

Crawford County, Illinois Multi-Hazard Mitigation Plan

A 2017 Update of the 2009 Countywide MHMP



FEMA



SIU
Southern
Illinois
University
CARBONDALE

Multi-Hazard Mitigation Plan
Crawford County, Illinois

Adoption Date: -- _____ --

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Section 1. Introduction

Hazard mitigation is any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) makes reducing hazards one of its primary goals; hazard-mitigation planning and the subsequent implementation of mitigation projects, measures, and policies is a primary mechanism in achieving FEMA's goal.

The Multi-Hazard Mitigation Plan (MHMP) is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). The development of a local government plan is required in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. In order for the National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt an MHMP.

In recognition of the importance of planning in mitigation activities, FEMA created Hazus Multi-Hazard (Hazus-MH), a powerful geographic information system (GIS)-based disaster risk assessment tool. This tool enables communities of all sizes to estimate losses from floods, hurricanes, earthquakes, and other natural hazards and to measure the impact of various mitigation practices that might help reduce those losses. The Illinois Emergency Management Agency (IEMA) has determined that Hazus-MH should play a critical role in the risk assessments performed in Illinois.

Crawford County completed their first Multi-Hazard Mitigation Plan in 2009. Throughout the five-year planning cycle, the Crawford County Emergency Management Agency and Mitigation Planning Team reconvened to monitor, evaluate, and update the plan on an annual basis. The Natural Hazards Research and Mitigation Group at Southern Illinois University Carbondale (SIU), Greater Wabash Regional Planning Commission (GWRPC) and Crawford County have joined efforts in updating the County's first mitigation plan. The update process addressed changes in the probability and impact of specific hazards to the county, as well as changes in land-use, population, and demographics. The plan incorporates detailed GIS and Hazus-MH Level 2 analyses to improve the risk assessment, and finally revised and updated mitigation strategies. This document hereby serves as the 2017 Crawford County Multi-Hazard Mitigation Plan update.

Section 2. Planning Process

2.1 Timeline

The MHMP update process is broken into a series of four meetings. These meetings were organized by SIU, GWRPC and hosted by the Crawford County Emergency Management Agency. At these meetings, various tasks were completed by SIU, GWRPC, and the Crawford County Mitigation Planning Team.

Meeting 1: Introduction of the MHMP process and organize resources. SIU gathered local resources that contributed to the detailed county risk assessment and presented the county's historical hazards. Based on this information, the Planning Team identified natural hazards to include in the plan, and ranked hazards by potential damages and occurrences.

Meeting 2: SIU presented the draft risk assessment, derived from the Hazus-MH and GIS modeling of the identified disasters, to the Planning Team. The general public was invited to this meeting through a series of newspaper articles and/or radio spots. At the end of the meeting, SIU encouraged the general public to ask questions and provide input to the planning process, fulfilling one of FEMA's requirements for public input.

Meeting 3: This meeting also consisted of a "brainstorming session." The Planning Team lent local knowledge to identify and prioritize mitigation strategies and projects that can address the threats identified in the risk assessment. FEMA requires the plan to contain mitigation strategies specific to each hazard and for each incorporated area within the county. At this meeting, SIU and GWRPC presented options for funding implementation of different mitigation strategies, including a written guide to be distributed to all participants.

Meeting 4: The Planning Team reviewed the draft plan and, proposed revisions, and accepted the plan after SIU incorporated the necessary changes. Subsequently, SIU forwarded the county MHMP to the mitigation staff at the Illinois Emergency Management Agency (IEMA) for review prior to submitting it to FEMA.

2.2 Jurisdiction Participation Information

Approximately thirteen jurisdictions participated in the development of this MHMP with the intent of formally adopting the plan and subsequently fulfill the requirements of the DMA 2000. Various representatives from each jurisdictions were present at the meetings (see Section 2.3 Planning Team Information). Each jurisdiction falls under the one of the following categories: County, City, Village, Town, School, or Non-Profit Organization.

<u>Participating Jurisdictions</u>			
Crawford County	Oblong	Stoy	Palestine CUSD #3
Flat Rock	Palestine	Hutsonville CUSD #1	Robinson CUSD #2
Hutsonville	Robinson	Oblong CUSD #4	Lincoln Trail College
Crawford Memorial Hospital			

2.3 Planning Team Information

Ken Pryor, Crawford County EMA Coordinator, heads the Planning Team. The Planning Team includes representatives from various county departments, municipalities, and public and private utilities. Members of the Planning Team have a common vested interest in the County's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. All members of the Planning Team actively participated in the meetings, reviewed and provided comments on the draft plan, participated in the public input process and the county's formal adoption of the plan.

Crawford County Planning Team Members

Jurisdiction	Name	Title
Crawford County	Brad Midgett	Crawford County EMA Coordinator
	Gareld Bilyew	County Board Chairman
	Fayrene Wright	County Clerk
	Tyler Lowrance	911 Coordinator
	Jerica Robinson	Director of Environmental Health & Emergency Preparedness
	Howard Hunt	Manager Crawford County Airport Authority
	Alex Pleasant	Executive Director Crawford Co. Development Association
	John Daugherty	District 1
	George Bohman	District 3
	Kevin Utterback	District 4
Flat Rock	James Keller	District 5
	J.D. Branson	Fire Chief
	Garry Branson	Village Board/Fireman
Hutsonville	Larry Keeler	Village President
	Tina Callaway	Village President
Oblong	Randy Rich	Mayor
	Ken Russell	Trustee
	Dave Hasty	Village Board Member
	Chad Pusey	Chief of Police
Palestine	Jeffrey Besing	Chief of Police
Robinson	Roger Pethtel	Mayor
	Ted Atteberry	Fire Chief
	Chad Weaver	Chief of Police
Stoy	John Baud	Village President
Hutsonville CUSD #1	Julie Kraemer	Superintendent
Oblong CUSD #4	Jeff Patchett	Superintendent
Palestine CUSD #3	Chris Long	Superintendent
Robinson CUSD #2	Josh Quick	Superintendent
Regional Office of Education #12	Monte Newlin	Regional Superintendent
Crawford Memorial Hospital	Carrie Miller	Associate Chief Nursing Officer
	Jed Holt	Safety Officer
	Denise Hahn	Director of Emergency Department
Lincoln Trail College	Dr. Ryan Gower	President
	Chris Forde	Marketing and Public Info Coordinator
Tempco Products	Steve McGahey	Executive

The DMA 2000 planning regulations require that Planning Team members from each jurisdiction actively participate in the MHMP process. The Planning Team was actively involved on the following components:

- Attending the MHMP meetings
- Providing available assessment and parcel data and historical hazard information
- Reviewing and providing comments on the draft plans
- Coordinating and participating in the public input process
- Coordinating the formal adoption of the plan by the county

The first MHMP update meeting was held in Robinson, Illinois on November 6th, 2014. Representatives from SIU explained the rationale behind the MHMP update process and answered questions from the participants. SIU representatives also provided an overview of GIS/Hazus-MH, described the timeline and the process of mitigation planning.

The Crawford County Planning Team assembled for four formal meetings. Each meeting was approximately two hours in length. Additional meetings were held outside of the four formal meetings. Appendix A includes the minutes for all meetings. During these meetings, the Planning Team successfully identified critical facilities, reviewed hazard data and maps, identified and assessed the effectiveness of existing mitigation measures, established mitigation projects for the future, and assisted with preparation of the public participation information.

Planning Meetings

MEETING 1	Nov 6 th , 2014
MEETING 2	Feb 24 th , 2015
MEETING 3a	<i>Dec 1st, 2015</i>
Meeting 3b	<i>April 12th, 2016</i>
MEETING 4	Nov 9 th , 2016

2.4 Public Involvement

The Crawford County EMA solicited public input throughout the planning process and a public meeting was held on February 24th, 2015 to review the County's risk assessment. Appendix A contains the minutes from the public meeting. Appendix B contains press releases and/or articles sent to local newspapers throughout the MHMP development process.

2.5 Neighboring Community Involvement

The Planning Team invited participation from various representatives of county government, local city and town governments, community groups, local businesses, and universities. The Planning Team also invited participation from adjacent counties to obtain their involvement in the planning process.

Neighboring Community Participation

Person Participating	Neighboring Jurisdiction	Title/Organization
Debbie Judge	Edwards County	EMA Coordinator
Jess Angle	Lawrence County	EMA Coordinator
Gerald Brooks	Wabash County	EMA Coordinator
Jeff Jake	Wayne County	EMA Coordinator
Jim Totten	White County	EMA Coordinator

2.6 Review of Technical Documents

The Crawford County Planning Team identified technical documents from key agencies to assist in the planning process. These documents includes land use plans, comprehensive plans, emergency response plans, municipal ordinances, and building codes. The planning process incorporated the existing natural hazard mitigation elements from previous planning efforts. The following technical data, reports, and studies were utilized:

Federal Emergency Management Agency	NOAA / National Water Service Storm Prediction Center
<i>Developing the Mitigation Plan (April 2003)</i>	<i>Severe Weather Data</i>
<i>Mitigation Ideas (January 2003)</i>	Illinois Emergency Management Agency
<i>Local Mitigation Planning Handbook</i>	<i>2013 Illinois Natural Hazard Mitigation Plan</i>
<i>Flood Insurance Study (June 2011)</i>	<i>Hazardous Materials Incident Reports</i>
United State Census Bureau	Illinois Environmental Protection Agency
<i>County Profile Information</i>	<i>2014 303d Listed Waters and Watershed Maps</i>
<i>2010 Census Data</i>	Illinois State Water Survey
<i>American Community Survey (2009-2013)</i>	<i>Climate Data</i>
United States Department of Transportation	Illinois Department of Natural Resources
<i>PHMSA Hazardous Materials Incident Data</i>	<i>Repetitive Loss Data</i>
United States Geological Survey	<i>Dam and Levee Data</i>
<i>Earthquake Data</i>	Illinois State Geological Survey
United States Army Corps of Engineers	<i>Geologic Data</i>
<i>National Inventory of Dams</i>	Crawford County
<i>National Levee Database</i>	<i>2013 Assessment Records</i>
NOAA National Climatic Data Center	<i>2013 Countywide GIS Parcel Database</i>
<i>Climate Data</i>	<i>2009 Multi-Hazard Mitigation Plan</i>

2.7 Adoption by Local Government

Upon IEMA and FEMA approval, the Planning Team presented and recommended the plan to the County Board for formal adoption. The plan was formally adopted by the Crawford County Board on **<adoption date>**. The Planning Team worked with the County and its jurisdictions to ensure all parties formally adopted the plan. Appendix C contains the Adopting Resolutions for each participating jurisdiction.

