on FEMA/EMC	Yes
Install new fire hydrants	9	2	11	Adequate in place; other ways would be more effective to mitigate fire hazards	No
New or upgrade fire station	6	9	15	Costly; a local priority over time but not essential for mitigation in next five years	No
Investigate and implement alternative energy sources	3	8	11	Costly; city does not have jurisdiction over energy	No
Purchase/install backup fixed power generators and pumps	15	7	22	Increasing need seen for some assets, most of which are not city owned; need to keep option open for entities in the city	Yes
Purchase stand-by portable pumps and generators	13	12	25	Lower cost for temporary and portable needs in town; need to keep option open for entities in city	Yes

Figure 8 – 18: City of Cromwell Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	24	11	35	Low-cost necessary planning step	Yes
Establish alert systems for vulnerable populations	38	9	47	Few resources in the city mean that many seniors live alone and would need direct line to fire and EMS	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	7	11	18	No real local capability; can be handled at EMA	No
Promote/provide tornado safe room design education to builders/developers	5	4	9	Not a local priority; few developers/builders in town	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	27	9	36	Have been done in the past; champions exist	Yes
Work with FEMA and IDNR to update flood maps	16	1	17	Existing FHAs exist; this is a county and FEMA priority	Yes
Discourage/prohibit development in flood hazard areas – Actively participate in the program	27	1	28	FEMA requirement	Yes
Assure jurisdictional plans are in place and current	23	11	34	Many plans are in need of attention	Yes

Business and residential preparedness programs	13	11	24	Low cost overall; champions exist	Yes
Formally designate and stock community shelters (food and lodging, proper support)	-27	6	-21	Only one building, a church, is capable, but interest is limited	No
Implement/update and enforce zoning ordinances	-21	7	-14	Limited local political will and capability to implement; little new development likely	No
Investigate alternative water sources for fire suppression	-9	1	-8	Limited resources in the city to implement	No
Install speed limit signs	-3	5	2	Limited need	No
Make public facilities handicap accessible	-3	6	3	Limited need	No
Special needs/oxygen user registration program	-32	2	-30	Limited capability; city does not want to implement; will not interfere if fire or utilities implement	No
Encourage citizen purchase/use of smoke detectors	30	1	31	City interested in Creston Fire implementing in town	Yes
Encourage private insurance purchase	-13	10	-3	Limited resources in the city to implement	No
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	-7	8	1	Limited resources in the city to implement; residents do reasonable job already	No
Promote tree and vegetation maintenance on private properties	-3	9	6	Limited resources in the city to implement	No
Repair structurally weak homes and do weatherization	-6	8	2	Limited resources in the city to implement	No
Remove dead vegetation on public properties and nuisance areas	40	10	50	A municipal function that could be done better	Yes
Create a continuity of operations & succession plan for jurisdiction	10	8	18	Limited local interest but is a county priority the city will take part	Yes
Develop/implement an extreme heat event medical response plan	-12	1	-11	Limited resources in the city to implement (no local EMS)	No
Develop/implement a thorough recovery plan for power failure	11	7	18	Limited resources in the city to implement	No
Develop/update/publicize city evacuation plans	9	3	12	Limited need; small population, people would know how to leave	No
Develop volunteer base – trained and stand-by groups	5	10	15	Limited resources in the city to implement	No
Purchase road closure barricades	12	8	20	Low cost option and the city would benefit from having a limited number on hand	Yes
Bury utility lines in existing and new development areas	-11	9	-2	Needed but limited resources; city does not own electric utility	No
Clear and deepen ditches on right-of-ways	19	1	20	Needed; resources limited but could be increased	Yes
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	15	4	19	A long-term priority if resources can be made available; no safe places in town; few basements	Yes
Demolish abandoned properties	4	6	10	Is needed but resources are limited; abandoned properties are not close to occupied ones	No
Harden public buildings	-14	8	-6	Limited resources in the city to implement; no public buildings are occupied full-time	No
Improve roads (resurface, pave, widen, etc.)	26	3	29	Significantly needed and a strong local priority but costly	Yes
Install water impervious manhole covers	-9	1	-8	Sewer system is relatively new and problems are limited	No

Promote the construction of private in-home tornado safe rooms	-1	4	3	Limited resources in the city to implement	No
Retrofit/harden existing overhead utility lines	-3	9	6	Needed but limited resources; city does not own electric utility	No
Full review of policy, procedure, and codes to include mitigation	10	11	21	Needed; champions exist but local resources limited	Yes
GIS mapping system – implementation of hazard maps	-11	8	-3	Limited need for city to have its own mapping system	No
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	-8	1	-7	Limited resources in the city to implement	No
Investigate and implement alternative energy sources	0	7	7	Limited resources in the city to implement	No
Purchase/install backup fixed power generators and pumps	15	7	22	The church that serves as a shelter needs this	Yes
Purchase stand-by portable pumps and generators	16	10	26	Possible alternative to fixed generator and for infrastructure maintenance	Yes

Figure 8 – 19: City of Lorimor Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE -E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	27	11	38	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	28	11	39	Low-cost necessary public information; city hall can accommodate.	Yea
Initial community briefings immediately after events	21	9	30	Not a high priority and limited capability; EMA can address	No
Install hazard signs in area campgrounds, parks, and open spaces	26	4	30	Limited need and benefits likely; costly to maintain.	No
Promote NOAA weather radio – citizen purchase (rebate incentive/giveaway)	32	8	40	Have been done in the past; champions exist	Yes
Acquire modern chemicals and equipment for firefighting	35	3	38	Always a recurring need for the small fire department	Yes
Adopt manufactured home development storm shelter ordinances	20	10	30	Need has diminished with removal of "trailer park."	No
Work with FEMA and IDNR to develop quality flood maps (if flood hazard areas found)	22	0	22	Needed; city wants to be updated on this issue	Yes
Develop electronic directory of local and other resources	31	11	42	A good affordable project; community has a website	Yes
Enforce OSHA's regulations on hazardous materials	7	2	9	Little local authority, capability, and need	No
Backup jurisdictional files and records – store in alternative locations	33	8	41	Always a need and is not a significant cost.	Yes
Business and residential preparedness programs	30	11	41	Low-cost and framework in place	Yes
Enforce burning restrictions	21	4	25	County process is adequate; large lots in most of Lorimor	No
Enforce multi-family housing extinguisher laws	25	1	26	State regulations handle; not much local authority; few units.	No
Implement/update and enforce zoning ordinances	29	7	36	Zoning is in place but could be updated at low cost.	Yes
Investigate alternative water sources for fire suppression	27	2	29	Not a local priority; water provider will address this issue.	No
Install and/or update anti-virus software	34	2	36	Always a recurring need	Yes
Map past chemical contamination sites	26	2	28	Not a local priority or capability; not likely a significant problem	No
Promote good landscaping practices among property owners	32	6	38	Has become a priority as part of local comprehensive plan	Yes
Restricted access procedures	16	8	24	No means to enforce this	No

Special needs/oxygen user registration program	24	3	27	Fire department not ready to implement this project	No
Subdivision ordinances to address hazard interface areas	28	10	38	Ordinance is in place but could be updated at low cost.	Yes
Encourage citizen purchase/use of smoke detectors	34	2	36	Is a fire department priority but funding is limited most years	Yes
Encourage private insurance purchase	31	11	42	A low cost project through local media	Yes
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	28	9	37	No official program is necessary; residents look out for one another	No
Install windbreaks	26	4	30	Not a high priority and need; will require long-term care.	No
Integrate tornado safe room retrofits into critical assets and facilities	32	4	36	Possible inclusion as an attachment to the city hall	Yes
Lightning protection to tall buildings and towers	36	4	40	Water tower and utility poles can be at risk.	Yes
Maintain sandbags in dry storage	12	0	12	No major flooding history in town; limited storage space.	No
Promote tree and vegetation maintenance on private properties	27	9	36	A low cost project through local media	Yes
Remove underground fuel storage tanks	28	2	30	Likely not a significant problem; address when needed.	No
Repair structurally weak homes and do weatherization	44	8	52	A local priority to improve housing conditions	Yes
Develop soil erosion stabilization projects	27	2	29	Not a significant issue if other actions taken.	No
Install backflow devises	30	1	31	Unsure if this is a need; further study needed in next 4 years	No
Post “no dumping” signs	26	2	28	Not a significant issue	No
Remove dead vegetation on public properties and nuisance areas	30	10	40	Is a considerable problem, especially on conservation land at north end of town	Yes
Remove unused chemical containers	32	8	40	Several “brownfield” sites have been identified in comprehensive plan.	Yes
Tree planting programs on public property	39	3	42	Continued need for shade in parks.	Yes
Create a continuity of operations & succession plan for jurisdiction	28	9	37	Low-cost with potential for strong benefits	Yes
Develop/implement an extreme heat event medical response plan	20	1	21	Low-cost but limited benefit in city perceived; little city political will to do project	No
Develop/implement a thorough recovery plan for power failure	22	8	30	Low-cost plan although implementing it may be costly	No
Develop/update/publicize city evacuation plans	22	4	26	Not a significant need; several routes to leave town	No
Develop volunteer base of trained and stand-by groups	32	10	42	Always a need; most volunteers work outside of town.	Yes
Emergency response guidebooks in all emergency vehicles	28	9	37	Low-cost that can help city’s small staff	Yes
Establish backup communications center or facilities	20	2	22	Not a significant need; can use broadband.	No
Establish HAZMAT decontamination sites	21	1	22	Limited facilities in city to make this work	No
Install computers in emergency vehicles	30	10	40	Costly and a high priority	No
Install GPS units in emergency vehicles	31	9	40	Costly and a high priority	No
Hire or designate a public information officer	20	11	31	City’s mayor and the EMA provide information	No
Participate in a regional HAZMAT team agreement	22	2	24	County authority	No
Participate new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	38	10	48	Always a need but costly; grants will be sought in order to meet standards	Yes

Purchase SCBA (self-contained breathing apparatus)	40	3	43	Always a need in order for sustainable fire service	Yes
Bury utility lines in existing and new development areas	25	9	34	Good project but costly and utility owner lacks interest.	No
Clear and deepen ditches on right-of-ways	32	1	33	An identified need in storm water study	Yes
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	33	4	37	Vital for tornado protection; costly but worthwhile if grants are available.	Yes
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	34	2	36	An identified need in storm water study	Yes
Demolish abandoned properties	38	6	44	An identified objective of local comprehensive plan.	Yes
Harden public buildings	26	8	34	At current values, such buildings should be replaced instead	No
Improve roads (resurface, pave, widen, etc.)	43	3	46	Costly but a very high local priority	Yes
Install water impervious manhole covers	38	1	39	Identified by engineer as a sewer rehabilitation need	Yes
Replace bridges and culverts	39	3	42	Many culverts are in need of immediate attention	Yes
Replace, expand, or improve sewer lines	41	4	45	An identified need in storm water study	Yes
Retrofit/harden existing overhead utility lines	29	9	38	Good project but costly and utility owner lacks interest.	No
Community drills	26	10	36	If lead by EMA	Yes
Develop local debris disposal sites	27	7	34	Helps with beautification and property maintenance	Yes
Develop/maintain security at applicable critical assets (surveillance cameras, lighting)	24	3	27	Has been discussed but is very costly to maintain and monitor	No
Expand law enforcement capabilities	22	0	22	Strong desire but limited capabilities	No
Full review of policy, procedure, and codes to include mitigation	27	11	38	Low-cost necessary planning step	Yes
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	37	3	40	Popular low-cost methods as part of roadway improvements	Yes
Install new fire hydrants	36	2	38	Minor need at this time; requires support of SIRWA	No
Investigate and implement alternative energy sources	28	7	35	Very costly and difficult for a small town to implement	No
New or upgrade fire station	31	8	39	Larger and sturdier station is needed but costly	Yes
Purchase/install backup fixed power generators and pumps	36	7	43	Can be added with grant funding to public buildings	Yes
Purchase stand-by portable pumps and generators	40	9	49	Useful for city and fire department; low cost overall	Yes

Figure 8 – 20: City of Shannon City Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the HMP	22	11	33	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	11	11	22	Low-cost option that can be based at EMA office	Yes
Initial community briefings after events	31	9	40	Rely on the county EMA; city needs to feel more included	Yes
Work with FEMA and IDNR to update flood maps	39	1	40	Low cost and great need in the city	Yes

Adopt tree trimming ordinance	1	8	9	Low density development, so not much need; little enforcement capabilities	No
Assure jurisdictional plans are in place and current	44	11	55	Many plans are in need of attention	Yes
Discourage/prohibit development in flood hazard areas – Actively participate in the program	21	1	22	Not a significant local priority but is a FEMA requirement	Yes
Backup jurisdictional files and records – store in alternative locations	24	8	32	Relatively low-cost option; with limited capabilities, protecting the few systems is vital.	Yes
Business and residential preparedness programs	15	11	26	Low cost overall; champions exist outside of the city	Yes
Develop electronic directory of local and outside resources	10	11	21	Would like to see county system but not able to participate	No
Formally designate and stock community shelters (food and lodging, proper support)	-3	6	3	Limited resources; no sturdy larger buildings; would be very costly for modest benefit	No
Make public facilities handicap accessible	-18	6	-12	Only a city hall exists and it is small and not a suitable shelter.	No
Special needs/oxygen user registration program	-12	2	-10	Very limited resources; Afton Fire would provide, if any.	No
Encourage citizen purchase/use of smoke detectors	26	1	27	Afton Fire provides but the efforts don't impact Shannon City as much as they should	Yes
Encourage private insurance purchase	26	10	36	EMA/EMC along with insurance industry can do; city would like to be more involved	Yes
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	26	8	34	Underway informally but effort could be strengthened	Yes
Promote tree and vegetation maintenance on private properties	24	8	32	Low-cost option that is very feasible with EMA support; more feasible than ordinance enforcement.	Yes
Repair structurally weak homes and do weatherization	1	8	9	Costs too high and resources not available; home values make it infeasible to implement this alternative	No
Install backflow devises on sewer lines	-19	1	-18	Not really necessary; no city central sewer.	No
Post "no dumping" signs	3	7	10	Limited need and risks to date	No
Remove dead vegetation on public properties and nuisance areas	31	10	41	A continual need; no full-time maintenance staff available, so additional resources desired.	Yes
Remove unused chemical containers	27	6	33	Some tanks and containers exist at abandoned properties; some not fenced and can be a hazard.	Yes
Tree planting programs on public property and ROW areas	15	4	19	Few resources available and not likely to have a dramatic mitigation impact in the city	No
Develop/implement a thorough recovery plan for power failure	8	7	15	Little need for a complete plan at individual at city level; lack of local resources	No
Develop/update/publicize city evacuation plans	13	3	16	No real need; people know how to leave; communicating need might be an issue	No
Develop volunteer base – trained and stand-by groups	14	10	24	City has very people to volunteer; rely upon county and state efforts	No
Hire or designate a public information officer	19	11	30	No cost for the city to formally designate a person.	Yes
Purchase road closure barricades	30	8	38	Low cost for the very few that are needed	Yes