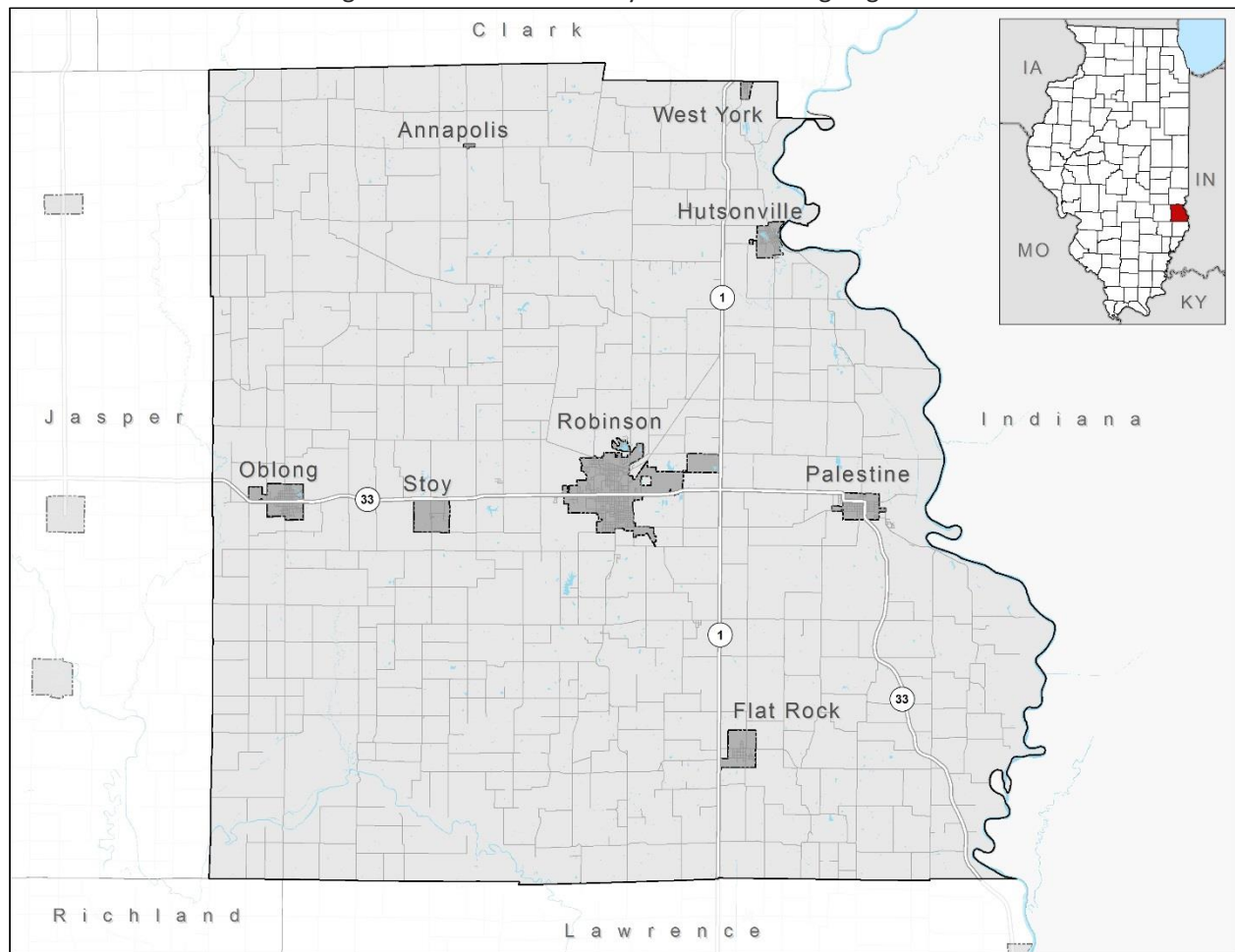
Section 3. County Profile

3.1 County Background

Crawford County, named for Secretary of War and Secretary of Treasury William H. Crawford, was formed from Edwards County in 1816. At the time of its formation, it encompassed approximately $\frac{1}{4}$ of the state, but it was reduced to its present borders in 1831. In 1818, the town of Palestine was designed as the county seat. After elections in 1843, a new site was chosen, which would become the town of Robinson. Robinson remains the county seat today.

Crawford County is located in southwestern Illinois (Figure 3-1). It is bounded on the north by Clark County, on the south by Lawrence and Richland Counties, on the west by Jasper County, on the east by the Indiana State Line and Wabash River. Its relation to major urban areas is as follows: 122 miles west-southwest of Indianapolis, Indiana; 136 miles south-southeast of Springfield, Illinois; 243 miles south-southeast of Chicago, Illinois.

Figure 3-1. Crawford County and Surrounding Region

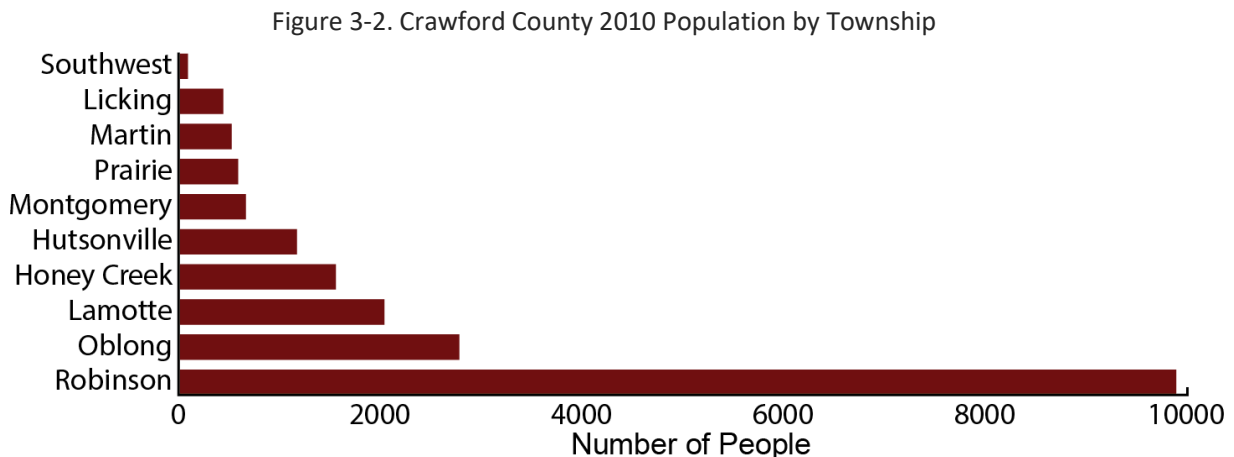


Crawford County's population has remained relatively stable over the past three decades. The major sources of economic activity include manufacturing, technology, agriculture, and oil. A few of the major area employers include Fortune 500 companies: Hershey Chocolate USA, Marathon Petroleum, and Dana Corporation. In 2014, Crawford County's most famous exporter, the Heath Brothers Confectionery, received statewide and national attention as it celebrated its 100th birthday. New development in Crawford County tends to focus around the city of Robinson.

Crawford County offers a host of amenities such as shopping centers, hotels, restaurants, and entertainment. Crawford County is home to Crawford County State Fish and Wildlife Area, a 1,129-acre state park bisected by Hutson Creek. The State Park offers 1,100 huntable acres and nine fishing ponds. The County is also rich in educational opportunities and home to Lincoln Trail College, an Illinois Eastern Community College campus. Other communities within the county offer similar amenities, such as restaurants, entertainment, and shopping on a rural scale.

3.2 Demographics

According to the U.S. Census Bureau, Crawford County's 2013 population estimate is 19,505, a decrease of 1.6% from 2010. The population is spread throughout ten townships: Honey Creek, Hutsonville, Lamotte, Licking, Martin, Montgomery, Oblong, Prairie, Robinson, and Southwest. Figure 3-2 displays the breakdown of population by township from the 2010 Census.



3.3 Economy and Industry

Crawford County has strong roots in agriculture and oil and more recently manufacturing and technology. The diversified Crawford County workforce is spread across agriculture, forestry, construction, manufacturing, retail, healthcare and social assistance, hospitality, education, and transportation. Table 3-1 lists the top employers and the approximate number of employees in Crawford County. Four employers have employment rolls of over 300 people – Hershey Chocolate, Marathon Petroleum, Crawford Memorial Hospital, and Robinson Correctional Center – that have a combined workforce of nearly 2,046. Education services, health care, social assistance, and manufacturing employ 44% of the workforce (American Community Survey 2013). The 2013 annual per capita income in the county is \$25,214, compared to an Illinois average of \$29,666.

Table 3-1. Crawford County's Major Employers

Employer	Industry	Approximate Number of Employees
Hershey Chocolate	Candy	700
Marathon Petroleum	Refinery	700
Crawford Memorial Hospital	Health Care	346
Robinson Correctional Center	Corrections	300
Dana Corporation	Gaskets	220
E.H. Baare Corp.	Fan Guards and Motor Mounts	120
SENCO	Labor	112
Tempco Products	Aluminum and Vinyl Doors and Windows	65
Fair-Rite Product	Electronic Shields	45
Lincolnland Agri-Energy	Ethanol	33

Source: [Crawford County Development Association](#)

3.4 Land Use and Development Trends

Today, agriculture is the predominant land cover in the county. Figure 3-3 displays the current land use in Crawford County. This fact did not result because of great agricultural capabilities of the land as a major agricultural producer; neither did it occur because of maximum economic development potential resting in agricultural pursuits. Rather it is a result of the existence of large volumes of land which cannot rationally be occupied by major urban uses within the foreseeable future. As a result many agricultural uses have only limited agricultural potential. Soybeans is the primary crop, followed by corn, winter wheat, and hay.

In recent years, residential developments tend to focus along Illinois Route 33, particularly within the city limits of Robinson. Residential land use has had few significant developments within the county at this time. The largest communities within the county is the city of Robinson (9,900) according to the U.S. Census 2010 population estimates.