Bury utility lines in existing and new development areas	-10	9	-1	Costly for burial; city does not own utility.	No
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	1	4	5	Costly, but needed for a few residents. Capabilities too limited; in-home options may be better.	No
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	-11	4	-7	Low density of development; ditches exist; resources inadequate for city to construct and maintain.	No
Demolish abandoned properties	19	6	25	Significant need, although resources are limited.	Yes
Harden public buildings	17	8	25	City hall building is modest and needs improvement	Yes
Improve roads (resurface, pave, widen, etc.)	43	3	46	Need is very great and can mitigate hazards, but will take lots of outside resources.	Yes
Promote the construction of private in-home tornado safe rooms	25	4	29	Low cost alternative to a community safe room.	Yes
Retrofit/harden existing overhead utility lines	5	9	14	Costly; city does not own utility.	No
GIS mapping system – implementation of hazard maps	23	8	31	Working on at this time; not too difficult to add hazard maps	Yes
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	10	1	11	Not a local priority; flash flooding is addressed by ditches and large lots, few impermeable surfaces.	No
Purchase/install backup fixed power generators and pumps	22	7	29	City and facility owners (private) have need	Yes

Figure 8 – 21: City of Thayer Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Availability of cable or satellite with weather advisory overrides	16	6	22	Already increasingly done and not a local issue	No
Develop annual leadership awareness campaign about the HMP	22	10	32	Low-cost necessary planning step	Yes
Establish alert systems for vulnerable populations	24	9	33	Always a need as population ages and fewer other resources	Yes
Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	26	10	36	Low-cost option that can be based at EMA office	Yes
Initial community briefings immediately after events	20	8	28	Rely on the county EMA; no local resources	No
Promote NOAA weather radio and continue rebate incentive for citizen purchase	29	8	37	Have been done in the past; champions exist	Yes
Work with FEMA and IDNR to develop quality flood maps (survey area to determine if hazards exist)	22	0	22	This is a County and FEMA priority	Yes
Adopt tree trimming ordinances	18	8	26	Few capabilities and no staff	No
Assure jurisdictional plans are in place and current	18	10	28	Not a local priority; others to help with planning	No
Backup jurisdictional files and records – store in alternate locations & electronically	25	6	31	A low-cost necessary local effort	Yes
Business and residential preparedness programs	25	10	35	Not a local priority; others to help with effort	No
Develop electronic directory of local and other resources	28	10	38	No local capabilities; would support countywide effort	Yes
Develop/enforce snow removal policies	20	3	23	Needed, but no local resources	No
Formally designate and stock community shelters (food and lodging, proper support)	12	6	18	Limited local population and no viable facility in the area; can house in Afton and Murray	No

Formulate partnerships to gain legislation	22	10	32	A viable low-cost option but not likely to have direct mitigation impact.	No
Install speed limit signs	21	6	27	Not really necessary in town	No
Promote good landscaping practices among property owners	23	6	29	Beneficial but little political will.	No
Special needs/oxygen user registration program	17	4	21	Rely on utility providers and Afton/Murray Fire Depts.	No
Encourage citizen purchase/use of smoke detectors	22	1	23	Rely on Afton/Murray Fire Depts.	No
Encourage private insurance purchase	21	10	31	Beneficial but little political will	No
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	14	8	22	Informally done already and found adequate	No
Integrate tornado safe room retrofits into critical assets and facilities	25	4	29	No significant public assets for integration	No
Promote tree and vegetation maintenance on private properties	22	9	31	Beneficial but little political will	No
Repair structurally weak homes and do weatherization	33	8	41	Vital project with significant benefits in this community	Yes
Remove dead vegetation on public properties and nuisance areas	24	10	34	Limited political will and resources by strongly needed	Yes
Tree planting programs on public property	28	2	30	Popular and might be beneficial but few public properties	No
Create a continuity of operations & succession plan for jurisdiction	21	8	29	City has limited functions and resources	No
Develop/implement an extreme heat event medical response plan	14	1	15	No local capabilities; handle at county level	No
Develop/implement a thorough recovery plan for power failure	14	7	21	No local capabilities; handle at county/utility level	No
Develop/update/publicize city evacuation plans	13	3	16	Few routes but small population	No
Develop volunteer base of trained and stand-by groups	21	9	30	Always needed but to be handled at county level	No
Purchase road closure barricades	23	7	30	No staff to maintain	No
Build highway or rail overpass or improve existing overpass as a secondary emergency vehicle route into town	21	8	29	Is a needed project; existing overpass is deteriorated; no resources in near future to address this issue	No
Bury utility lines in existing and new development areas	22	9	31	Desirable but no utility interest	No
Clear and deepen ditches on right-of-ways	22	2	24	Can help with flash flooding but no capabilities	No
Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	27	4	31	Very expensive but can be considered if funding is available; homes are not structurally sound	Yes
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	25	2	27	This is overbuild of infrastructure for this city; no resources to maintain	No
Demolish abandoned properties	24	6	30	A significant need for the sustainability of the community	Yes
Harden public buildings	23	8	31	Few buildings available and funds are unlikely.	No
Improve roads (resurface, pave, widen, etc.)	33	2	35	Always a need but funds are inadequate; will have to prioritize over many years	Yes
Replace bridges and culverts	26	3	29	Limited need but can be addressed with road improvements	No
Retrofit/harden existing overhead utility lines	19	9	28	Desirable but limited utility interest	No
Full review of policy, procedure, and codes to include mitigation	18	10	28	Limited staff and capacity to address this issue at this time	No

Purchase/install backup fixed power generators and pumps	25	7	32	No asset truly needing fixed power.	No
Purchase stand-by portable pumps and generators	26	8	34	Possible if a storage place is provided; not expensive	Yes

Figure 8 – 22: Creston Community School District Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE -E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
NOAA weather radio in schools and on school property	19	6	25	Some exist but other properties lack; is a priority for alerting all students and staff	Yes
Purchase stand-by portable pumps	11	6	17	Not a significant need; while no designated pumps at school level; they can be available	No
Realign Hurley Creek and protect building floor from Hurley Creek flooding	29	1	30	A high-priority project if funding can be obtained a plan is feasible; might be expensive.	Yes
Construct public safe rooms in school and school property (Burton R. Jones facility)	8	3	11	Experience with other safe rooms is desired before decision on adding more for other building(s)	No
Develop annual leadership awareness campaign about the HMP	24	10	34	Low-cost necessary planning step	Yes
Emergency response guidebooks in key school buildings	27	9	36	A key need for buses traveling in rural areas	Yes
School participate in an emergency operations plan (county update)	28	10	38	School needs to be up-to-date with new practices county is required to institute	Yes

Figure 8 – 23: East Union School District Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop an annual local leadership awareness campaign about the hazard mitigation plan	43	9	52	Low-cost necessary planning step	Yes
Improve public awareness of hazard risks – written and presentation instruments	35	9	44	Low-cost option that can be based at EMA office; school can educate youths.	Yes
Install NOAA weather radio in school	56	6	62	Relatively low-cost and high priority to have them in various locations on campus	Yes
Rail and highway safety education program for youth	41	4	45	Already being done but needs to be added as an official mitigation effort each year.	Yes
Assure jurisdictional plans are in use and updated	31	9	40	School has shown increased interest in planning to protect its new building investment.	Yes
Backup jurisdictional files – store electronically and at alternative locations	18	6	24	Not a significant mitigation impact; starting to be completed electronically	No
Develop electronic directory of local and other resources	18	9	27	Not a school priority; low-cost and the county can handle this.	No
Develop/maintain hazardous materials inventories on school campus	39	7	46	School is not an expert in this, so help is needed.	Yes
Formally designate and stock community post-disaster shelter (food and lodging)	15	8	23	Desired but informal use for this is adequate; no real opportunity to become certified Red Cross facility	No
Remove asbestos from public buildings	34	2	36	Need to complete for legal purposes but limited amount likely in the school	Yes
Tree planting programs on school	49	2	51	A popular and relatively low	Yes

property				cost measure that has public support.	
Adopt a thorough EOP addressing multiple hazards and including a mass casualty plan	36	9	45	School has shown increased interest in planning to protect its new building investment.	Yes
Create a jurisdictional continuity of operations and succession plan	35	3	38	School has shown increased interest in planning to protect its new building investment.	Yes
Develop/implement an extreme event medical response plan	43	2	45	Can be a low-cost project with school nurse and county public health dept.	Yes
Develop/implement a thorough recovery plan for power failure	32	6	38	With rural school building, might be important, even though a limited power generator is located on site.	Yes
Emergency response guidebooks in district vehicles	46	8	54	Bus drivers should have access to these at a reasonable cost.	Yes
Participate in a regional HAZMAT team agreement	45	2	47	Costly but is standard; more and more chemicals used	Yes
Harden public buildings	2	6	8	With new safe room, this is not a considerable issue; most of building is built to modern codes.	No
Redundant systems and looping (water, sewer, electric, gas)	15	7	22	Too costly, especially if other mitigation efforts are completed, like fixed generators.	No
Full review of policy, procedure, and codes to include mitigation	51	9	60	A necessary and low-cost step can be provided with EMA help.	Yes
GIS mapping system implementation and digital hazard maps	5	6	11	Not a significant need at the school level; county can handle.	No
Install alternative/sustainable storm water control options such as buffer strips, bioswales, and rain gardens	-3	1	-2	Need is not extremely strong since some of these options built into new addition.	No
Investigate and implement alternative energy sources	33	6	39	School would like lower energy costs if this project can be funded but it has little direct mitigation impact.	No
Purchase/install backup fixed generators	30	6	36	Is a need for certain times when there is a widespread outage.	Yes
Purchase standby portable pumps and generators	29	9	38	Is a need for its portability and multiple uses on response and recovery.	Yes
Install air quality monitors	48	4	52	Due to location near railroad, there is concern of ambient air quality.	Yes

Figure 8 – 24: Southwestern Community College Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Promote/provide tornado safe room design education for builders and developers	55	3	58	Building trades classes can be taught on this issue	Yes
Adopt building codes to address various natural hazards	38	6	44	Viewed as important after tornado damage to campus buildings	Yes
Business and residential preparedness programs	49	10	59	College can be a leader to coordinate such training	Yes
Develop electronic directory of local and other resources	42	10	52	Low-cost to coordinate with the EMA, expand website	Yes
Install windbreaks	54	6	60	Exposed north and west areas of campus make these beneficial at low cost; some in	Yes

				place on north side.	
Integrate tornado safe room retrofits into critical assets/facilities	56	3	59	Might to easier in some cases than new safe rooms where sturdy buildings are in place.	Yes
Seminars and demonstrations on retrofitting (site visits)	43	6	49	Building trades classes can be taught on this issue	Yes
Tree planting programs on campus	52	3	55	Trees damaged by tornado need replaced; low-cost wind breaks	Yes
Install GPS units in emergency vehicles	23	6	29	Can be beneficial in avoiding some risk of getting lost but does not mitigate hazards directly	No
Raise grade to eliminate backup flooding	41	1	42	Continued problem with flooding of a building may require an engineered solution. BCA is needed.	Yes
Redundant systems and looping (water, sewer, electric, gas)	52	8	60	As campus grows, additional infrastructure needed; SWCC seen increasingly as a response and mitigation partner to the Creston/Union Co. area	Yes
Construct public safe rooms on campus	58	3	61	Costly but excellent mitigation measure when a new building is constructed, which is possible or even likely in five years.	Yes
Develop annual leadership awareness campaign about the plan	53	10	63	Low-cost necessary planning step	Yes
Investigate and implement alternative energy sources	59	2	61	Not directly a mitigation priority but is an institutional desire; needs further planning.	Yes
College participate in an emergency operations plan (county update)	54	10	64	Low-cost necessary planning step	Yes

Figure 8 – 25: Greater Regional Medical Center Proposed Mitigation Action Scores

Mitigation Action	Total STAPLE-E Score	# of Priority Hazards Affected	Total Score	Comments on Benefits vs. Costs	Selected for Prioritization ?
Develop annual leadership awareness campaign about the plan	45	9	54	Low-cost necessary planning step	Yes
Increase public awareness on household hazardous materials	37	7	44	Promotion of the poison control and proper health care risks, including use of prescription drugs makes sense.	Yes
Promote/provide tornado safe room design education for buildings and developers	21	3	24	Not a suitable function of the institution.	No
Backup jurisdictional files and records - store in alternative locations	50	6	56	Significant issue due to the all paper and electronic records and compliance with new law.	Yes
Develop/implement watershed studies and plans for possible flood prone areas	8	0	8	No longer an issue on campus. Hospital area has been part of Hurley Creek improvements.	No
Formally designate and stock community shelters (food and lodging, proper support)	22	8	30	Low priority for investment with cafeteria in place but some discussions needed on how to implement this in disasters	Yes
Special needs/oxygen user registration program	11	8	19	Hospital would support county effort with fire and utilities but lacks capabilities to implement at institutional level	No
Integrate tornado safe room retrofits into critical assets/facilities	36	3	39	More cost effective than new safe room unless there is an expansion. Vital to safety of immobile occupants of hospital	Yes
Develop/implement an extreme heat	34	2	36	Continual need for local EMS;	Yes

event medical response plan				can be costly but can save lives.	
Develop/update evacuation plans and sheltering in place plans after renovation	50	5	55	This has proved to be an issue after 2012 tornado; best practices learned need to be formalized.	Yes
Install computers in emergency vehicles	-3	8	5	Fixed computers are not needed; technology now solves this issue.	No
Install GPS units in emergency vehicles	-8	8	0	Drivers know their way around with the E911 system in place	No
GIS mapping system implementation and digital hazard maps	-11	1	-10	No strong need and no staff available to implement	No
Install water impervious manhole covers	-9	0	-9	Not really needed now that parking situation has improved; flash flood risk due to this issue is low.	No
Construct public safe rooms on campus	18	3	12	Not a strong desire and costly but it may make sense if a new expansion planned after 5 years.	No
Investigate and implement alternative energy sources	-6	6	0	Costly and not feasible for the institution	No

The next chapter contains the selected mitigation actions by jurisdiction and the strategy for each jurisdiction for the implementation of this hazard mitigation plan.

Chapter 9: Selected Mitigation Actions and Mitigation Strategy

This chapter provides the list of mitigation actions by jurisdiction and the strategy for its implementation. It also lists the selected mitigation actions by the main goal and objective to which the action pertains.

9.1: Selection of Alternative Measures by Jurisdiction

In this section, the alternative measures selected by jurisdiction are listed for further consideration later in the implementation strategy. The following table shows the mitigation actions selected across the jurisdictions. The following table does not limit the types of actions that can be undertaken but rather lists those that the jurisdictions (local governments, schools, and other key stakeholder organizations in the county) seek to implement in the next five years from among the comprehensive list of alternatives provided. The individual scores for a measure in each jurisdiction is one factor in selecting those for inclusion in the implementation plan. Another is the inclusion of a requirement of the State of Iowa or FEMA, such as NFIP participation.

Figure 9 - 1: Alphabetized Selected Actions By Jurisdiction

Selected Mitigation Action	Union Co. *	Afton	Arispe	Creston	Cromwell	Lorimor	Shannon City	Thayer	Creston Schools	East Union Schools	SWCC	GRMC
Acquire modern chemicals and equipment for firefighting		X				X						
Adopt a thorough EOP addressing multiple hazards and inc1luding a mass casualty plan			X						X	X	X	
Adopt building codes to address various natural hazards											X	
Adopt manufactured home development storm shelter ordinances			X	X								
Assure jurisdictional plans are in place and current	X	X	X	X	X		X			X		
Backup jurisdictional files and records – store in alternate locations & electronically						X	X	X				X
Bury utility lines in existing and new development	X											
Business and residential preparedness program	X	X	X	X	X	X	X				X	
Clean sewage lagoons and install rock to berm		X										
Clear and deepen ditches on right-of-ways	X				X	X						
Community drills						X						
Construct community safe rooms in various community assets (parks, buildings, mfd home areas, etc.)	X	X	X	X	X	X		X			X	
Construct or elevate wastewater lift stations		X										
Construct storm water drainage (underground, culverts, curb & gutter, etc.)	X	X	X	X		X						
Create a jurisdictional continuity of operations and succession plan		X	X	X	X	X				X		
Demolish abandoned properties		X	X	X		X	X					
Develop annual leadership awareness campaign about the HMP	X	X	X	X	X	X	X	X	X	X	X	X
Develop electronic directory of local and other resources						X		X			X	
Develop local debris disposal sites						X						
Develop volunteer base of trained and stand-by groups	X			X		X						
Develop/enforce snow removal policies			X									
Develop/implement a thorough recovery plan for power failure		X	X									
Develop/implement an extreme heat event medical response plan	X		X							X		X
Develop/maintain hazardous materials inventories on campus										X		
Develop/update evacuation plans and sheltering in place after renovation												X
Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program	X			X								
Emergency response guidebooks in all emergency vehicles		X				X			X	X		

Encourage citizen purchase and use of smoke detectors			X	X	X	X	X					
Encourage private insurance purchase	X		X	X		X	X					
Establish alert systems for vulnerable populations					X			X				
Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	X			X			X					
Establish partnerships with other jurisdictions to control storm water				X								
Expand law enforcement capabilities		X										
Flood structure elevation projects *(best option for property must be identified)*				X								
Flood structure relocation projects *(best option for property must be identified)*				X								
Formally designate and stock campus buildings as community shelters											X	
Full review of policy, procedure, and codes to include mitigation	X	X	X	X	X	X				X		
GIS mapping system implementation and digital hazard maps	X	X					X					
Harden public buildings	X						X					
Hire or designate public information officer							X					
Improve public awareness of hazard risks - dispense print materials	X			X		X	X	X		X		
Improve roads (resurface, pave, widen, etc.)	X	X		X	X	X	X	X				
Increase public awareness on household hazardous materials												X
Initial community briefings immediately after events		X					X					
Install air quality monitors										X		
Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens						X						
Install and/or update anti-virus software						X						
Install backflow devises				X								
Install computers in emergency vehicles		X										
Install GPS units in emergency/County vehicles	X											
Install hazard signs in City parks, campgrounds, and open spaces		X		X								
Install new fire hydrants		X										
Install speed limit signs			X									
Install water impervious manhole covers		X				X						
Install windbreaks											X	
Integrate safe room retrofits into critical assets/facilities				X		X					X	X
Investigate and implement alternative energy sources											X	
Lightning protection to tall buildings and towers						X						
Maintain active participation in the NFIP program; prohibit development in floodplain					X		X					
Maintain Emergency Operations Center with 24-hr capabilities	X											
Make all public facilities handicap accessible			X									
New or upgrade fire station		X				X						
Participate in a regional HAZMAT team	X	X								X		
Promote good landscaping practices among property owners	X	X	X	X		X						
Promote NOAA weather radio - citizen purchase (possible rebate initiative)	X	X	X	X	X	X		X	X	X		
Promote the construction of private in-home tornado safe rooms	X			X			X					
Promote tree and vegetation maintenance on private properties	X			X		X	X					
Promote/provide tornado safe room design education for builders and developers											X	
Purchase new fire trucks and ambulances		X		X								
Purchase new, modernize, and/or harden existing mobile and personal communications equipment	X	X				X						
Purchase road closure barricades	X				X		X					
Purchase SCBA (self-contained breathing apparatus)		X				X						
Purchase stand-by portable pumps and generators		X	X	X	X	X		X		X		
Purchase thermal imaging camera for fire departments		X		X								
Purchase vehicle extrication equipment		X										
Purchase/install backup fixed power generators and/or pumps	X	X	X	X	X	X	X			X		

Rail and highway safety education programs for students										X		
Raise grade to eliminate backup flooding (entrances to buildings)											X	
Realign Hurley Creek and protect building floor from Hurley Creek flooding									X			
Redundant systems and looping (water, sewer, electric, gas)		X									X	
Remove asbestos from campus (likely very little still exists)										X		
Remove dead vegetation on public properties and nuisance areas		X	X	X	X	X	X	X				
Remove unused chemical containers	X		X			X	X					
Repair structurally weak homes and do weatherization			X	X		X		X				
Replace bridges and/or culverts	X	X		X		X						
Replace, expand, or improve water and/or sewer lines		X		X		X						
Retrofit/harden existing overhead utility lines		X										
Seminars and demonstrations on retrofitting (site visits)											X	
Special needs/oxygen user registration program	X	X		X								
Subdivision ordinances to address hazard interface areas						X						
Tree planting programs on public property						X				X	X	
Update zoning ordinance to include mitigation ideas						X						
Work with FEMA and IDNR to develop quality flood maps		X		X	X	X	X	X				

** Including Green Valley State Park*

9.2: Implementation Strategy by Jurisdiction

According to FEMA guidance, the final major piece in the mitigation plan is the implementation strategy for the jurisdictions that are included in the mitigation plan. The mitigation strategy is a description of the proposed mitigation actions by jurisdiction that details the timeline, leadership, and funding for the action. The following tables provide the proposed implementation plans for each jurisdiction. The mitigation strategy was reviewed and discussed during the seventh mitigation planning meeting.

The following mitigation strategy is prioritized for each jurisdiction based on the following: a) a cost-benefit review, b) the STAPLE-E criteria, c) committee and citizen comments, d) comments from public officials in each jurisdiction, e) FEMA and state requirements (such as NFIP participation), and f) logistical feasibility. The final one, logistical feasibility, needs more comment. Some projects are not feasible until other actions take place. For example, educating the public on safe room locations and how to access them is impossible until the safe rooms are built. Other projects are impossible until the political and staffing needs are in place. Finally, some projects are delayed because they simply take too long to move to fruition, such as bridge replacement. The benefit-cost review considers the feasibility of the project and whether the benefits are great for the costs. As much as possible, such considerations help form the timeline for the mitigation actions in the above tables. However, because some actions are nearly underway or are eminent, no matter the benefits versus the cost, this criterion is only one of many that helped prioritize the actions.

The following mitigation strategy is today's best estimate of when projects should be initiated and completed, the cost for each activity, who or which organization(s) should lead the effort, and possible funding sources. Because funding is so complex and varies so much from year to year and changes after a major Presidential declaration, *Chapter 10* contains only a generic list of sources. Local organizations, such as SICOG, can be consulted to assist with the funding process for a specific project. The planning team and each jurisdiction should keep in mind, however, that outside funding is limited and almost all projects and programs require some local funding and/or in-kind involvement (often called a "match") to make the state, federal, private, or foundation support possible.

Note: for local governments, the listing "City" or "County" means the governing body and staff directly under the command of the governing body in most cases. As an example, most of the implementing activity will be done during council meetings and by the city clerk at the council's direction. The "EMA" is the Emergency Management Agency. If any town decides to dis-incorporate in the next five years, the rural or county's mitigation strategy, as much as is relevant to the effected jurisdiction, should prevail.

Please note that when each jurisdiction adopts the plan, this document, the jurisdiction indicates willingness to implement the projects that are discussed in this section, more or less as proposed. Also note that some mitigation actions taken in one jurisdiction may affect hazard mitigation efforts in other jurisdictions even if such actions are not mentioned as part of the approved strategy for those other jurisdictions, as shown on the column to the right.

Table 9.2: Union County (Including rural & Green Valley/IDNR) Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Develop annual leadership awareness campaign about the plan	Board of Supervisors (BOS), EMA, local leaders	2013	2014	$250	1, 2	Local leaders are fully aware of plan and its relevance	Y
M	Remove unused chemical containers	EMA, Landfill, BOS/Sheriff enforcement	2013	2014+	$10,000+	1, 2, 3, 6, 7	Toxic hazards removed or exposure reduced	N
H	Business and residential preparedness program	EMA, possible SWCC and other leaders	2013	2015	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
H	Promote NOAA weather radio - citizen purchase (possible rebate initiative)	EMA, BOS, awareness group	2013	2015	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
H	Assure jurisdictional plans are in place and current	EMA Commission	2013	2017+	$1,000/yr	1, 2	Greater support for hazard mitigation and annual reviews of plan	Y
H	Develop volunteer base of trained and stand-by groups	EMA, local responders	2013	Ongoing	$250	1, 2, 3, 4	More people are in place to respond to hazards	Y
H	Replace bridges and culverts	Secondary Rds Dept, BOS, IDOT, NRCS	2013	Ongoing	$2 M/yr.	1, 2, 3, 4	Collaboration in place to expedite funding for upgrades; upgrades made as timely as possible	Y
H	Improve public awareness of hazard risks - dispense print materials	EMA, Public Health, Fire, EMS, Police, NRCS	2013	Ongoing	$1,000	1, 2, 3, 4, 7	Information available at key locations in city	Y
H	Construct storm water drainage (underground, culverts, curb and gutter, basins, buffer strips, etc.)	BOS, Secondary Rds Dept, NRCS	2013	Ongoing	$50,000/ yr or more	1, 2, 3, 4, 5, 7	Adequate systems are built where problems are identified	N
H	Improve roads (resurface, pave, widen, etc.)	Secondary Roads Dept., IDOT	2013	Ongoing	$250,000 +	1, 2, 3, 6	Better streets and roads	Y
M	Clear and deepen ditches on right-of-ways	Public works	2013	Ongoing	$10,000/ yr.	1, 2, 3, 4	Ditches are cleared where problems are worst	Y
M	Purchase/install backup fixed power generators and pumps	BOS, Dept heads, Co. Conservation and IDNR	2014	2015+	$25,000 ea.	1, 2, 3, 4, 5, 7	Installed fixed generators at more critical assets	N
H	Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Hospital, EMA, Public Health	2014	Ongoing	$5,000	1, 2, 3, 4	Volunteers in place; policies established and learned	Y
H	GIS mapping system –	BOS, All	2014	Ongoing	$20,000/	1, 2, 3, 4, 6,	All offices	Y