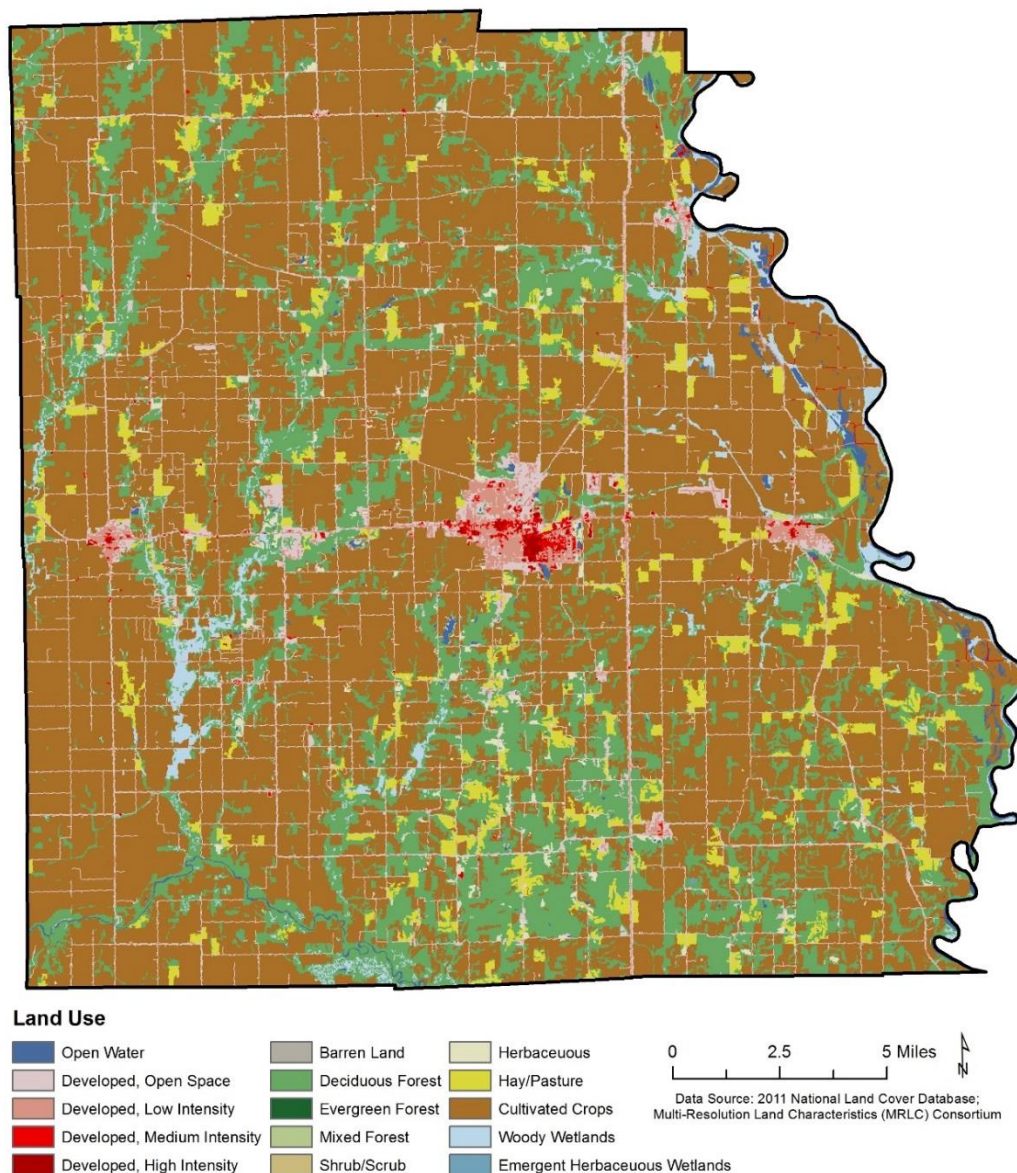
Commercial land use has historically been, and continues to be, concentrated within the business districts of the incorporated municipalities of the county. However, the most recent commercial growth has occurred in and around the city of Robinson. Crawford County as a whole is experiencing minor commercial development at this time. Industrial land use has been strategically planned and concentrated within the Enterprise Zone. Robinson is the predominant location for most of the industries in the county.

The major industries in the county are Hershey Chocolate and Marathon Petroleum. The Marathon Petroleum Company's Robinson Illinois Refining Division was built in 1906. The refinery processes approximately 212,000 barrels per calendar day. Some of the products include gasoline, distillates, propane, aromatics, slurry, anode-grade coke, propylene, and sulfur. In 1914, L. S. Heath purchased an existing confectionary shop in Robinson and opened a combination candy store and ice cream parlor. The following year, L. S. Heath and his sons, Bayard and Everett, built a small factory for making ice cream, eventually adding butter-churning and bottling equipment. The Heath bar, a candy bar made of toffee and milk chocolate, grew in popularity nationally during the depression. The production of the Heath Bar was even ramped up to commercial scale to supply American troops during World War II. The Heath Confectionary was eventually acquired by Leif, Inc. in 1989 and later acquired by Hershey in 1996. Today, the Hershey Plant produces Payday, Heath, Whoppers, and Milk Duds candies.

Oil production in Crawford County has had a tremendous impact on land usage in Crawford County. In 1906 production in the Main Consolidated Field of the Illinois Basin began in Crawford County. The Illinois Basin is a Paleozoic depositional and structural basin, centered in and underlying most of the state of Illinois, and extending into southwestern Indiana and western Kentucky. The rocks of the Illinois Basin are sources of coal, petroleum, and minerals. Over 300 million barrels of oil have been produced in Crawford County. The Illinois Oil Field Museum, located in Oblong, is committed to preserving the history of the oil field industry in Southern Illinois.

Public land use in Crawford County includes schools, parks, playgrounds, public utilities, and transportation facilities. Major areas of public land use include the Crawford County Airport, Crawford County State Fish and Wildlife Area, Lincoln Trail College, Quail Creek Country Club, Palestine Business District (listed on National Register of Historic Places), and the Hutsonville Memorial Village.

Figure 3-3. Land Use in Crawford County



3.5 Climate

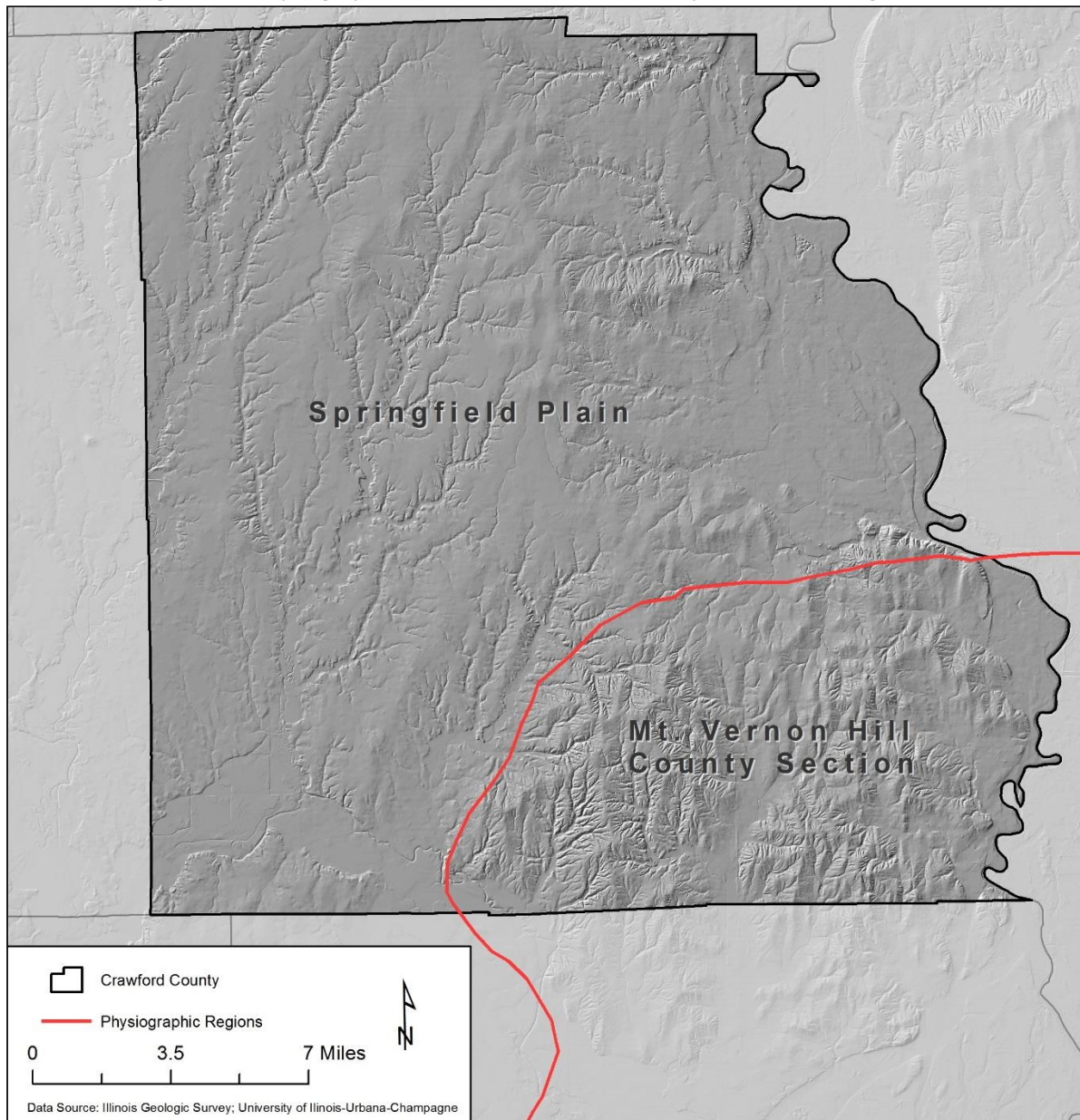
Crawford County's climate is typical of Southern Illinois and generally characterized by hot dry summers and cool wet winters. The variables of temperatures, precipitation, and snowfall can vary greatly from one year to the next. According to records from the weather station located in Palestine, Illinois (station 116558), where the average annual temperature for Crawford County is 55.3 degrees Fahrenheit (°F). The coldest average temperatures are in January, and the warmest average temperatures are in July. The coldest temperature recorded was -27 °F on February 13, 1999. The warmest temperature recorded was 114°F on July 14, 1954. Crawford County's average annual total precipitation is 42.84 inches, which includes an average annual snowfall of 18.6 inches. The largest daily snowfall on record was 14.5 inches on January 26, 1904. The largest recorded daily rainfall total was 6.10 inches on July 11, 1958.