	implementation of hazard maps	county offices			yr	7	networked; share hazard map info	
M	Purchase new, modernize, and/or harden existing mobile and personal communications equip	EMA, Sheriff, Engineer, Cons.	2014	Ongoing	$50,000	1, 2, 3, 4, 5, 7	All key personnel and organizations have interoperable communications meeting standards	Y
L	Participate in a regional HAZMAT Team	BOS, local fire, cities	2014	Ongoing	$15,000/ yr	1, 2	Formal signed contract for services	Y
M	Promote good landscaping practices among property owners	EMA, public awareness team, NRCS, civic clubs	2014	Ongoing	$1,000/yr	1, 2, 7	More property owners implement landscaping efforts	N
H	Special needs/oxygen user registration program	EMA commission	2014	Ongoing	$1,000/yr	1, 2, 6, 7	Database maintained and EOP plans based on needs of such groups	Y
M	Develop/implement an extreme heat event medical response plan	Fire, EMS, EMA	2014	2015	$1,000	1, 2, 4, 5, 7	Equipment acquired, plans in place	Y
M	Install GPS units in emergency/County vehicles	EMA, Sheriff, Engineer, Cons.	2015	2016	$500 ea.	1, 2, 5, 7	GPS units and computers are installed in vehicles	Y
M	Purchase road closure barricades	Secondary Roads Dept., BOS	2015	2016	$10,000	1, 2, 3	County has enough road closure barricades for likely incidents	N
L	Bury utility lines in existing and new development	BOS (through zoning, etc.), utility owners, pub. awareness group, NRCS	2015	2017	$1 million	1, 2, 4, 7	Priorities established and lines buried over time	Y
M	Encourage private insurance purchase	EMA, public awareness team	2015	Ongoing	$2,000	1, 2, 7	Increase number of people with proper insurance	Y
L	Full review of policy, procedure, and codes	All County Departments, BOS	2015	2016	$2.500	1, 2	Mitigation measures and concepts included in local policies, procedures, and codes	N
H	Maintain Emergency Operations Center with 24-hr capabilities	EMA commission	2016	2017+	$100,000	1, 2, 3, 4	Countywide facility	Y
M	Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program	BOS, EMA, Public awareness team	2016	2017+	$25,000	1, 2, 3, 4	Maps in place, policies are promoted, property protected	Y
L	Promote vegetation maintenance on private properties	EMA, Secondary Rds Dept, public awareness team, insurance firms, utility owners	2016	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
M	Construct public safe rooms in parks, campgrounds, other assets	EMA, County Conservation, IDNR	2016	2017+	$500,000	1, 2, 3, 4	Staff, users, visitors are protected from tornados, etc.	N
L	Promote the construction of private in-home tornado safe rooms	EMA, public awareness team	2016	2017+	$500	1, 2	In-home safe room options are promoted	N
L	Harden public buildings	BOS, Dept. heads, IDNR	2017	2017+	$100,000 +	1, 2, 4, 5, 6	Buildings better able withstand hazards	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.3: City of Afton Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Assure jurisdictional plans are in place and current	City council, clerk	2013	2014+	$10,000+	1, 2, 3	Other plans, such as comprehensive plan, are in place and consider mitigation	Y
H	Promote good landscaping practices among property owners	City council, civic clubs, EMA, insurers	2013	2014+	$1,000/yr.	1, 2, 7	More property owners implement landscaping efforts	N
H	Demolish abandoned properties	City council	2013	2014+	$15,000	1, 2, 6, 7	Demolition effort in place and actively funded	N
H	Develop/implement recovery plan for power failure	Fire dept, EMS, City, Alliant	2013	2014	$2,500	1, 2, 7	Improved relationship with providers	N
H	Replace, expand, or improve water and sewer lines	City council, Public works	2013	2015+	$1 million	1, 2, 3, 6	System improved and less vulnerable	Y
L	Initial community briefings immediately after events	Mayor, EMA, Fire, Police	2013	Ongoing	$250	1, 2	Person designated and trained	Y
H	Purchase thermal imaging camera for fire dept.	Fire, City	2014	2015	$10,000	1, 2, 3, 4, 5, 7	Good unit in place and people trained	Y
H	Improve roads (resurface, pave, widen, etc.)	City council, public works, county engineer, IDOT	2014	2015+	$250,000 +	1, 2, 3, 6	Better streets and roads	Y
H	Replace bridges and culverts	City council, public works, county engineer, IDOT	2014	2015+	$250,000 +	1, 2, 3, 6	Bridges and culverts replaced based on engineering study needs	Y
H	Emergency response guidebooks in key emergency and City vehicles	Fire, police, EMS, public works	2014	2015	$1,000	1, 3, 4	All buildings and buses contain	N
H	Purchase new fire trucks and ambulances	City council, Fire, EMS	2014	2015+	$300,000	1, 2, 4, 7	Upgrades as needed	Y
H	Clean sewage lagoons and install rock to berm	City council	2014	2015	$100,00	1, 2, 3, 5, 6	Extended life of lagoon system	Y
M	Promote NOAA weather radio - citizen purchase (rebate initiative)	City council, EMA	2014	2015	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
M	Remove dead vegetation on public properties and nuisance areas	City council, public works	2014	2015	$25,000/ yr.	1, 2, 7	Debris is removed and disposed in all parts of Afton	N
M	Create a jurisdictional continuity of operations and succession plan	City council, EMA	2013	2015	$1,000	1, 2	Plan is in place and reviewed regularly; new staff and elected officials are aware	N
M	Construct storm water drainage (underground, culverts, curb and gutter, basins, buffer strips, etc.)	Public works	2014	2016	$50,000	1, 2, 3, 4, 5	Adequate systems are built where problems are identified	N
H	Participate in a regional HAZMAT Team	EMA, Fire, City council	2014	Ongoing	$2,000/yr	1, 2	Formal signed contract for services	Y
H	GIS mapping system implementation and digital hazard maps	City council, possible SICOG and County	2015	2016	$5,000	1, 2	Local maps are on the county's system and are online	Y
M	New or upgrade of fire station	Fire, City council	2015	2016	$500,000	1, 2, 3, 5, 7	Fire department is more efficient and	Y

							building is sturdier	
H	Purchase new, modernize, and/or harden existing mobile and personal communications equip	City council, fire, police, public works	2015	2016	$50,000	1, 2, 3, 4, 5, 7	All key personnel and organizations have interoperable communications meeting standards	Y
M	Install water impervious manhole covers	Public works	2015	2016	$25,000	1, 2, 3, 6	Water and sewer main protected	N
L	Work with FEMA and IDNR to develop quality flood maps	Public works	2015	2016	$1,000	2, 3, 4	FEMA approved flood maps in place	Y
M	Acquire modern chemicals and equipment for firefighting	Fire department	2015	2016	$5,000	1, 2	Fire suppression needs are known; addressed	Y
H	Redundant systems and looping (water, sewer, electric, gas)	City council, public works, SIRWA, Alliant, MidAmerican	2015	2016+	$100,000 +	1, 2, 3, 4, 5, 6, 7	Secondary feeds protect from hazard-related outages	Y
L	Construct or elevate wastewater lift stations	Public works	2015	2016+	$50,000	1, 2, 3, 4, 5	Lift stations no longer at flash flood risk	N
M	Full review of policy, procedure, and codes	City clerk, council, dept heads	2016	2017	$10,000	1, 2, 7	Codes updated, mitigation options considered	N
M	Develop annual leadership awareness campaign about the plan	City council, clerk, EMA	2016	2017+	$1,000	1, 2	Prepare plan evaluations; update project list; prepare plan 5-yr update	N
L	Purchase SCBAs	Fire and EMS	2016	2017	$5,000 ea.	1, 2, 3, 4	SCBA in place for all personnel, trained in use	Y
L	Special needs/oxygen user registration program	EMA, fire, Electric Dept., MidAmerican Energy, EMS	2016	2017+	$1,000/yr	1, 2, 6, 7	Database maintained and EOP plans based on needs of such groups	Y
H	Retrofit/harden existing overhead utility lines	Electric dept.	2017	2017+	$1 million	1, 2, 4, 7	Priorities established and lines hardened over time	Y
M	Purchase vehicle extrication equipment	Fire dept.	2017	2017+	$15,000	1, 2, 4, 5, 7	Equipment in place and training updated	Y
M	Purchase standby pumps and generators	City council, dept heads, emergency svcs	2017	2017+	$5,000 ea.	1, 2, 5, 7	Purchased and in effective use	Y
L	Install new fire hydrants	City council, rural water, fire	2017	2017+	$5,000 ea.	1, 2, 3, 5, 6	Fire protection improved	N
L	Expand law enforcement capabilities	City council, police, Sheriff	2017	2017+	$25,000/ yr +	1, 2, 6, 7	Improved law enforcement efficiency and safety	Y
L	Purchase/install backup fixed power generators	Public works, city council, asset owners	2017	2017+	$25,000 ea.	1, 2, 3, 4, 5, 7	Installed fixed generators at more critical assets	N
L	Business and residential preparedness program	EMA, city council, UCDA	2017	2017+	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
L	Construct community safe rooms in various community assets (parks, buildings, mfd home areas, etc.)	City council, EMA, SICOG, park board, public works	2017	2017+	$500,000	1, 2, 3, 4	Workers, staff, visitors, and users protected	N
L	Install computers in emergency vehicles	City council, public works, fire, EMS	2017	2017+	$1,000	1, 3, 4, 5, 6, 7	Computers in place allow for more efficient response	Y
L	Install hazard signs in City parks, and open spaces	City council, public works, park board	2017	2017+	$1,000	1, 2, 3, 6, 7	Signs in place make outdoor recreation safer	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Afton also has identified five other projects to be completed after the five-year timeframe of this plan:

- Develop/maintain security at applicable critical assets (surveillance cameras, lightning);
- Harden public buildings;
- Promote the construction of private in-home tornado safe rooms;
- Bury utility lines in existing and new development areas.

Table 9.4: City of Arispe Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
M	Develop annual leadership awareness campaign about the HMP	City council, EMA	2013	2016	$250	1, 2	Local leaders are fully aware of plan and its relevance	N
M	Assure jurisdictional plans are in place and current	City council, EMA	2013	2016	$10,000	1, 2	Other plans, such as comprehensive plan, are in place and consider mitigation	Y
M	Promote NOAA weather radio and continue rebate incentive for citizen purchase	City council, EMA	2013	2017	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
M	Adopt a thorough EOP addressing multiple hazards and inc1luding a mass casualty plan	City council, admin, EMA	2014	2015	$2,500	1, 2, 3, 4	Plan in place and district is compliant	Y
H	Demolish abandoned properties	City council, clerk	2014	2016	$15,000	1, 2, 6, 7	Demolition effort in place and actively funded	N
M	Develop/enforce snow removal policies	City council, clerk	2014	2015	$500	1, 2	Policies are in place and implemented	N
M	Purchase/install backup fixed power generators and pumps	City council, clerk, property owners	2014	2015	$25,000	1, 2, 3, 4, 5	Adequate emergency power in place	N
H	Make all public facilities handicap accessible	City council	2014	2017	$100,000	1, 2, 5, 7	City hall is updated or replaced	N
M	Remove dead vegetation on public properties and nuisance areas	City council, public works, Alliant	2014	Ongoing	$5,000/yr.	1, 2, 7	Debris is removed and disposed in all parts of Arispe	N
M	Business and residential preparedness programs	EMA, city council, UCDA	2015	2017+	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
M	Purchase stand-by portable pumps and generators	Council, clerk, emergency svcs	2015	2017	$5,000 ea.	1, 2, 5, 7	Purchased and in effective use	Y
M	Encourage citizen purchase/use of smoke detectors	City code, fire dept	2015	Ongoing	$5,000/yr	1, 2, 3, 4, 5, 7	More homes have operable detectors	Y
L	Create a continuity of operations & succession plan for jurisdiction	City council, city, EMA, SICOG	2015	2016	$1,000	1, 2	Plan in place	N
L	Promote tree and vegetation maintenance on private properties	EMA, City council, insurance firms, utility owners	2015	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
M	Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	City council, SICOG	2015	2017	$250,000 +	1, 2, 3, 4	Safe rooms constructed and promoted, used when needed	N
M	Repair structurally weak homes and do weatherization	City, SICOG	2015	2017	$25,000 per unit	1, 2, 3, 5, 6, 7	More homes are safe and sturdy	N
L	Promote good landscaping	City council,	2015	2017	$1,000/yr	1, 2, 7	More property	N

	practices among property owners	civic clubs			.		owners implement landscaping efforts	
L	Remove unused chemical containers	City, IDNR, EMA	2015	2017	$25,000	1, 2, 3, 6, 7	Possible hazards are removed and disposed properly	N
L	Full review of policy, procedure, and codes to include mitigation	City council, city, EMA, SICOG	2016	2017	$10,000	1, 2, 7	Codes updated, mitigation options considered	N
L	Encourage private insurance purchase	EMA, public awareness team	2016	Ongoing	$2,000	1, 2, 7	Increase number of people with proper insurance	Y
L	Develop/implement an extreme heat event medical response plan	City, emergency svcs	2017	2017	$2,500	1, 2, 3, 4, 7	Equipment and supplies in place and people trained	Y
L	Develop/implement a thorough recovery plan for power failure	City, Utilities	2017	2017	$2,500	1, 2, 7	Plan and place and people trained	Y
L	Construct storm water drainage (underground, culverts, curb & gutter, etc.)	City council, public works, SIRWA	2017	2017	$50,000	1, 2, 3, 4, 5	Adequate systems are built where problems are identified	N
L	Adopt manufactured home development storm shelter ordinances	City council	2017	2017	$5,000	1, 2	Protections for people in mfd homes are used	N
L	Install speed limit signs	City, County, IDOT	2017	2017	$500	1, 2, 3	Signs changed or added as needed	Y