3.6 Topography

Crawford County is located in the Springfield Plain and Mount Vernon Hill Country physiographic subdivision of the Till Plains Section. Figure 3-4 depicts the physiographic divisions within Crawford County. The Springfield Plain includes the level portion of the Ridged Plan physiographic division. It is distinguished mainly by its flatness and by shallow entrenchment of drainage. The Mount Vernon Hill Country is characterized by low rolling hills and broad alluvial valleys along the major streams. The relief in this region is not pronounced. Upland prairies are flat to moderately hilly, and the valleys are shallow. The land surface is primarily controlled by bedrock, which has been only slightly modified by glacial drift deposits. While the southern boundary of the Mount Vernon Hill Country lies within a few miles of the limits of glaciations, moraine ridges are essentially absent in the area.

The relief in Crawford County is characterized as low on the nearly level to gently sloping uplands. The greatest change in relief is in areas along major drainage ways with some areas having as much as a 75-foot drop in elevation from the adjacent uplands. Elevation in the county varies from slightly more than 640 feet above sea level, at about 2 miles northwest of the Village of Flat Rock, to approximately 410 feet above sea level at the point in the southeast corner where the Wabash River leaves the county.

Figure 3-4. Physiographic Divisions of Crawford County and Surrounding Terrain



3.7 Major Lakes, Rivers, and Watersheds

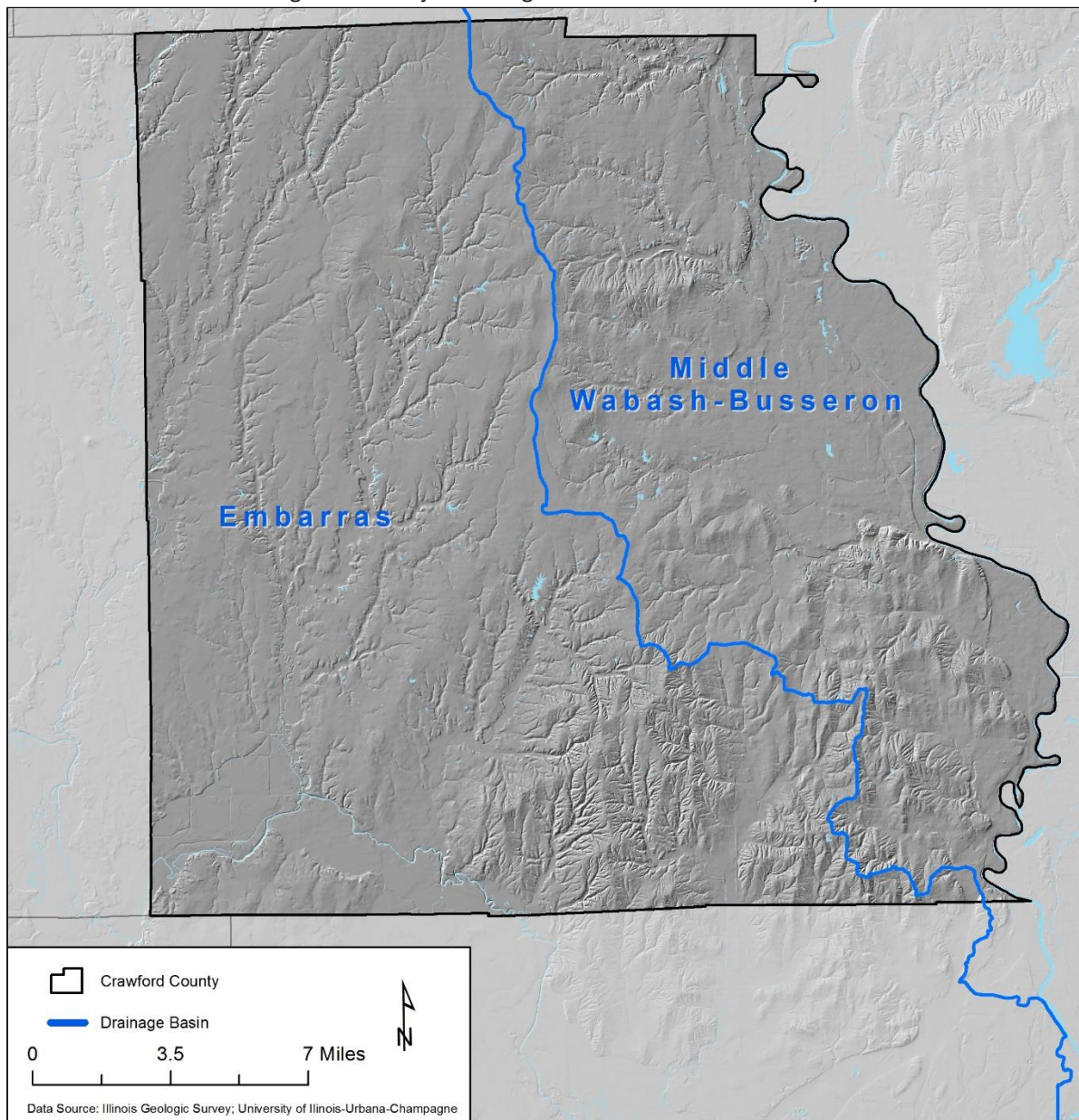
Of the 102 Illinois Counties, Crawford County ranks 75th in portion of county covered by open water. The County is located on the southeastern edge of the state with its eastern border formed by the Wabash River. Nearly 3,715 acres are covered by lakes, rivers and streams. Figure 3-5 depicts the major drainage basins in Crawford County. Crawford County lies on the dividing ridge between the Embarras and Wabash Rivers. The county crosses two eight-digit Hydrologic Unit Code (HUC) Watersheds: Embarras and Middle Wabash-Busseron Watersheds.

There are no significant lakes in Crawford County. However, there are a small number of small lakes and large farm ponds: Walton Lake, Horseshoe Pond, Long Pond, Circle Pond, Ridgeway Lake, Brooks Lake,

West Lake, Athey Lake, and Campbell Lake. There are also several small creeks and streams in the county: Hutson Creek, Onion Creek, Sweet Creek, Brush Creek, Elm Creek, Big Creek, Oblong Creek, Painter Creek, Howey Creek, and Minnow Slough.

The North Fork Embarras, Embarras, and Wabash Rivers drain most of the county. The North Fork Embarras is a tributary of the Embarras River, and the Embarras River is a tributary of the Wabash River. The Wabash River eventually drains into the Ohio River. The floodplains along these rivers and their tributaries generally are flooded annually, and most of the soils in these areas have a seasonal high water table. Most areas are sufficiently drained for the crops commonly grown. Subsurface tile drains have been installed in fields across the county.

Figure 3-5. Major drainage basins in Crawford County



Section 4. Risk Assessment

The goal of mitigation is to reduce future hazard impacts including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation requires a rigorous risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. This assessment identifies the characteristics and potential consequences of a disaster, how much the disaster could affect the community, and the impact on community assets. This risk assessment consists of three components—hazard identification, vulnerability assessment, and risk analysis.

4.1 Hazard Identification

4.1.1 Existing Plans

The Planning Team identified technical documents from key agencies to assist in the planning process and incorporated the natural hazard mitigation elements from previous 2009 Crawford County Multi-Hazard Mitigation Planning efforts. Several other documents were used to profile historical hazards and guide the Planning Team during the hazard ranking exercise. Section 2.6 contains a complete list of the technical documents utilized to develop this plan.

4.1.2 National Hazard Records

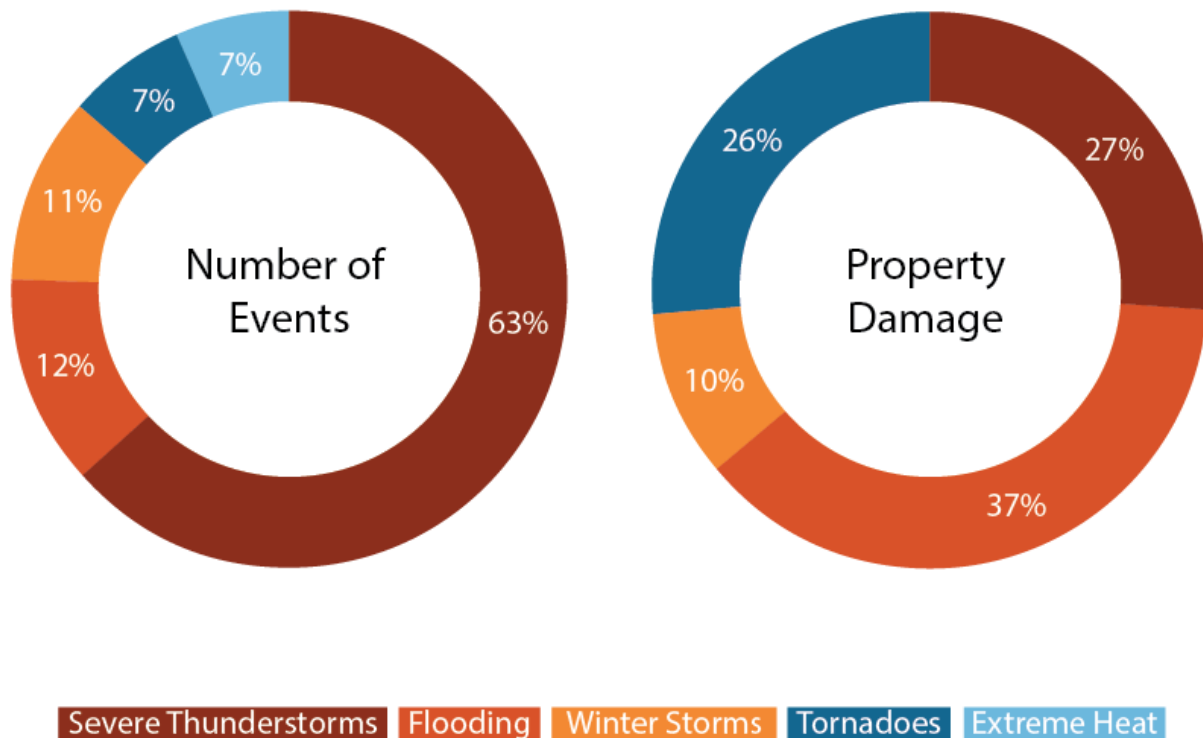
To assist the Planning Team, historical storm event data from the National Climatic Data Center (NCDC) was compiled. NCDC records are estimates of damages reported to the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses.

The NCDC database included 260 reported meteorological events in Crawford County from 1950-2014 (the most updated information as of the date of this plan). The following hazard-profile sections each include a summary table of events related to each hazard type. Table 4-1 summarizes the meteorological hazards reported for Crawford County. Figure 4-1 summarize the relative frequency of NCDC reported meteorological hazards and the percent of total damage associated with each hazard for Crawford County. Full details of individual hazard events are on the [NCDC website](#). In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail was mapped using SPC-recorded latitudes and longitudes. Appendix D includes a map of these events.

Table 4-1. Summary of Meteorological Hazards Reported by the NCDC for Crawford County

Hazards	Time Period		Number of Events	Property Damage	Deaths	Injuries
	Start	End				
Flooding	1996	2013	32	\$2,315,000	3	1
Severe Thunderstorms	1961	2014	165	\$1,661,600	0	1
Tornadoes	1959	2011	17	\$1,605,000	0	1
Winter Storms	1996	2014	28	\$600,000	2	3
Extreme Heat	1997	2012	18	\$0	1	0

Figure 4-1. Distribution of NCDC Meteorological Hazards for Crawford County



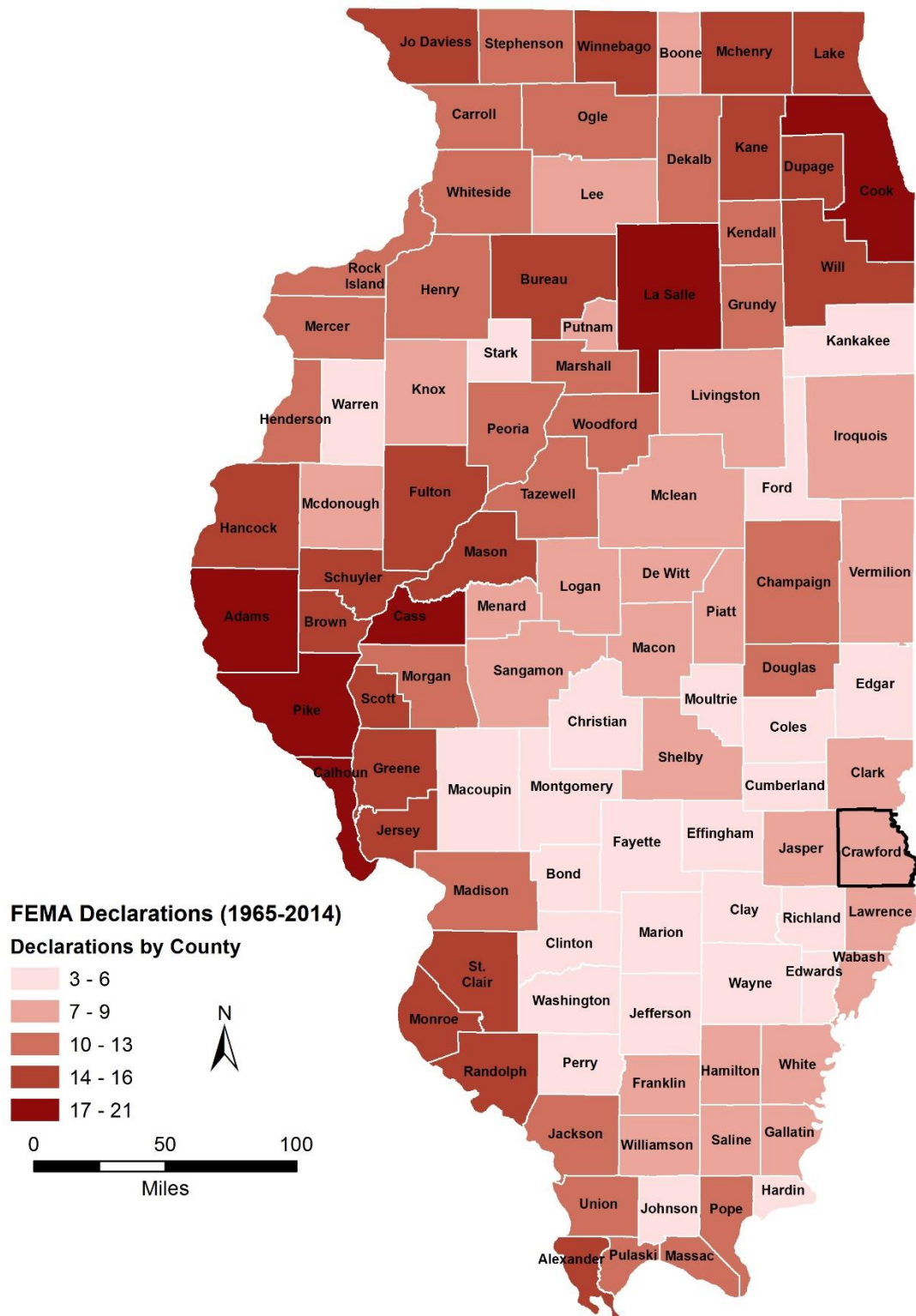
4.1.3 FEMA Disaster Information

Since 1957, FEMA has declared 53 major disasters and 7 emergencies for the State of Illinois. Emergency declarations allow states to access FEMA funds for Public Assistance (PA); disaster declarations allow for even more PA funding, including Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP). Crawford County has received federal aid for six declared disasters and one emergency since 1965. Table 4-2 lists specific information for each disaster declaration in Crawford County. Figure 4-2 depicts the number of disasters and emergencies that have been declared for the State of Illinois and Crawford County since 1965.

Table 4-2. Details of FEMA-declared Emergencies and Disasters in Crawford County

Declaration Number	Date of Declaration	Description
4116	5/10/2013	Severe Storms, Straight-Line Winds, and Flooding
1960	3/17/2011	Severe Winter Storm And Snowstorm
1771	6/24/2008	Severe Storms And Flooding
3230	9/7/2005	Hurricane Katrina Evacuation
1416	5/21/2002	Severe Storms, Tornadoes and Flooding
1112	5/6/1996	Severe Storms and Flooding

Figure 4-2. FEMA-declared Emergencies and Disasters in Illinois



4.1.4 Hazard Ranking Methodology

Based on Planning Team input, national datasets, and existing plans, the Crawford County Planning Team re-ranked the list of hazards from the 2009 MHMP. Other hazards were considered, but these hazards ranked the highest based on the Risk Priority Index discussed in Section 4.1.5. It should be noted that Ground Failure and Wildfire have been omitted from the plan and were not natural hazards identified by Crawford County or participating jurisdictions during the risk assessment process.

<u>Crawford County Hazard List</u>
FLOODING
SEVERE THUNDERSTORM
TORNADOES
EARTHQUAKES
WINTER STORMS
DROUGHT / EXTREME HEAT
HAZARDOUS MATERIALS RELEASE
DAM / LEVEE FAILURE

4.1.5 Risk Priority Index

The Risk Priority Index (RPI) quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards. Planning Team members use historical hazard data to determine the probability, combined with knowledge of local conditions to determine the possible severity of a hazard. Tables 4-3 and 4-4 display the criteria the Planning Team used to quantify hazard probability and magnitude.

Table 4-3. Hazard Probability Ranking

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year This event has occurred, on average, once every 1-2 years in the past
3 – Likely	Event is probable within the next 10 years Event has a 10-50% chance of occurring in any given year This event has occurred, on average, once every 3-10 years in the past
2 – Possible	Event is probable within the next 50 years Event has a 2-10% chance of occurring in any given year This event has occurred, on average, once every 10-50 years in the past
1 – Unlikely	Event is probable within the next 200 years Event has a 0.5-2% chance of occurring in any given year This event has occurred, on average, once every 50-200 years in the past

Table 4-4. Hazard Severity Ranking

Magnitude/Severity	Characteristics
8 – Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property is severely damaged
4 – Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 14 days More than 25% of property is severely damaged
2 – Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than seven days More than 10% of property is severely damaged
1 – Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life lost Shutdown of critical facilities and services for 24 hours or less Less than 10% of property is severely damaged

The product of hazard probability and magnitude is the RPI. The Planning Team members ranked specified hazards based on the RPI, with larger numbers corresponding to greater risk. After evaluating the calculated RPI, the Planning Team adjusted the ranking to better suit the County. Table 4-5 identifies the RPI and adjusted ranking for each hazard specified by the Planning Team.

Table 4-5. Crawford County Hazard Priority Index and Ranking

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Flooding	4	2	8	1
Severe Thunderstorms	4	2	8	2
Tornadoes	2	4	8	3
Earthquakes	2	6	12	4
Winter Storms	3	2	6	5
Drought / Extreme Heat	2	2	4	6
Hazardous Materials Release	2	2	4	7
Dam / Levee Failure	2	1	2	8

4.1.6 Jurisdictional Hazard Ranking

Each jurisdiction created its own RPI because hazard susceptibility may differ by jurisdiction. During the five-year review of the plan, the Planning Team will update this table to ensure these jurisdictional rankings accurately reflect each community's assessment of these hazards. Table 4-6 lists the jurisdictions and their respective hazard rankings (Ranking 1 being the highest concern). The individual jurisdictions made these rankings at Meeting 1.

Table 4-6. Hazard Ranking by Jurisdiction

Jurisdiction	Flooding	Severe Storm	Tornadoes	Earthquakes	Winter Storms	Heat / Drought	HAZMAT	Dam / Levee Failure
Flat Rock	7	1	2	5	3	4	6	8
Hutsonville	1	2	3	5	4	7	6	8
Oblong	7	2	1	4	3	6	5	8
Palestine	1	2	3	6	4	5	7	8
Robinson	6	2	1	3	4	5	-	7
Stoy	1	2	3	4	5	6	7	8
Hutsonville CUSD #1	1	4	2	2	4	5	5	3

Jurisdiction	Flooding	Severe Storm	Tornadoes	Earthquakes	Winter Storms	Heat / Drought	HAZMAT	Dam / Levee Failure
Oblong CUSD #4	7	1	2	4	3	6	5	8
Palestine CUSD #3	5	3	1	6	2	4	-	-
Robinson CUSD #2	1	3	2	4	5	6	7	8
Lincoln Trail College	1	2	3	4	5	6	7	8
Crawford Memorial Hospital	3	5	1	2	4	7	-	6

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Processes and Sources for Identifying Assets

Before meeting one, the Planning Team used their resources to update the list of critical facilities from the 2009 MHMP. Local GIS data was used to verify the locations of all critical facilities. SIU GIS analysts incorporated these updates and corrections to the Hazus-MH data tables prior to performing the risk assessment. The updated Hazus-MH inventory contributed to a Level 2 analysis, which improved the accuracy of the risk assessment. Crawford County also provided local assessment and parcel data to estimate the actual number of buildings susceptible to damage for the risk assessment.