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.5: City of Creston Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Install backflow devises	Public works	2013	Ongoing	$5,000 ea.	1, 2, 5, 6	Priority problem areas protected to prevent sewer backup issues	N
H	Encourage citizen purchase and use of smoke detectors	City code, fire dept	2013	Ongoing	$5,000/yr	1, 2, 3, 4, 5, 7	More homes have operable detectors	Y
H	Demolish abandoned properties	City council	2013	Ongoing	$10,000 ea.	1, 2, 6, 7	Abandoned properties removed	N
H	Adopt manufactured home development storm shelter ordinances	City Council	2013	Ongoing	$5,000	1, 2	Ordinance in place; review enforcement mechanism	N
H	Repair structurally weak homes and do weatherization	City council, MATURA, UCDA, others	2013	Ongoing	$10,000+ each	1, 2, 3, 4, 5, 7	Target homes are improved	N
H	Remove dead vegetation on public properties and nuisance areas	City council, public works, Alliant	2013	Ongoing	$25,000/ yr.	1, 2, 7	Debris is removed and disposed in all parts of Afton	N
H	Replace, expand, or improve water and sewer lines	City council, Public works, CMU	2013	Ongoing	$1 million	1, 2, 3, 6	System improved and less vulnerable	Y
H	Purchase thermal imaging camera for fire dept.	Fire, City council	2013	2014	$10,000	1, 2, 3, 4, 5, 7	Good unit in place and people trained	Y
H	Purchase standby portable pumps and generators	EMA, utility providers, City council, public works, CMU	2013	2014	$5,000 ea.	1, 2, 5, 7	Purchased and in effective use	Y
H	Improve roads (resurface, pave,	City council,	2013	Ongoing	$250,000	1, 2, 3, 6	Better streets and	Y

	widen, etc.)	Co. engineer, IDOT, public works			+		roads	
L	Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program	City council, EMA, Public awareness team	2013	Ongoing	$25,000	1, 2, 3, 4	City remains active through five years, property protected	Y
H	Construct storm water drainage (underground, culverts, curb and gutter, basins, buffer strips, etc.)	Public works, city council	2014	2016	$50,000	1, 2, 3, 4, 5	Adequate systems are built where problems are identified	N
H	Purchase new fire trucks	Fire, City council	2013	2015	$300,000	1, 2, 4, 7	Grass rig needed urgently; will reduce fire losses	Y
H	Promote the construction of private in-home tornado safe rooms	City council, EMA, public awareness team	2015	2015+	$500	1, 2	In-home safe room options are promoted	N
M	Promote NOAA weather radio - citizen purchase (rebate initiative)	City council, EMA, public awareness team	2013	2015+	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
M	Develop annual leadership awareness campaign about the HMP	City council, SICOG, EMA	2014	2016	$1,000	1, 2	Prepare plan evaluations; update project list; prepare plan 5-yr update	N
H	Purchase/install backup fixed power generators and pumps	City council, Fire, EMS	2014	2016	$25,000 ea.	1, 2, 3, 4, 5, 7	Installed fixed generators at more critical assets	N
M	Install hazard signs in City parks, campgrounds, and open spaces	Park and Recreation Board	2014	2016	$1,000	1, 2, 3, 6, 7	Signs in place make outdoor recreation safer	N
M	Improve public awareness of hazard risks - dispense print materials	City council, admin, fire, EMS, police, EMA	2014	2016+	$1,000	1, 2, 3, 4, 7	Information available at key locations in city	Y
H	Develop volunteer base of trained and stand-by groups	EMA, CERT group, Fire, EMS	2014	Ongoing	$250	1, 2, 3, 4	More people are in place to respond to hazards	Y
H	Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Hospital, EMA, Public Health, volunteer groups	2014	Ongoing	$5,000	1, 2, 3, 4	Volunteers in place; policies established and learned	Y
H	Construct public safe rooms in various community assets (parks, buildings, mfd home areas, etc.)	City council, possible park board, others	2014	Ongoing	$500,000	1, 2, 3, 4	Public, staff, and visitors protected from hazards	N
H	Assure jurisdictional plans are in place and current	City council, administrator, attorney	2015	2016+	$10,000	1, 2	Other plans, such as comprehensive plan, are in place and consider mitigation	Y
H	Work with FEMA and IDNR to update flood maps	City council, administrator, FEMA, IDNR	2015	2016+	$5,000	1, 2, 3, 4	When parties map the area, the City is involved and receives good maps	Y
M	Full review of policy, procedure, and codes	City council, administrator, attorney	2015	2016+	$2,500	1, 2	Full review of local codes and polices complete	N
M	Establish partnerships with other jurisdictions to control storm water		2015	2016+	$5,000	1, 2	Address Hurley Creek properties and storm drains	Y
L	Create a jurisdictional continuity of operations and succession plan	City Council, Administrator, EMA	2015	2016+	$1,000	1, 2	Plan in place	N
L	Business and residential preparedness program	EMA, city council, UCDA	2015	2017+	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
L	Flood structure elevation	EMA, City	2015	2017+	$25,000	1, 2, 3, 4	Will prevent	N

	projects *(best option for property must be identified)*	council, FEMA, State HSEMD					flooding where buildings cannot be moved	
L	Flood structure relocation projects *(best option for property must be identified)*	EMA, City council, FEMA, State HSEMD	2015	2017+	$50,000	1, 2, 3, 4	Will prevent flooding by removing buildings	N
L	Promote good landscaping practices among property owners	City council, civic clubs, neighborhood groups, chamber	2016	2017+	$1,000/yr.	1, 2, 7	More property owners implement landscaping efforts	N
L	Encourage private insurance purchase **	EMA, public awareness team	2016	Ongoing	$2,000	1, 2, 7	Increase number of people with proper insurance	Y
M	Replace bridges and culverts	City council, county engineer, IDOT	2016	Ongoing	$250,000 +	1, 2, 3, 6	Bridges and culverts replaced based on engineering study needs	Y
L	Integrate safe room retrofits into critical assets/facilities	City council, Park and Rec Board	2016	Ongoing	$250,000 +	1, 2, 3, 4	Buildings retrofitted to include safe room	N
L	Promote vegetation maintenance on private properties	EMA, City council, public awareness team, insurance firms, utility owners	2016	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
L	Special needs/oxygen user registration program	EMA, fire, Alliant, City council, CMU, EMS	2016	Ongoing	$1,000/yr	1, 2, 6, 7	Database maintained and EOP plans based on needs of such groups	Y

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.
** Some of this is now underway (not by City) as a result of renter losses in 2012 tornado and renters having no renter insurance.

Table 9.6: City of Cromwell Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Establish alert systems for vulnerable populations	City council, EMS, Creston Fire, EMA	2013	Ongoing	$1,000	1, 2, 7	Populations surveyed, needs addressed	Y
H	Remove dead vegetation on public properties and nuisance areas	City council	2013	2017	$25,000/yr.	1, 2, 7	Debris is removed and disposed in all parts of Afton	N
H	Improve roads (resurface, pave, widen, etc.)	City council	2013	2017+	$100,000	1, 2, 3, 5, 6, 7	Roads more reliable and useful	Y
M	Promote NOAA weather radio - citizen purchase (rebate initiative)	City council, EMA	2013	2016	$5,000	1, 2, 4, 5, 7	More people own and use weather radio	Y
M	Full review of policy, procedure, and codes	City council, clerk	2013	2014	$2,500	1, 2	Full review of local codes and polices complete	N
M	Assure jurisdictional plans are in place and current	City council, clerk	2013	2016	$10,000	1, 2	Other plans, such as comprehensive plan, are in place and consider mitigation	Y
L	Develop annual leadership awareness campaign about the	City council, EMA	2013	2014	$1,000/yr	1, 2	Greater support for hazard mitigation	N

	plan						and annual reviews of plan	
L	Encourage citizen purchase/use of smoke detectors	City clerk, Creston Fire	2013	2014	$1,000/yr	1, 2, 5, 7	Effective education program has ongoing smoke detector incentive	Y
L	Create a jurisdictional continuity of operations and succession plan	2015-16	2013	2014	$1,000	1, 2	Plan in place	N
L	Business and residential preparedness program	City council	2013	2016	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
L	Maintain active participation in the NFIP program; prohibit development in floodplain	City council, EMA, floodplain manager	2013	Ongoing	$1,000	1, 2, 3, 4	Ordinances enforced, compliance maintained	N
L	Purchase standby pumps and generators	City council,	2015	2017	$2,500	1, 2, 3, 4	More volunteers available for emergency services	Y
L	Purchase road closure barricades	City council	Only as needed or initiated by partners		$2,000	1, 2, 3	City has enough road closure barricades for likely incidents	N
L	Work with FEMA and IDNR to develop quality flood maps	City council, IDNR, FEMA	Only as needed or initiated by partners		$1,000	2, 3, 4	FEMA approved flood maps in place	Y
L	Clear and deepen ditches on right-of-ways	City council, Co. Secondary Roads	Only as needed		$5,000/yr.	1, 2, 3, 4	Ditches are cleared where problems are worst	Y
L	Construct community safe rooms in various community assets (parks, buildings, mfd home areas, etc.)	City council, asset/bldg. owners	Only as needed or initiated by partners		$250,000 +	1, 2, 3, 4	Safe rooms constructed and promoted, used when needed	N
L	Purchase/install backup fixed power generators	City council, asset/bldg. owners	Only as needed or initiated by partners		$25,000+	1, 2, 3, 4, 5	Power generators in use during/after disasters	Y

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.7: City of Lorimor Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
M	Develop annual leadership awareness campaign about the HMP	City council, EMA	2013	2015	$250	1, 2	Local leaders are fully aware of plan and its relevance	N
H	Acquire modern chemicals and equipment for firefighting	City council, fire	2013	2015	$5,000	1, 2	Fire suppression needs are known; addressed	Y
H	Develop volunteer base of trained and stand-by groups	City, fire, EMA, civic clubs	2013	Ongoing	$2,500	1, 2, 3, 4	More volunteers available for emergency services	Y
H	Purchase SCBA (self-contained breathing apparatus)	Fire dept.	2013	2014	$5,000 ea.	1, 2, 3, 4	SCBA in place for all trained personnel	Y
H	Improve roads (resurface, pave, widen, etc.)	City council	2013	2017+	$100,000	1, 2, 3, 5, 6, 7	Roads more reliable and useful	Y
M	Backup jurisdictional files and records – store in alternative locations	City council, clerk	2013	Ongoing	$1,000	1, 2	Files in second location in vaults and electronically	N

M	Install and/or update anti-virus software	City council, clerk	2013	Ongoing	$500	1, 2, 7	Software in place, regularly updated	N
M	Purchase stand-by portable pumps and generators	Council, clerk, emergency svcs	2013	2015	$5,000 ea.	1, 2, 5, 7	Purchased and in effective use	Y
M	Develop electronic directory of local and other resources	City council, EMA	2014	Ongoing	$1,000	1, 2	Actively maintained directory is well promoted	Y
M	Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	City council, clerk, fire, EMS, EMA	2014	Ongoing	$1,000	1, 2, 3, 4, 7	Information available at key locations in city	Y
M	Promote NOAA weather radio – citizen purchase (rebate incentive/giveaway)	City council, admin, EMA	2014	2015	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
M	Update zoning ordinance to include mitigation ideas	EMA, city council	2014	2015	$5,000	1, 2	Ordinance in place and implemented	N
M	Purchase new, modernize, and/or harden existing mobile and personal first response communications equipment and systems	City council, fire/EMS, public works	2014	2015	$50,000	1, 2, 3, 4, 5, 7	All key personnel and organizations have interoperable communications meeting standards	Y
L	Work with FEMA and IDNR to develop quality flood maps (if flood hazard areas found) *	City council, EMA	2014	2016	$10,000	1, 2, 4	Digital FIRM maps are provided specific to city; put on local GIS	N
H	Repair structurally weak homes and do weatherization	City, SICOG	2014	2017	$25,000 per unit	1, 2, 3, 5, 6, 7 **	More homes are safe and sturdy	N
M	Encourage citizen purchase/use of smoke detectors	City code, fire dept	2014	Ongoing	$5,000/yr	1, 2, 3, 4, 5, 7	More homes have operable detectors	Y
M	Remove dead vegetation on public properties and nuisance areas	City council, public works, Alliant	2014	Ongoing	$5,000/yr.	1, 2, 7	Debris is removed and disposed in all parts of Lorimor	N
M	Tree planting programs on public property	City council, public works	2014	Ongoing	$5,000/yr	1, 2, 6, 7	Trees are planted at key locations	N
M	Construct storm water drainage (underground, culverts, curb & gutter, etc.)	City council, public works	2014	2016	$50,000	1, 2, 3, 4, 5	Adequate systems are built where problems are identified	N
H	Demolish abandoned properties	City council, clerk	2014	2017	$15,000	1, 2, 6, 7	Demolition effort in place and actively funded	N
H	Replace, expand, or improve sewer lines	Public works	2014	2016+	$1 million	1, 2, 3, 6	System improved and less vulnerable	Y
M	Promote good landscaping practices among property owners	City council, civic clubs	2015	2017	$1,000/yr.	1, 2, 7	More property owners implement landscaping efforts	N
M	Business and residential preparedness programs	EMA, city council, UCDA	2015	2017+	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
M	Promote tree and vegetation maintenance on private properties	EMA, City council, insurance firms, utility owners	2015	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
M	Remove unused chemical containers	City, IDNR, EMA	2015	2017	$25,000	1, 2, 3, 6, 7	Possible hazards are removed and disposed properly	N
M	Create a continuity of operations & succession plan for jurisdiction	City council, city, EMA, SICOG	2015	2016	$1,000	1, 2	Plan in place	N
L	Emergency response guidebooks in all emergency vehicles	City, Fire/EMS	2015	2016	$1,000	1, 3, 4	All buildings and buses contain	N
M	Clear and deepen ditches on right-of-ways	Public works	2015	2016	$5,000/yr.	1, 2, 3, 4	Ditches are cleared where problems are worst	Y

M	Install water impervious manhole covers	City council	2015	2017	$10,000 ea.	1, 2, 3, 5, 6	Flash flooding is reduced	N
M	Replace culverts	City council, county engineer, IDOT	2015	2017	$250,000 +	1, 2, 3, 6	Bridges and culverts replaced based on engineering study needs	Y
M	Purchase/install backup fixed power generators and pumps	City council, clerk, property owners	2015	2016	$25,000	1, 2, 3, 4, 5	Adequate emergency power in place	N
M	Lightning protection to tall buildings and towers	City, SIRWA, owners	2016	2017	$50,000	1, 2, 5, 7	Safety improved in those areas	N
L	Subdivision ordinances to address hazard interface areas	EMA, city council	2016	2017	$5,000	1, 2	Ordinance in place and implemented	N
M	Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	City council	2016	2017+	$250,000 +	1, 2, 3, 4	Safe rooms constructed and promoted, used when needed	N
L	Encourage private insurance purchase	EMA, city, insurance firms	2016	Ongoing	$2,000	1, 2, 7	Increase number of people with proper insurance	Y
L	Full review of policy, procedure, and codes to include mitigation	City council, city, EMA, SICOG	2016	2017	$10,000	1, 2, 7	Codes updated, mitigation options considered	N
L	Community drills	City council, EMA, fire, EMS, sheriff	2016	2017	$5,000/yr.	1, 2, 3, 4	Drills performed more regularly	Y
L	Develop local debris disposal sites	City council, public works	2016	2017	$50,000+	1, 2, 3	Debris site designated and opened	Y
M	New or upgrade fire station	Fire dept	2016	2017+	$1 million	1, 2, 5, 6, 7	Fire station is modern and sturdy	Y
M	Integrate tornado safe room retrofits into critical assets and facilities	City council, clerk, SICOG, EMA	2017	2017+	$250,000 +	1, 2, 3, 4	Buildings retrofitted to include safe rooms	N
L	Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens	City council, conservation groups, public works	2017	2017+	$100,000 +	1, 2, 3, 5, 6, 7	Sustainable infrastructure helps control storm water	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.
** A repair program funded in April 2013.