Essential Facilities List

Table 4-7 identifies the number of essential facilities identified in Crawford County. Essential facilities are a subset of critical facilities. Appendix E includes a comprehensive list of the essential facilities in Crawford County and Appendix F displays a large format map of the locations of the critical facilities within the county.

Table 4-7. Crawford County's Essential Facilities

Facility	Number of Facilities
Emergency Operations Centers	1
Fire Stations	6
Police Stations	5
Schools	13
Care Facilities	7

Facility Replacement Costs

Table 4-8 identifies facility replacement costs and total building exposure. Crawford County provided local assessment data for updates to replacement costs. Tax-exempt properties such as government buildings, schools, religious and non-profit structures were excluded from this study because they do not have an assessed value. Table 4-8 also includes the estimated number of buildings within each occupancy class.

Table 4-8. Crawford County's Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure
Residential	7,758	\$512,913,390
Agriculture	452	\$14,193,969
Commercial	9,150	\$6,744,174,294
Industrial	103	\$854,015,007
Total:	17,463	\$8,125,296,660.00

Future Development

Crawford County is expected to see a modest increase in population due to the expansion of existing distribution centers, light industry, and the creation of new opportunities in the service industry such as retail stores, restaurants, and hotels. Most of this expansion is expected to take place within the city limits of Robinson within close proximity to transportation corridors such as Illinois Route 33.

4.3 Risk Analysis

4.3.1 GIS and Hazus-MH

The third step in the risk assessment is the risk analysis, which quantifies the risk to the population, infrastructure, and economy of the community. The hazards were quantified using GIS analyses and Hazus-MH where possible. This process reflects a Level 2 Hazus-MH analysis. A level 2 Hazus-MH analysis involves substituting selected Hazus-MH default data with local data and improving the accuracy of model predictions.

Updates to the default Hazus-MH data include:

- Updating the Hazus-MH defaults, critical facilities, and essential facilities based on the most recent available data sources.
- Reviewing, revising, and verifying locations of critical and essential point facilities with local input.
- Applying the essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) to the Hazus-MH model data.
- Updating Hazus-MH reports of essential facility losses.

The following assumptions were made during analysis:

- Hazus-MH aggregate data was used to model the building exposure for all earthquake analyses. It is assumed that the aggregate data is an accurate representation of Crawford County.
- The analyses were restricted to the county boundaries. Events that occur near the county boundaries do not contain damage assessments from adjacent counties.
- For each tax-assessment parcel, it is assumed there is only one building that bares all the associated values (both structure and content).
- For each parcel, it is assumed that all structures are wood-framed, one-story, slab-on-grade structures, unless otherwise stated in assessment records. These assumptions are based on sensitivity analyses of Hazus and regional knowledge.

Depending upon the analysis options and the quality of data the user inputs, Hazus-MH generates a combination of site-specific and aggregated loss estimates. Hazus-MH is not intended as a substitute for detailed engineering studies; it is intended to serve as a planning aid for communities interested in assessing their risk to flood-, earthquake-, and hurricane-related hazards. This plan does not fully document the processes and procedures completed in its development, but this documentation is available upon request. Table 4-9 indicates the analysis type (i.e. GIS, Hazus-MH, or historical records) used for each hazard assessment.

Table 4-9. Risk Assessment Tool Used for Each Hazard

Hazard	Risk Assessment Tool(s)
Flooding	Hazus-MH
Severe Thunderstorm	Historical Records
Tornadoes	GIS-based
Earthquakes	Hazus-MH
Winter Storms	Historical Records
Drought / Extreme Heat	Historical Records
Hazmat Release	GIS-based
Dam / Levee Failure	Historical Records

4.3.2 Flooding Hazard

Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the magnitude and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods are classified as one of two types in this plan: upstream floods or downstream floods. Both types of floods are common in Illinois.

Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; 18 inches might carry off a car. Generally, upstream floods cause severe damage over relatively localized areas. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can result from inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Illinois, but they are most common in the spring and summer months.

Downstream floods, sometimes called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage. Riverine flooding on the large rivers of Illinois generally occurs during either the spring or summer.

Previous Occurrences of Flooding

The NCDC database reported 32 flooding events in Crawford County. The most recent recorded event was in July 2013 when a slow moving upper level atmospheric low in the lower Ohio River Valley, combined with ample moisture to produce widespread thunderstorms with heavy rain in southeast and southern Illinois. These periods of thunderstorms, which produced heavy rain on already saturated ground from flooding in the last half of June, resulted in renewed flash flooding in a large part of southeast Illinois the morning of July 1st. Periods of heavy rain on already saturated ground produced flash flooding in a large

part of Crawford County. Observers reported 3.00 to 5.00 inches of rain from the morning into the early afternoon. One foot of water was reported at the intersection of State Highways 1 and 33 east of Robinson. Numerous streets in the city of Robinson were flooded and most rural roads were impassable during the morning. Table 4-10 identifies NCDC-recorded flooding events that caused damage, death, or injury in Crawford County.

Table 4-10. NCDC-recorded Flooding Events that caused Death, Damage or Injury in Crawford County

Location or County*	Date	Deaths	Injuries	Property Damage
Crawford County	June	0	0	\$315,000
Robinson	8/7/2000	0	3	\$1,000,000
Robinson	9/10/2000	1	0	\$1,000,000
Total:		1	3	\$2,315,000

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

There have been 3 structures (2 single-family, 1 non-residential) in Crawford County and 3 structures (2 single-family, 1 non-residential) in Hutsonville that have experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is $\geq 25\%$ of the market value of the structure at the time of each flood loss.

The Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Crawford County. Records indicate that there are six repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is \$326,833.47. Table 4-11 describes the repetitive loss structures for each jurisdiction.

Table 4-11. Repetitive Loss Structures for each Jurisdiction in Crawford County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Crawford County	3	6	\$86,433.75
Village of Hutsonville	3	8	\$240,399.72
Total:	6	14	\$326,833.47

Geographic Location of Flooding

Most riverine flooding in Illinois occurs during either the spring or summer and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Flash flooding of low-lying areas in Illinois can occur during any time of the year, but tends to be less frequent and more localized between mid-summer and early winter.

The primary sources of river flooding in Crawford County are the Wabash and Embarras rivers and their larger tributaries. The Wabash River and its tributaries, Lamotte and Sugar Creeks, have inundated portions of Palestine; the Wabash River and Hutson Creek have inundated portions of the Village of Hutsonville; and the Embarras River and its tributary Benner Creek have inundated portions of the Village of Stoy. Within unincorporated areas of the county, the Wabash River has caused flooding along the entire eastern boundary of the county, and the Embarras River has flooded a significant portion of the south and eastern corner of the county.

Flash flooding in Crawford County is best documented in urban/developed areas. For example, in the town of Robinson, flash or urban flooding has occurred along Main Street and other low-lying roads within the town. Within unincorporated areas of the county, several county roads, as well as State Highways 1 and 33, are often closed or are impassable during these types of flood events.

Hazard Extent for Flooding

All floodplains are susceptible to flooding in Crawford County. The floodplain of concern is for the 100-year flood event which is defined as areas that have a 1% chance of flooding in any given year. However, flooding is dependent on various local factors including, but not limited to, impervious surfaces, amount of precipitation, river-training structures, etc. The 100-year flood plain covers approximately 15% of Crawford County