Table 9.8: City of Shannon City Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Improve roads (resurface, pave, widen, etc.)	City council	2013	2017+	$100,000	1, 2, 3, 5, 6, 7	Roads more reliable and useful	Y
H	Assure jurisdictional plans are in place and current	City council, clerk	2013	2016	$10,000	1, 2	Other plans, such as comprehensive plan, are in place and consider mitigation	Y
H	Remove unused chemical containers	City council	2013	2015	$10,000+	1, 2, 3, 6, 7	Toxic hazards removed or exposure reduced	N
H	Backup jurisdictional files and records - store in alternative locations	City clerk	2013	Ongoing	$1,000	1, 2	Files in second location in vaults and electronically	N
H	Harden public buildings	City council	2013	2016	$100,000	1, 2, 4, 5, 6	Buildings better able	N

					+		withstand hazards	
M	Initial community briefings immediately after events	Mayor, EMA	2013	Ongoing	$250	1, 2	Person designated and trained	Y
H	Maintain active participation in the NFIP program; prohibit development in floodplain	City council, EMA, floodplain manager	2013	Ongoing	$1,000	1, 2, 3, 4	Ordinances enforced, compliance maintained	N
H	Work with FEMA and IDNR to develop quality flood maps	City council, EMA	2014	2015	$1,000	2, 3, 4	FEMA approved flood maps in place	Y
M	Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.	Public health, council, volunteers	2014	Ongoing	$1,000	1, 2, 3, 4	Volunteers in place; policies established and learned	Y
L	Promote vegetation maintenance on private properties	EMA, City council, public awareness team, insurance firms, utility owners	2014	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
M	Encourage citizen purchase/use of smoke detectors	City clerk, Afton Fire	2014	Ongoing	$1,000/yr	1, 2, 5, 7	Effective education program has ongoing smoke detector incentive	Y
M	Business and residential preparedness program	City council	2014	Ongoing	$1,000	1, 2, 3, 4	Active program in place, citizens support	N
M	Remove dead vegetation on public properties and nuisance areas	City council	2014	Ongoing	$25,000/ yr.	1, 2, 7	Debris is removed and disposed in all parts of Afton	N
L	Develop annual leadership awareness campaign about the plan	City council, EMA	2014	2016	$1,000/yr	1, 2	Greater support for hazard mitigation and annual reviews of plan	N
L	Encourage private insurance purchase	EMA, public awareness team, council	2015	Ongoing	$2,000	1, 2, 7	Increase number of people with proper insurance	Y
L	Demolish abandoned properties	City council	2015	2017	$15,000	1, 2, 6, 7	Demolition effort in place and actively funded	N
L	Improve public awareness of hazard risks - dispense print materials	City council, clerk, EMA	2015	2016	$1,000	1, 2, 7	Pamphlets and unique education materials available/accessible	N
L	Promote the construction of private in-home tornado safe rooms	City council, EMA	2015	2017	$500	1, 2	In-home safe room options are promoted	N
L	Purchase road closure barricades	City council	2015	2017	$2,000	1, 2, 3	City has enough road closure barricades for likely incidents	N
L	GIS mapping system implementation and digital hazard maps	City council, County GIS	2016	2017	$1,000	1, 2	Local maps are on the county's system and are online	Y
L	Hire or designate public information officer	Mayor, EMA	2016	2017	$5,000	1, 2	Public information officer is designated, offers good service	Y
L	Purchase/install backup fixed power generators	City council, bldg. owners	2016	2017	$25,000 ea.	1, 2, 3, 4, 5, 7	Installed fixed generators at more critical assets	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.9: City of Thayer Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
M	Develop annual leadership awareness campaign about the HMP	City council, EMA	2013	2016	$250	1, 2	Local leaders are fully aware of plan and its relevance	N
M	Backup jurisdictional files and records – store in alternate locations & electronically	City council, clerk	2013	Ongoing	$1,000	1, 2	Files in second location in vaults and electronically	N
L	Work with FEMA and IDNR to develop quality flood maps (survey area to determine if hazards exist)	City council, EMA	2014	2016	$10,000	1, 2, 4	Digital FIRM maps are provided specific to city; put on local GIS	N
M	Establish alert systems for vulnerable populations	City council, EMS, Fire, EMA	2014	Ongoing	$1,000	1, 2, 7	Populations surveyed, needs addressed	Y
M	Improve public awareness of hazard risks – dispense info about key hazards – written and presentation equipment	City council, EMA	2014	Ongoing	$1,000	1, 2, 3, 4, 7	Information available at key locations in city	Y
M	Promote NOAA weather radio and continue rebate incentive for citizen purchase	City council, EMA	2014	Ongoing	$10,000 ea.	1, 2, 7	Many people have and use NOAA weather radio	Y
M	Improve roads (resurface, pave, widen, etc.)	City council, county engineer, IDOT	2014	2017	$250,000 +	1, 2, 3, 6	Better streets and roads	Y
M	Develop electronic directory of local and other resources	City council	2015	2016	$1,000	1, 2	Actively maintained directory is well promoted	Y
M	Repair structurally weak homes and do weatherization	City, SICOG	2015	2017	$25,000 per unit	1, 2, 3, 5, 6, 7	More homes are safe and sturdy	N
M	Demolish abandoned properties	City council, clerk	2016	2017+	$15,000	1, 2, 6, 7	Demolition effort in place and actively funded	N
L	Purchase stand-by portable pumps and generators	Council, clerk, emergency svcs	2017	2017+	$5,000 ea.	1, 2, 5, 7	Purchased and in effective use	Y
L	Remove dead vegetation on public properties and nuisance areas	EMA, City council, insurance firms, utility owners	2017	Ongoing	$2,500	1, 2	Brush maintained in hazard areas to reduce losses and make recovery easier	N
L	Construct public safe rooms in parks, campgrounds, mobile homes parks, special housing, and other community assets	City council	2017	2017+	$250,000 +	1, 2, 3, 4	Safe rooms constructed and promoted, used when needed	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.10: Creston Community Schools Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Develop annual leadership awareness campaign about the plan	School board, admin staff, EMA	2013	2017	$1,000	1, 2, 3, 4	School leaders are fully of aware of the plan and its benefits	N
H	Promote NOAA weather radio - citizen purchase (rebate initiative)	School board, admin staff	2014	2015	$1,000	1, 2, 7	School district has radios strategically located	Y
H	School participate in an emergency operations plan	School board, staff, EMA	2014	2015	$2,500	1, 2, 3, 4	School has active role in countywide EOP	Y
H	Emergency response guidebooks in school buildings/vehicles	School board, admin staff	2014	2015	$1,000	1, 3, 4	All buildings and buses contain	N
H	Realign Hurley Creek and protect building floor from Hurley Creek flooding	School board, admin staff, City, FEMA	2015	2017	$250,000+	1, 2, 3, 4	Flood hazards addressed through construction project(s)	Y

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.11: East Union Community Schools Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Promote NOAA weather radio - citizen purchase (rebate initiative)	School board, admin staff	2014	2015	$1,000	1, 2, 7	School district has radios strategically located	Y
H	Full review of policy, procedure, and codes	School board, admin staff, City of Afton, Union Co., EMA	2014	2015	$25,000	1, 2, 3, 4	School has included mitigation actions and ideas into codes	N
H	Emergency response guidebooks in school buildings/vehicles	School board, admin staff	2014	2015	$1,000	1, 3, 4	All buildings and buses contain	N
H	Participate in a regional HAZMAT Team	BOS, local county, cities	2014	Ongoing	$15,000/ yr	1, 2	Formal signed contract for services	Y
H	School participate in an emergency operations plan	School board, staff, County, City	2014	2015	$2,500	1, 2, 3, 4	School has active role in countywide EOP	Y
H	Purchase/install backup fixed power generators	School Board, City, County, utilities	2014	2015	$25,000 ea.	1, 2, 3, 4, 5, 7	Installed fixed generators at more critical assets	N
H	Purchase standby pumps and generators	School Board, staff	2014	2015	$10,000	1, 3, 4, 5, 6, 7	Pumps and generators purchased and used	Y
M	Tree planting programs on school property	School board, admin	2014	2015	$5,000/yr	1, 2, 6, 7	Trees are planted at key locations	N
M	Develop/maintain hazardous materials inventories on campus	Staff, Afton Fire, EMA	2014	2015	$5,000	1, 2, 7	HAZMAT inventories are current and active	N
M	Develop/implement an extreme heat event medical response plan	Nursing Staff, Afton Fire,	2014	2015	$1,000	1, 2, 4, 5, 7	Equipment acquired, plans in place	Y

		EMA, GRMC						
H	Develop annual leadership awareness campaign about the plan	School board, admin staff, EMA	2015	2017	$1,000	1, 2, 3, 4	School leaders are fully of aware of the plan and its benefits	N
M	Install air quality monitors	Staff, EMA, BNSF RR	2015	2016	$10,000	1, 2, 6, 7	School has air monitoring in place	Y
M	Rail and highway safety education programs for students	School board, staff, IDOT	2015	2016	$1,000	1, 2, 6, 7	Comprehensive student education	N
M	Improve public awareness of hazard risks - dispense print materials	School Board, staff, EMA	2015	2016	$1,000	1, 2, 3, 4, 7	Information available to students, staff, parents	Y
M	Assure jurisdictional plans are in place and current	School board, staff, EMA	2015	2017	$10,000	1, 2	Other plans, such as facility plan, are in place and consider mitigation	Y
M	Create a school continuity of operations and succession plan	School board, admin, EMA	2015	2017	$1,000	1, 2	Plan in place	N
L	Remove asbestos from campus (likely very little still exists)	School board and staff	2016	2017+	$100,000	1, 2, 6, 7	Asbestos removed on the campus as funds allow/need	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.12: Southwestern Community College Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	College participate in an emergency operations plan	SWCC Econ Development office, EMA	2013	2015	$2,500	1, 2, 3, 4	SWCC has active role in countywide EOP	Y
H	Investigate and implement alternative energy sources	SWCC Bldgs and Grounds Maintenance	2013	2017+	$100,000+	1, 2, 3, 5, 6, 7	SWCC has local energy capacity for critical buildings	Y
H	Develop annual leadership awareness campaign about the plan	SWCC Bldgs and Grounds Maintenance	2013	2017	$1,000	1, 2, 3, 4	SWCC leaders are fully of aware of the plan and its benefits	N
H	Construct public safe rooms in school and school property	SWCC Econ Development office	2014	2017	$250,000	1, 2, 3, 4	Community tornado safe rooms are constructed on campus	N
H	Integrate safe room retrofits into critical assets/facilities	SWCC Econ Development office	2014	2016	$250,000+	1, 2, 3, 4	Buildings retrofitted to include safe rooms	N
H	Promote/provide tornado safe room design education for builders and developers	SWCC Econ Development office	2014	2016	$2,500	1, 2, 3, 4	Buildings retrofitted to include safe rooms	N
M	Tree planting programs on campus	SWCC Bldgs and Grounds Maintenance	2014	2017	$5,000/yr	1, 2, 6, 7	Trees are planted at key locations	N
M	Seminars and demonstrations on retrofitting (site visits)	SWCC adult and continuing ed	2014	2017	$1,000/yr	1, 2, 4, 7	People educated on practices	N
M	Redundant systems and looping (water, sewer, electric, gas)	SWCC Bldgs and Grounds Maintenance	2015	2017+	$100,000+	1, 2, 3, 4, 5, 6, 7	Secondary feeds protect from hazard-related outages	Y
M	Business and residential preparedness programs	SWCC Econ Development office	2015	Ongoing	$1,000/yr	1, 2, 3, 4	Program started with public education effort and volunteers	N