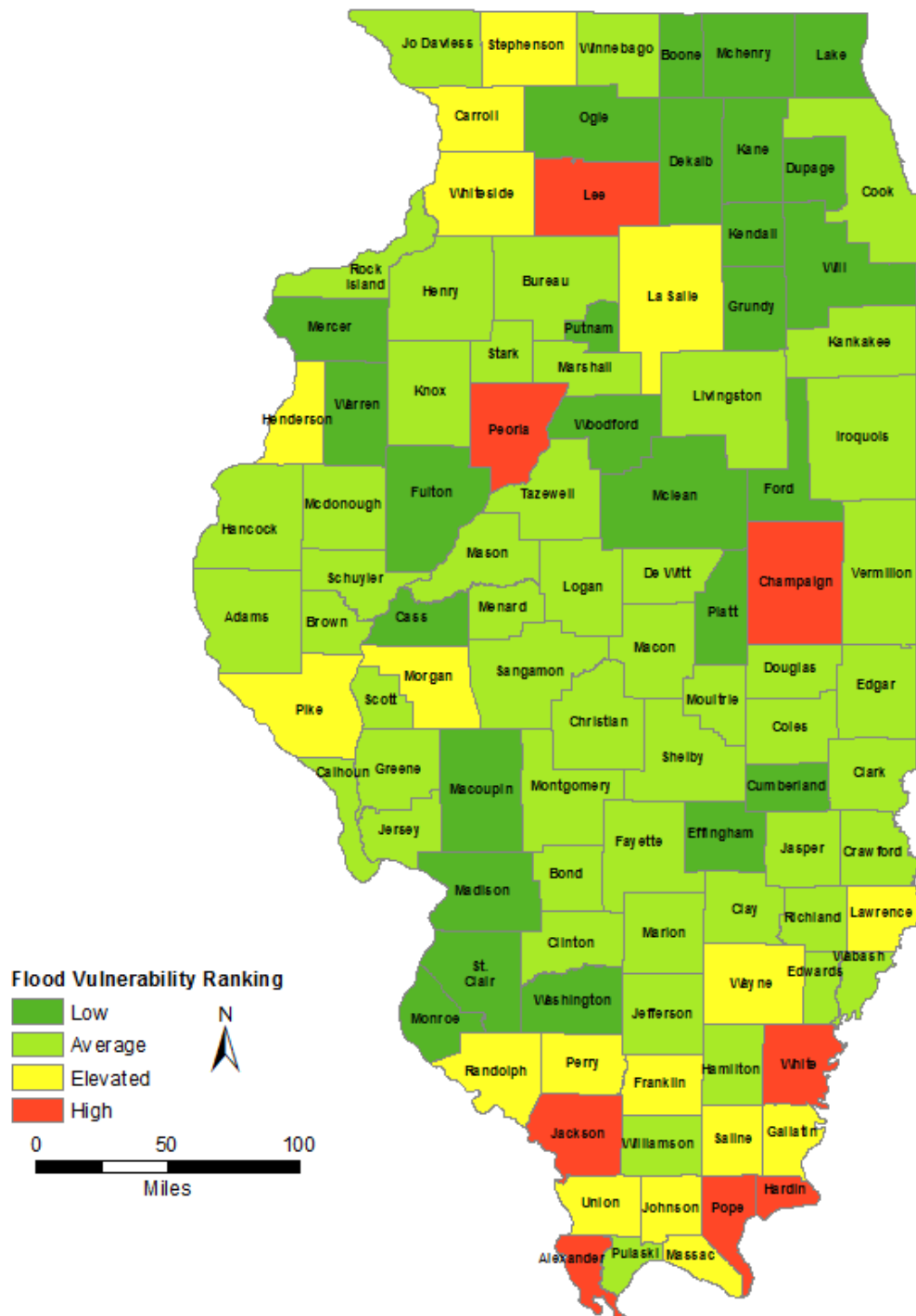
Vulnerability Analysis for Flooding

The 2013 Illinois Hazard Mitigation Plan analyzed a variety potential natural hazards including vulnerability to flooding. A Flood Vulnerability Index (FVI) was calculated for all counties and jurisdictions in Illinois. FVI combines Hazus-based estimates of flood exposure and loss with the widely utilized Social Vulnerability Index (SoVI). The highest vulnerability scores and vulnerability ratings were generally in rural counties and communities located along Illinois's large rivers (i.e., Mississippi, Green, Illinois, Kaskaskia, Rock, and Ohio Rivers). Figure 4-3 displays the Flood Vulnerability Ratings for the 102 Counties in Illinois. The vulnerability ratings are categorically representations (low, average, elevated, or high) of the flood vulnerability index. Crawford County has an Average Flood Vulnerability Rating and ranks 61 out of the 102 Counties in Illinois in terms of loss estimation according to Hazus-MH for floods. Table 4-12 lists the jurisdictional Flood Vulnerability Ratings for Crawford County. Two jurisdictions of Crawford County surpass an average Flood Vulnerability Rating: Hutsonville and Palestine.

Table 4-12. Jurisdictional Flood Vulnerability Ranking for Crawford County

Jurisdiction	State Ranking	Flood Vulnerability Rating
Hutsonville	140	Elevated
Palestine	243	Elevated
Stoy	313	Average
Robinson	332	Average
Flat Rock	333	Average

Figure 4-3. County Flood Vulnerability Rating for Illinois



Because all floodplains are susceptible to flooding in Crawford County; therefore, the population and all buildings located within the floodplain are vulnerable to flooding. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable.

Risk Identification for Flood Hazard

Based on historical information and the Flood Vulnerability Rating, future occurrence of flooding in Crawford County is likely. Although historical information equates a lesser chance of flooding events per year for Crawford County, input from the Planning Team suggests flooding in this area of great magnitude and severity of damage and loss is a highly likely event. According to the Risk Priority Index (RPI) and County input, flooding ranked as the number one hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
4	x	2	=	8

Critical Facilities

All critical facilities within the floodplain are vulnerable to floods. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). Appendix E include a list of the critical facilities in Crawford County and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

All buildings within the floodplain are vulnerable to floods. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located within 100-year flood plain as vulnerable.

Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. The impacts to these items include: broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Hazus-MH Flood Analysis

Hazus-MH was utilized to generate the flood depth grid for a 100-year return period and made calculations by clipping the USGS one-third-arc-second DEM (~10 m) to the flood boundary. Next, Hazus-MH was used to estimate the damages for Crawford County by utilizing a detailed building inventory database created from assessor and parcel data.

According to this analysis, there are 223 buildings located in the Crawford County 100-year floodplain. The estimated damage to these structures is \$131 million. It should be noted that the results should be interpreted as degrees of loss rather than exact number of buildings exposed to flooding. Figure 4-4 depicts the building inventory within the 100-year floodplain and Table 4-13 shows the loss estimates by occupancy class.

Figure 4-4. Building Inventory Located within the 100-year Floodplain in Crawford County

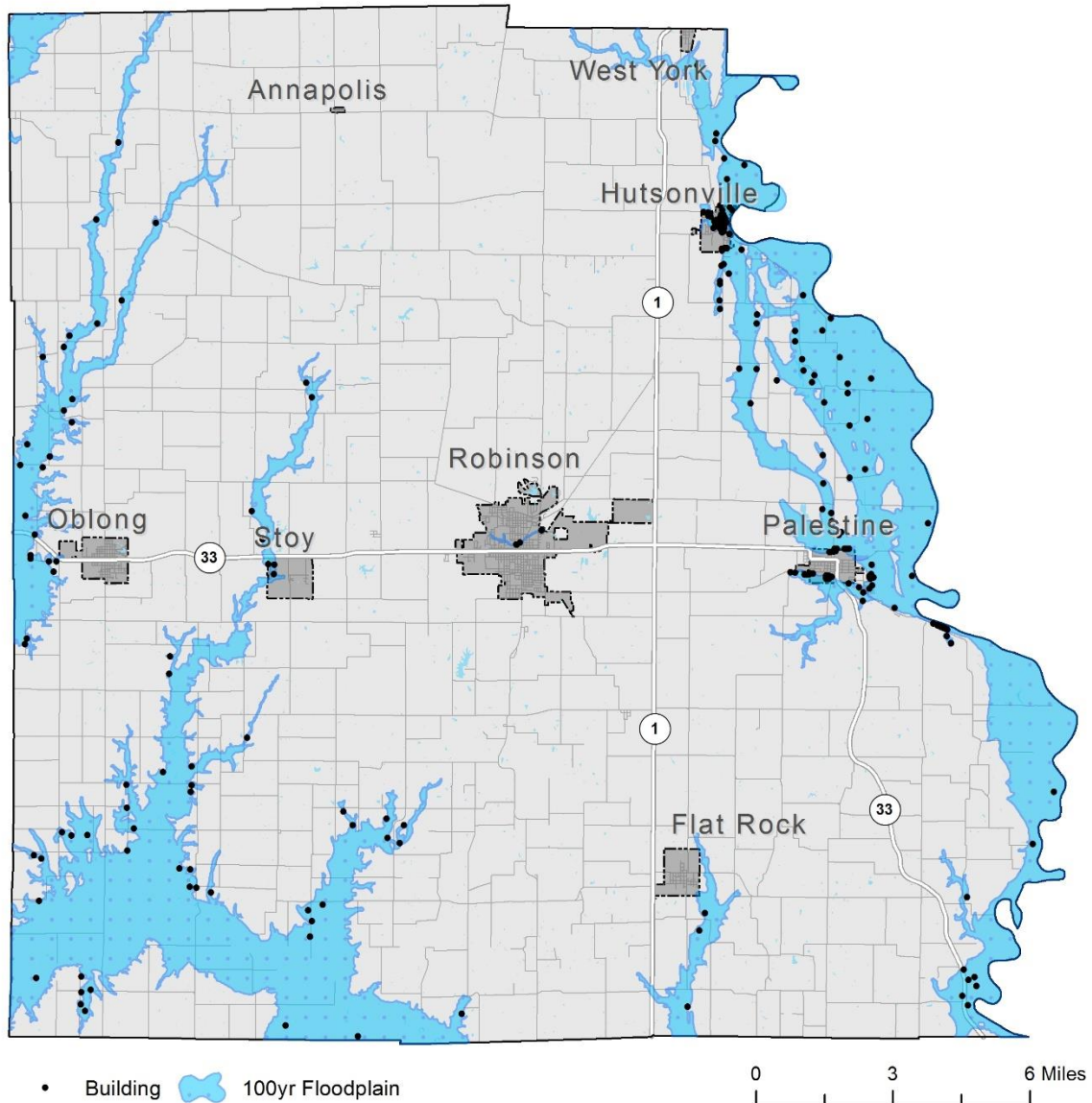


Table 4-13. Estimated Flood Losses within the 100-year Floodplain

Occupancy Class	Number of Structures	Estimated Building Related Losses
Residential	169	\$4,761,965
Commercial	12	\$102,750,119
Industrial	12	\$22,887,135
Agricultural	30	\$969,373
Total:	223	\$131,368,592

Essential Facilities Damage

The analysis identified zero essential facilities that are subject to flooding.

Vulnerability Analysis to Future Assets/Infrastructure

Flooding may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable. Table 4-8 includes the building exposure for Crawford County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Crawford County and Appendix F displays a large format map of the locations of all critical facilities within the county. Currently, the municipal planning commission reviews new developments for compliance with the local flood zoning ordinance. At this time no new construction is planned with the 100-year floodplain.

Suggestions for Community Development Trends

Reducing floodplain development is crucial to reducing flood-related damages. Areas with recent development may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible to drainage issues. Damage to these can cause back-up of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

4.3.3 Thunderstorm Hazard

Hazard Definition

Severe thunderstorms are weather events with one or more of the following characteristics: strong winds, large and damaging hail, and frequent lightning. Severe thunderstorms most frequently occur in Illinois during the spring and summer months, but can occur at any time. A severe thunderstorm's impacts can be localized or can be widespread in nature. A thunderstorm is classified as severe when it meets one or more of the following criteria:

Hail 0.75 inches or greater in diameter

Hail is a possible product of a strong thunderstorm. Hail usually falls near the center of a storm, but strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in damage in other areas near the storm. Hailstones range from pea-sized to baseball-sized, and some reports note hailstones larger than softballs.

Frequent and dangerous lightning

Lightning is a discharge of electricity from a thunderstorm. Lightning is often perceived as a minor hazard, but lightning damages many structures and kills or severely injures numerous people in the United States each year.

Wind speeds greater than or equal to 58 miles per hour

Straight-line winds from thunderstorms are fairly common in Illinois. Straight-line winds can cause damage to homes, businesses, power lines, and agricultural areas, and may require temporary sheltering of individuals who are without power for extended periods of time.