L	Develop electronic directory of local and other resources	SWCC adult and continuing ed	2015	2016	$1,000	1, 2	Actively maintained directory is well promoted	Y
L	Install windbreaks	SWCC Bldgs and Grounds Maintenance	2015	2016	$1,000	1, 2. 7	Permanent and seasonal windbreak systems installed	N
L	Adopt building codes to address various natural hazards	SWCC Econ Development office, EMA	2015	2016	$2,500	1, 2	Building standards are reviewed for hazard mitigation concepts	N
L	Raise grade to eliminate backup flooding (entrances to buildings)	SWCC Bldgs and Grounds Maintenance	2015	2016	$50,000+	1, 2, 3, 4, 6, 7	Building interiors are protected from flash flooding	N

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

Table 9.13: Greater Regional Medical Center Mitigation Strategy for 2013-2017

Priority (High, Medium, Low)	Action	Leadership, implementing, administrating party(s)	Initiating Timeframe	Completion timeframe	Estimated Cost (overall program, individual project)	Possible Funding Sources *	Evaluation Result	Will Affect Other Jurisdictions?
H	Back-up jurisdictional files, store in alternative locations	GRMC admin, IT staff	2013	2014	$1,000	1, 2	Files in second location in vaults and electronically	N
H	Develop/update evacuation plans and sheltering in place after renovation	GRMC Disaster Coordinator	2013	2014	$5,000	1, 2, 3, 4	Plans in place, and exercises completed	Y
M	Develop annual leadership awareness campaign about the plan	GRMC Disaster Coordinator	2013	2015	$1,000	1, 2, 3, 4	GRMC leaders are fully of aware of the plan and its benefits	N
L	Increase public awareness on household hazardous materials	GRMC Disaster Coordinator, landfill agency	2014	2015	$10,000/ yr.	1, 2, 7	Household HAZMAT education efforts expanding	Y
L	Integrate safe room retrofits into critical assets/facilities	GRMC Disaster Coordinator	2014	2017	$250,000+	1, 2, 3, 4	Buildings retrofitted to include safe rooms	N
L	Develop/implement an extreme heat event medical response plan	GRMC Disaster Coordinator	2014	2015	$1,000	1, 2, 4, 5, 7	Equipment acquired, plans in place	Y
L	Formally designate and stock campus buildings as community shelters	GRMC Disaster Coordinator	2015	2016	$20,000	1, 2, 3, 4, 5, 7	Work with Red Cross and EMA, etc., to have stocked shelter and policies	Y

* Funding sources: 1- local, 2- in-kind, 3-State of Iowa, 4- FEMA, 5- USDA, 6- Other federal, 7- Private/Non-profit sources. See the State of Iowa Hazard Mitigation Plan for full example list of funding sources.

This mitigation plan is too broad and has too many projects to simply use as an annual plan. A more detailed annual mitigation strategy (akin to a capital improvement program) should be developed under local leadership for each jurisdiction at the time or just before local budgets and site development plans are considered. Further, the plan's description of who should lead the project is a best estimate only. Local leaders must determine specifically who will lead each project and if a private consultant or nonprofit agency serving the area is necessary or if AmeriCorps or Citizen Corps volunteers are needed. The annual review and update should include notes about what was completed in the previous year and what is planned for the following year.

9.3: Limited Data

Throughout the mitigation plan, there were extensive gaps in data, such as the lack of publicly available dam failure inundation maps. In addition to specific mitigation actions in this chapter, it is important that the Union County jurisdictions review this plan periodically as the County prepares for the next five-year update of this Plan. This process would help satisfy FEMA Region VII requirements. Missing data should be found and included by the next major update.

9.4: Goals, Objectives, and Approved Actions

This section details the mitigation measures listed under each applicable goal and objective. While most mitigation actions can and do fall under several goals and objectives, the planning team placed each action under the most logical goal and objective. The purpose is not to narrowly define each measure but it is to give the planning team a reference point as to how the mitigation actions help improve the local quality of life and to help convey the measure as accomplishing a goal in a mitigation funding application.

Table 9.14: Goals, Objectives, and Actions Matrix

Goal 1: Reduce the extent of fatalities and injuries due to hazards.
Objective 1: Improve warning capabilities against hazards.
Action 1: Establish alert systems for vulnerable populations.
Action 2: Establish neighbor watch programs for vulnerable populations during winter storms, extreme heat, etc.
Action 3: Install air quality monitors.
Action 4: Promote NOAA weather radio - citizen purchase (possible rebate initiative).
Objective 2: Implement structural projects that will result in protection of life and safety.
Action 1: Clear and deepen ditches on right-of-ways.
Action 2: Construct community safe rooms in various community assets (parks, buildings, mfd home areas, etc.).
Action 3: Harden public buildings.
Action 4: Install speed limit signs.
Action 5: Install windbreaks.
Action 6: Integrate safe room retrofits into critical assets/facilities.
Action 7: Lightning protection to tall buildings and towers.
Action 8: Purchase/install backup fixed power generators and/or pumps.
Action 9: Remove asbestos from campus (likely very little still exists).
Objective 3: Heighten public awareness of natural hazards.
Action 1: Encourage citizen purchase and use of smoke detectors.
Action 2: Hire or designate public information officer.
Action 3: Improve public awareness of hazard risks - dispense print materials.
Action 4: Increase public awareness on household hazardous materials.
Action 5: Install hazard signs in City parks, campgrounds, and open spaces.
Action 6: Promote/provide tornado safe room design education for builders and developers.
Action 7: Rail and highway safety education programs for students.
Goal 2: Improve public response to hazards and make recovery easier.
Objective 1: Enhance the continuity of local government.
Action 1: Backup jurisdictional files and records – store in alternate locations & electronically.
Action 2: Create a jurisdictional continuity of operations and succession plan.
Action 3: Develop local debris disposal sites.
Action 4: Develop/enforce snow removal policies.
Action 5: Expand law enforcement capabilities.
Action 6: Initial community briefings immediately after events.
Action 7: New or upgrade fire station
Action 8: Purchase stand-by portable pumps and generators
Objective 2: Prepare plans and identify resources to facilitate government operations after a disaster.
Action 1: Assure jurisdictional plans are in place and current.
Action 2: Develop/implement a thorough recovery plan for power failure.
Action 3: Emergency response guidebooks in all emergency vehicles.
Action 4: Formally designate and stock campus buildings as community shelters
Action 5: GIS mapping system implementation and digital hazard maps.
Action 6: Purchase road closure barricades.
Goal 3: Improve coordination and communication with other relevant organizations.
Objective 1: Enhance cross-agency and intra- and inter-county communications.
Action 1: Develop/maintain hazardous materials inventories on campus.

Action 2: Maintain Emergency Operations Center with 24-hr capabilities.
Action 3: Purchase new, modernize, and/or harden existing mobile and personal communications equipment.
Objective 2: Maximize utilization of the best technology.
Action 1: Acquire modern chemicals and equipment for firefighting.
Action 2: Install and/or update anti-virus software.
Action 3: Install computers in emergency vehicles.
Action 4: Install GPS units in emergency/County vehicles.
Action 5: Purchase SCBA (self-contained breathing apparatus).
Action 6: Purchase thermal imaging camera for fire departments.
Action 7: Purchase vehicle extrication equipment.
Action 8: Seminars and demonstrations on retrofitting (site visits).
Goal 4: Build and support local capacity and commitment to become continuously less vulnerable to hazards.
Objective 1: Improve education and training to increase public and responder awareness.
Action 1: Develop volunteer base of trained and stand-by groups.
Action 2: Community drills.
Action 3: Special needs/oxygen user registration program.
Objective 2: Review and then either continue, enhance, expand, or end response capabilities, protocols, and training efforts.
Action 1: Adopt a thorough EOP addressing multiple hazards and inc1uding a mass casualty plan.
Action 2: Develop/implement an extreme heat event medical response plan.
Action 3: Develop/update evacuation plans and sheltering in place after renovation.
Action 4: Full review of policy, procedure, and codes to include mitigation.
Action 5: Participate in a regional HAZMAT team.
Action 6: Remove dead vegetation on public properties and nuisance areas.
Action 7: Remove unused chemical containers.
Objective 3: Ensure the hazard mitigation plan is reviewed regularly and is updated as needed.
Action 1: Develop annual leadership awareness campaign about the HMP.
Objective 4: Maximize property owner participation in hazard mitigation.
Action 1: Business and residential preparedness program.
Action 2: Demolish abandoned properties.
Action 3: Encourage private insurance purchase.
Action 4: Promote good landscaping practices among property owners.
Action 5: Promote the construction of private in-home tornado safe rooms.
Action 6: Promote tree and vegetation maintenance on private properties.
Action 7: Repair structurally weak homes and do weatherization.
Goal 5: Be as efficient as possible with government funding.
Objective 1: Maximize the use of outside sources of funding.
Action 1: Develop electronic directory of local and other resources.
Action 2: Establish partnerships with other jurisdictions to control storm water.
Objective 2: Prioritize mitigation projects, based on true costs and benefits, annually and with each budget.
Action 1: Investigate and implement alternative energy sources.
Action 2: Purchase new fire trucks and ambulances.
Action 3: Tree planting programs on public property
Action 4: Work with FEMA and IDNR to develop quality flood maps.
Goal 6: Protect existing and future properties.
Objective 1: Improve public assets and infrastructure and provide back-up systems in hazard impact areas.
Action 1: Bury utility lines in existing and new development.
Action 2: Clean sewage lagoons and install rock to berm.
Action 3: Construct or elevate wastewater lift stations.
Action 4: Improve roads (resurface, pave, widen, etc.).
Action 5: Install backflow devises.
Action 6: Install new fire hydrants.
Action 7: Install water impervious manhole covers.
Action 8: Make all public facilities handicap accessible.
Action 9: Redundant systems and looping (water, sewer, electric, gas)
Action 10: Replace bridges and/or culverts
Action 11: Replace, expand, or improve water and/or sewer lines
Action 12: Retrofit/harden existing overhead utility lines
Objective 2: Use appropriate mitigation actions to protect properties from site-specific hazards.
Action 1: Construct storm water drainage (underground, culverts, curb & gutter, etc.).
Action 2: Flood structure elevation projects *(best option for property must be identified)*.
Action 3: Flood structure relocation projects *(best option for property must be identified)*.
Action 4: Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens.
Action 5: Raise grade to eliminate backup flooding (entrances to buildings).

Action 6: Realign Hurley Creek and protect building floor from Hurley Creek flooding
Objective 3: Ensure that current and future owners have the means to maintain and improve their properties.
Action 1: Maintain active participation in the NFIP program; prohibit development in floodplain.
Objective 4: Create and/or update maps, ordinances, and regulations affecting new development.
Action 1: Adopt building codes to address various natural hazards.
Action 2: Adopt manufactured home development storm shelter ordinances.
Action 3: Discourage/prohibit development in flood hazard areas – Join NFIP and actively participate in the program.
Action 4: Subdivision ordinances to address hazard interface areas
Action 5: Update zoning ordinance to include mitigation ideas

9.5: Mitigation Plan Summary

This Hazard Mitigation Plan is a guide for future policy planning for participating jurisdictions in the county. The Plan considers demographics trends and projections, community background information, current and future political decisions, and overall important goals and objectives for the county's jurisdictions. The goals and objectives have been developed to reflect the general consensus of the county's Hazard Mitigation Planning team, the broad range of elected officials, and the citizenry of the county. These recommendations have been developed to look five-plus years into the future with the expectation that periodic updates will occur in order to reflect changes within the county.

The success of this Plan will require the support of the emergency management commission/agency, elected officials, department heads, and volunteers (including civic groups, academia, and general citizens). Cooperation from the public and private sectors will allow implementation of the recommendations that will provide long-term benefits for the entire county and each jurisdiction. By implementing these recommendations, the jurisdictions will be furthering other civic goals also.

Chapter 10: Implement the Plan and Monitor Progress

This chapter outlines the requirements for monitoring and amending the plan and provides ideas and options for funding and implementing the mitigation strategies of the plan.

10.1: Funding the Implementation

Funding sources vary over time and by project type, applicant agency, and jurisdiction. However, all jurisdictions in the county have access to funds from outside the local government or applicant organization for most projects. The following table provides a list of some of the known funding sources.

Figure 10 – 1: Mitigation Project Funding Matrix for Local Projects

Source - Name	Type	Type of projects	Limitations	Levels of funding
Federal				
FEMA – Hazard Mit. Grant Prog.	Grant	Construction and property protection	Only available after Presidential dec.	Up to 85% Fed/State
FEMA—Pre-disaster Mit. Prog.	Grant	Construction and property protection	Annual competition	Up to 75% Federal
FEMA—Flood Mit. Assistance	Grant	Flood projects	Only available after Presidential dec.	Up to 85% Fed/State
FEMA—Assistance to Firefighters Grant Program	Grant	Equip., hiring, training, vehicles, fire prevention	Fire depts only can apply	Annual competition, 95% Federal
USACE—Challenge 21 Program	Grant	Non-structural watershed-based flood	Limited assistance	Limited
USACE—Streambank Protection Program (Section 14)	Grant	Protect critical assets in flood areas	Limited assistance	65% Federal
USACE—Emergency Readiness and Response	Grant/Tech Assist.	Workforce and information	Limited assistance	Limited
DHS—State Homeland Security Prog.	Grant	Various terrorism-related projects	Projects must meet specific requirements	Depends on annual appropriation
FEMA Bioterrorism Program	Grant	Terrorism projects	Projects must meet specific requirements	Depends on annual appropriation
DOC/EDA—Public Works Prog.	Grant	Roads, water, sewer, electric infrastructure	Tied to economic dev projects	Generally 50% of cost
HUD—Brownfields Economic Dev Program	Grant	Remove contaminants from developed land	Tied to economic dev projects	Limited
EPA—Brownfields Programs	Grant	Assessments, cleanups	Tied to economic dev projects	Generally 50% of cost
USDA—Conservation Reserve Prog.	Indiv Assist	Funding to idle land to buffer properties	Not a grant but funding for owners	Payments to landowners
USDA—Water and Waste Prog.	Grant and loan	Water and sewer infrastructure	USDA involved in engineering	Depends on local poverty level
USDA—Solid Waste Program	Grant	Landfill programs	Limited – little brick and mortar funding	Generally 50% of cost
USDA—Community Facilities Prog.	Grant and loan	Generators, equip., vehicles, shelters, and fire station	USDA involved in design	Depends on local poverty level
USDA—Small Watershed Prog.	Grant	Watershed programs	Limited funding	Limited
State of Iowa (including Federal funding to the State)				
State Disaster Fund	Grant	Specific needs	Limited funding	Limited
I-Jobs Funding	Grant	Specific infrastructure and recovery progs.	Short-term in next year	Generally 50% of cost
IDED—Comm. Dev. Block Grant (CDBG)	Grant	Infrastructure and comm. facility projs.	Meet national income objectives	Generally 50% of cost
IDED—CDBG Imminent Threat Fund	Grant	Specific emergency infrastructure	Contingency fund only	May pay most of cost
IDALS—Watershed Improvement Review Board	Grant	Flood control and related projects	Must be watershed-based	May pay most of cost
IDNR—Flood Technical Assist.	Tech Assist	Assistance to communities	Depends on staff availability	No true grant funds
IDOT—Traffic Safety Improvement Program	Grant	Various highway and road projects	Heavy IDOT involvement	Limited
IDOT—Fed-Aid Rail/Hwy	Grant	Signage and traffic lights	Heavy IDOT	Limited

Crossing Safety Program			involvement	
IDOT—State Grade Crossing Safety/Surface Repair Prog.	Grant	Crossing improvements	Heavy IDOT involvement	Limited
IDOT—Operation Lifesaver	Grant	Road and rail safety education	Education only – not cash	Limited
IDOT—Various rail and road programs	Grant	Road and rail construction/repair	Heavy IDOT involvement	Some up to 80% State
IDOT—HAZMAT Awareness Program for First Responders	Tech Assist	Training by state officials of HAZMAT	Education only – not cash	Limited
IDPS—Firefighter training programs	Tech Assist	Training for firefighters	Education only – no or limited funding	Limited
IDED—Response 2020	Grant	First response planning funds	No bricks and mortar funds	Limited amt available
Iowa Dry Hydrant Program	Grant	Install rural dry hydrants	Limited number per county	Limited amt available
IDALS—Iowa Buffer Initiative	Grant	Flood control projects	No bricks and mortar	Limited amt available
IDALS—Water Quality Protection Program	Grant	Flood control projects	Water quality focus	Limited amt available
IDALS—State Soil Conservation Cost Share	Grant	Flood control projects	Water quality focus	Limited amt available
IDALS—Iowa Watershed Protection Program	Grant	Flood control projects	Water quality focus	Generally 50% of cost
Iowa Dept of Commerce—Pipeline Safety Program	Tech Assist	Assistance with pipeline inspections	No funding	Limited
IDPH—EMS Education & Training Program	Grant	Education and training for first responders	Limited funding	Limited
IDPH—EMS Provider Authorization/Cert. Prog.	Tech Assist	Certifications management	Limited or no funding	Limited
IDPH—Public Health Nursing Prog.	Tech Assist	Nursing programs	Limited or no funding	Limited
IDPH—EMS System Dev. Prog.	Grant	EMS equip, planning, etc. funding	Limited funding	Limited – usually formula based
IDPH—Bioterrorism Surveillance and Epidemiology Prog.	Tech Assist	Terrorism health focus	Limited or no funding	Limited
IDPH—Public Health & Healthcare Disaster Preparedness Prog.	Tech Assist	Planning and other assistance for public health needs	Limited or no funding	Limited
Private and Non-profit Funding				
American Red Cross	Tech Assist	Staffing, technical assistance, volunteers	Partnerships should be in place before event	Limited
Union County Endowment Foundation	Grant	Various brick and mortar	Competing for local dollars	Makes good local match for govt grants
US Smokeless Tobacco ATV Grant	Grant	Purchase rescue equipment and ATVs	Limited funding	Generally 50% of cost
Iowa Farm Bureau Federation	Grant	Projects that protect land and environment	Must apply through county IFB office	Gap financing
Dekko Foundation	Grant	Planning and capital projects with broad support and that impact youth	Must have an impact on youth	Can be large grants; likes phased projects where Dekko partners throughout
Grants from local business and industry	Grant	Capital projects with broad support, community programs	Set by the business or company	Can be large grants but usually corporate donations and challenge grants
Alliant Energy Foundation	Grant	Equipment and supplies	Not brick and mortar, must be an Alliant community	Generally 50% of cost or challenge grants
CIPCO/local cooperatives – USDA funding	Grants, loans	Equipment and supplies	Limited funding	Limited

Sources: SICOG, 2021; Iowa Hazard Mitigation Plan, 2007; www.fema.gov, 2007

While almost all actions will require local funds and some in-kind contributions, outside funding will be needed for many of them as a match to local funds. Funding is available if one is willing to seek it for most of the proposed mitigation actions. FEMA has several guides on federal funds on www.fema.gov, including brochures,

case studies, source lists, and links to other funding sites. Local organizations that currently undertake projects with mitigation effects, such as NRCS, fire associations, RC&D, and area community colleges may have funding or may offer programs for local governments, first responders, and landowners already.
It is important to engage public elected officials in the budgeting process using a capital improvements plan and strategic planning to acquire needed expensive equipment and programs over multiple budget cycles.

In addition, there are many new resources becoming available as a result of the State and FEMA Region VII response to flooding and severe storms since 2007. Flood mapping, watershed planning, and other mitigation projects may fall under resources offered by these state and federal governments as well as ISU Extension.

10.2: Plan Review

A review evaluates a plan for compliance with the DMA of 2000. It also serves as a tool for improving the quality of plans. A high quality plan that is well monitored will guide the community to the maximum reduction of risks. The planning consultant and FEMA have completed the Plan Review comments form, attached in *Appendix G*. This guidance can supplement the mitigation plan in *Chapter 9* to help the implementation teams and leaders through each action to see how it relates to the DMA of 2000. The FEMA hazard mitigation planning main guidebook is known as the "Blue Book." It can be obtained from FEMA free as a PDF file from www.fema.gov. This plan, as drafted today, is not final until FEMA approves the plan with or without changes. The adopted plan includes those changes that are required. Recommended changes can be made also at any time.

10.3: Annual Review and Update

The DMA of 2000 suggests that each local jurisdiction review the plan annually. Principally, each jurisdiction's government body and key staff should review the actual implementation plan for that jurisdiction. A review of capabilities, and goals/objectives, and proposed actions is particularly warranted. It is important that the review notes and suggested changes be made at a public meeting and records are kept. If any of the changes relate to a project that is being submitted to FEMA, such as through a PDM, FMA, or HMGP application, the jurisdiction must adopt the changes at a council or supervisor meeting to make the changes officially part of the plan and thus eligible for mitigation funding. The local jurisdictional body, such as city council, board of supervisors, or school board, is responsible for ensuring reviews are completed.

In *Appendix F* are templates that can be used to help with reviews and updates. The existing planning team or a newly appointed team can be appointed to assist the local jurisdiction with annual updates.

10.4: Evaluating the Plan

Periodically, as warranted, a major step in the plan implementation process is the plan evaluation. The effort should be made to determine if the planned course of action and the current implementation of the course of action has had the desired effect on each jurisdiction. FEMA's how-to guide 386-4, "Bringing the Plan to Life: Implementing the Hazard Mitigation Plan," downloadable from www.fema.gov, provides ideas, examples, and funding information that can guide the community in the evaluation and implementation processes. Evaluation can be formal or informal. Formal evaluation includes public meetings where the jurisdiction or a multi-jurisdictional planning team discusses the status of implementation and what can be improved. Informal evaluation can be internally as related to a given mitigation action and may not be made public or incorporated into the plan file.

10.5: Opportunities for Publicity

Once the plan is prepared, support can be maintained and grown throughout the implementation process. Several times the local media can make comments about the effort and successes that may arise:

- Adoption of the mitigation plan
- Receipt of approval by FEMA
- Initiation and completion of tangible mitigation actions or projects
- Update and evaluation meetings and results

Annually, each jurisdiction is to hold at least one public meeting or hearing that is publicized so that the public can comment on the status of the mitigation plan's implementation and changes that are needed to the plan.

10.6: Planning Team's Role in Implementing the Plan

The hazard mitigation planning team was created to develop the mitigation plan and guide the plan preparer. The planning team should not formally end with the approval of the plan. The planning team can evolve into one of a watchdog over the practices of land developers and public officials. Members can help remind public officials of that particular year's mitigation strategy and possible funding options and can volunteer in the implementation process for certain actions. The team and local governments may participate in the process and engage regional organizations, state agencies, state universities, schools, and churches via memoranda of agreement.

Finally, the planning team is partly responsible to ensure that the public officials are incorporating mitigation actions into relevant plans and planning mechanisms, such as zoning, annexation plans, and bonding proposals. Communities should also include mitigation initiatives as regular line items in community capital or operational budgets to ensure ongoing funding for hazard mitigation initiatives. The following matrix shows the types of planning mechanisms available and how the plan should be incorporated into them.

Figure 10 – 2: Implementation of Plan Incorporation into Existing Planning Mechanisms

Current Planning Mechanism	Jurisdictions Currently In Place	Method of incorporation	Who Responsible or Lead
Comprehensive land use plan	In place for the county and larger towns only	Review each, develop plans in other jurisdictions	Zoning commissions and staff
Capital improvements plan	Not much formal in place	Modernize each, develop plans if they are outdated	Public works directors and staff
Economic development plan	UCDA, town development groups, SICOG	Add a mitigation section to annual regional plan	City clerks, supervisors, Chambers, ED groups, regional associations
Open space/conservation plan	Limited, focused on county conservation sites	Incorporate mitigation projects affecting open spaces into plans	Conservation board/staff, City parks/recreation staff
Watershed protection plans	Limited, focused on certain watershed areas	Address mitigation actions in watershed areas	EMC and NRCS/SWCD
Zoning ordinance	In place in larger towns and county	Review zoning code concerning applicable hazards	Zoning commissions and staff
Subdivision regulations	In place in larger towns and county	Review subdivision code concerning applicable hazards	Zoning commissions and staff
Building codes	In place in larger towns and county	Update building codes for fire and wind standards	Building inspector, floodplain manager
Tree maintenance codes	Found in most jurisdictions; generally limited in scope	Consult with utilities	City and county public works officials
Soil erosion/water control ordinance	None known to be in place	Consult with NRCS/SWCD & DNR	Local governments, NRCS/SWCD
Solid/hazardous waste regulations	Limited but in all jurisdictions	Review regulations as to what can be landfilled, add hazard maps	EMC and landfill commission
Public health regulations	All jurisdictions	Collaborate with PH agencies to incorporate new protocols	EMC and public health board and staff
Historic district programs	Creston	Provide data to assist in protecting properties	Development groups with State IDED assistance
Downtown revitalization programs	Creston, Afton, future in Lorimor	Provide data to assist in protecting properties	Development groups with State IDED assistance
Long-range transportation plan	Mainly county, but all cities to lesser degree	Incorporate hazard maps and transportation improvement ideas	County engineer, IDOT, area RPA (ATURA)
Water source plan	All jurisdictions through rural water associations	Include mitigation actions related to relevant hazards	SIRWA, Creston Mun. Utilities
Storm water management program	Limited in most of the towns, traditional sewer	Include mitigation actions related to flash flooding	Floodplain manager, public works, EMA
Housing and special needs plans	Limited for each city – not part of City itself	Consider mitigation recommendations in housing plans and funding requests for improvements	SICOG Housing Trust Fund, SIRHA, hospital, special needs boards
Administrative operations processes – departments	All jurisdictions but small cities have very limited	Convene meetings where possible realignment of tasks, new or improved	EMA, elected officials, clerks and board chairs

and boards	budgets for staff	tasks and processes, and board goals are updated	

It is strongly recommended that staff and elected/appointed officials become aware of the mitigation strategy and its practical applications. An annual review of local planning mechanisms is warranted, simply to give the local leaders an opportunity to think about how mitigation actions affect the local planning mechanisms and to ensure local plans are current.

10.7: Five-year Major Updates

FEMA approved mitigation plans expire five years after the date FEMA approves the mitigation plan (see *Appendix G* for the FEMA letter). In order not to miss out on potential FEMA funding, a new plan should be authored and submitted for FEMA approval before that date. Because it takes considerable time for a multi-jurisdictional plan update, the community should begin this process by mid 2015. From time to time, HMGP and PDM funding is available to fund up to 85% of the planning costs for the plan update. The scope of work for a plan update is similar to this initial plan except one of the added features is that the initial plan will be thoroughly evaluated in the new plan. The jurisdictions will be required to address the results of implementation of the initial plan, how hazard impacts have changed, and how goals and objectives have changed. Further, many of the FEMA recommended but not required improvements will have to be addressed in the five-year update.

10.8: Non-Adopting Jurisdictions

Several jurisdictions in the county that could receive FEMA funds have either not participated in the plan or did not participate adequately in order to meet planning requirements. These jurisdictions can finish participation in the process and adopt the plan and request FEMA approval in order to access those funds. They can also participate in the next county multi-jurisdictional plan update, whether or not their participation is as an initial plan or an update.

10.9: Final Summary

After adoption, the approved plan will be held at each city hall, the county courthouse, emergency management office, and at other relevant locations for future review and consultation. Persons can view the plan free of charge or make copies at low cost.

A public meeting will be held after any and all plan updates and public comments, concerns, opinions, and questions will be given serious consideration.

The planning consultant thanks the hard work the Emergency Management Agency, the planning team, reviewers at the Iowa JFO and HSEMD who assisted with reviews during the plan's writing, and other professionals, including those from other COGs, who provided insight into improving the plan.