Previous Occurrences of Thunderstorm Hazards

The National Climatic Data Center (NCDC) database reported 54 hailstorms in Crawford County since 1950. Hailstorms occur nearly every year in the late spring and early summer months. The most recent reported occurrence was in April of 2012, when a warm front lifting northward into the area triggered scattered thunderstorms across south-central Illinois during the afternoon and evening of April 28th. Some of the storms produced large hail along and southwest of a Crawfordville to Robinson line. The largest reported

hailstones were the size of golf balls. Table 4-14 lists the significant hail storms (such as those that cause death, damage or injury) in Crawford County.

Table 4-14. Selected NCDC-Recorded Hail that Caused Damage, Death, or Injury in Crawford County

Location or County*	Date	Deaths	Injuries	Property Damage
Crawford County	6/12/1994	0	0	\$100
Robinson	7/15/1995	0	0	\$1,000
Total:		0	0	\$1,100

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

The NCDC database reported one lightning events in Crawford County. The reported event was in June 2011 when lightning strikes from an isolated thunderstorm produced damage to electrical equipment and computers at the Crawford County 9-1-1 center, and at several nearby businesses and a church. Table 4-15 identifies NCDC-recorded lightning that caused damage, death, or injury in Crawford County.

Table 4-15. Selected NCDC-Recorded Lightning that Caused Damage, Death, or Injury in Crawford County

Location or County*	Date	Deaths	Injuries	Property Damage
Crawford County	6/12/2011	0	0	\$100,000
Total:		0	0	\$100,000

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

The NCDC database reported 103 severe thunder- and wind storms in Crawford County. Table 4-16 identifies selected NCDC-recorded wind storms that caused major damage (over \$50,000), death, or injury in Crawford County.

Table 4-16. Selected NCDC-Recorded Thunder and Wind Storms that Caused Major Damage (over \$50,000), Death, or Injury in Crawford County

Location or County*	Date	Deaths	Injuries	Property Damage
Crawford County	4/16/2006	0	0	\$755,000
Crawford County	4/2/2006	0	0	\$120,000
Crawford County	6/27/2008	0	0	\$70,000
Crawford County	8/4/2009	0	0	\$75,000
Crawford County	7/19/2010	0	0	\$85,000
Crawford County	5/15/1984	0	1	\$0
Total:		0	1	\$1,105,000

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

Geographic Location of Thunderstorm Hazard

The entire county has the same risk for occurrence of thunderstorms. They can occur at any location within the county.

Hazard Extent for Thunderstorm Hazard

The extent of the hypothetical thunderstorms depends upon the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

Risk Identification for Thunderstorm Hazard

Based on historical information, the occurrence of future high winds, hail, and lightning is highly likely. The County should expect high winds, hail, and lightning of widely varying magnitudes in the future. According to the Crawford County Planning Team's assessment, severe thunderstorms are ranked as the number two hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
4	x	2	=	8

Vulnerability Analysis for Thunderstorm Hazard

The entire county's population and all buildings are vulnerable to a severe thunderstorm and can expect the same impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County.

Critical Facilities

All critical facilities are vulnerable to severe thunderstorms. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a damaged police station cannot serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect impacts similar to those discussed for critical facilities. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

A severe thunderstorm could impact roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that a severe thunderstorm could damage any number of these structures. The impacts to these structures include broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or impassable railways. Bridges could become impassable causing risk to motorists.

Potential Dollar Losses from Thunderstorm Hazard

According to the NCDC, Crawford County has incurred approximately \$1.5 million in damages relating to thunderstorms, including hail, lightning, and high winds since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained; however, based on average property damage in the past

decade, SIU estimates that Crawford County incurs property damages of approximately \$26,000 per year related to severe thunderstorms.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

All future development within the county and all communities will remain vulnerable to severe thunderstorm events.

Suggestions for Community Development Trends

Local officials could enhance severe storm preparedness if they sponsor a wide range of programs and initiatives to address the overall safety of county residents. It is suggested that the county should build new structures with more sturdy construction, and harden existing structures to lessen the potential impacts of severe weather. This is particularly import where the future economic expansion is expected to take place within the city limits of Robinson. Additional warning sirens can warn the community of approaching storms to ensure the safety of Crawford County residents and minimizing property damage.

4.3.4 Tornado Hazard

Hazard Definition

Tornadoes are violently rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently rotating column of air can reach the ground quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado.

Tornadoes are a significant risk to Illinois and its citizens. Tornadoes can occur at any time on any day. The unpredictability of tornadoes makes them one of Illinois' most dangerous hazards. Tornado winds are violently destructive in developed and populated areas. Current estimates place maximum wind velocity at about 300 miles per hour, but higher values can occur. A wind velocity of 200 miles per hour results in a pressure of 102.4 pounds per square foot—a load that exceeds the tolerance limits of most buildings. Thus, it is easy to understand why tornadoes can devastate the communities they hit.

Tornadoes are classified according to the Enhanced Fujita tornado intensity scale. The Enhanced Fujita scale ranges from intensity EF0, with effective wind speeds of 40 to 70 miles per hour, to EF5 tornadoes, with effective wind speeds of over 260 miles per hour. Table 4-17 outlines the Enhanced Fujita intensity scale.

Table 4-17. Enhanced Fujita Tornado Rating

Enhanced Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
0 Gale	40-72 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, signboards damaged, shallow-rooted trees blown over.
1 Moderate	73-112 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
2 Significant	113-157 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.

Enhanced Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
3 Severe	158-206 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
4 Devastating	207-260 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
5 Incredible	261-318 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Previous Occurrences of Tornadoes

There have been several occurrences of tornadoes in Crawford County during recent decades. The National Climatic Data Center (NCDC) database reported seventeen tornadoes/funnel clouds in Crawford County since 1950. Table 4-18 identifies NCDC-recorded tornadoes that caused damage, death, or injury in Crawford County. Additional details of individual hazard events are on the NCDC website.

Location or County*	Date	Scale	Deaths	Injuries	Property Damage
Crawford County	5/25/2011	EF2	0	0	\$920,000
Crawford County	4/26/1994	F0	0	0	\$50,000
Crawford County	6/2/1990	F1	0	0	\$25,000
Crawford County	6/20/1990	F1	0	0	\$25,000
Crawford County	5/19/1989	F1	0	0	\$2,500
Crawford County	3/6/1983	F0	0	0	\$250,000
Crawford County	5/31/1982	F0	0	1	\$250,000
Crawford County	3/20/1976	F1	0	0	\$25,000
Crawford County	5/30/1974	F2	0	0	\$2,500
Crawford County	5/30/1974	F0	0	0	\$2,500
Crawford County	4/21/1972	F1	0	0	\$25,000
Crawford County	10/24/1967	N/A	0	0	\$2,500
Crawford County	2/10/1959	F1	0	0	\$25,000
Total:			0	1	\$1,605,000

Table 4-18. NCDC-Recorded Tornadoes That Caused Damage, Death, or Injury in Crawford County

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

The most damaging tornado event occurred in May 2011 when a deep area of low pressure lifting from the plains into the Upper Midwest pulled a strong cold front eastward toward the Mississippi River during the afternoon of May 25th. Severe thunderstorms developed ahead of the cold front, as well as along a warm front lifting northward through the area. Many of the storms produced large hail up to the size of golf balls and damaging winds in excess of 60 mph. 6 tornadoes touched down across central Illinois, including an EF2 tornado that caused significant damage south of Robinson in Crawford County. A tornado touched down about 3 miles south of Robinson, and tracked to the northeast. Fourteen homes sustained damage, with three homes losing most of their roofs and one home pushed three feet off its

foundation. In addition, numerous outbuildings and garages were destroyed, numerous trees and power poles were blown down, and a large camper was rolled over.

Geographic Location for Tornado Hazard

The entire county has the same risk of tornado occurrence. Tornadoes can occur at any location within the county.

Hazard Extent for Tornado Hazard

Historical tornadoes generally moved from southwest to northeast across the county, although many other tracks are possible, from more southerly to northerly directions. The extent of the hazard varies in terms of the size of the tornado, its path, and its wind speed.

Risk Identification for Tornado Hazard

Based on historical information, the probability of future tornadoes in Crawford County is likely. The County should expect tornadoes with varying magnitudes to occur in the future. Although historical information equates for a more likely chance of a tornado event per year for Crawford County, input from the Planning Team suggests tornadoes in this area of great magnitude and severity of damage and loss is a possible event. According to the Risk Priority Index (RPI) and County input, tornadoes are ranked as the number three hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
2	x	4	=	8

Vulnerability Analysis for Tornado Hazard

Tornadoes can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County.

Critical Facilities

All critical facilities are vulnerable to tornadoes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts vary based on the magnitude of the tornado but can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can all expect the same impacts, similar to those discussed for critical facilities. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of building function (e.g., damaged home will no longer be habitable, causing residents to seek shelter).

Infrastructure

The types of infrastructure that could be impacted during a tornado include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that any number of these structures could become damaged during a tornado. The impacts to these structures include broken, failed, or impassable roadways, broken or failed utility lines (e.g., loss of power or gas to community), and railway failure from broken or impassable rail lines. Bridges could fail or become impassable, causing risk to motorists.

GIS-based Tornado Analysis

Two hypothetical tornado scenarios were conducted for Crawford County. The following analysis quantifies the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure damaged.

GIS-overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used two hypothetical path based upon two EF4 tornados: 12 miles through the Robinson and Hutsonville and 13 miles through Flat Rock and Palestine. Table 4-19 depicts tornado damage curves and path widths utilized for the modeled scenario. The damage curve is based on conceptual wind speeds, path winds, and path lengths from the Enhanced-Fujita Scale guidelines.

Table 4-19. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
5	2,400	100%
4	1,800	100%
3	1,200	80%
2	600	50%
1	300	10%
0	150	0%

Degrees of damage depend on proximity to the path centerline within a given tornado path. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. To model the EF4 tornados, two hypothetical tornado path were used in GIS with buffers added (damage zones) around the tornado path. Table 4-20 and Figure 4-5 illustrate the zone analysis. Figure 4-6 depicts the selected hypothetical tornado paths.

Table 4-20. EF4 Tornado Zones and Damage Curves

Zone	Buffer (feet)	Damage Curve
1	0-150	100%
2	150-300	80%
3	300-600	50%
4	600-900	10%

Figure 4-5. Tornado Analysis (Damage Curves) Using GIS Buffers

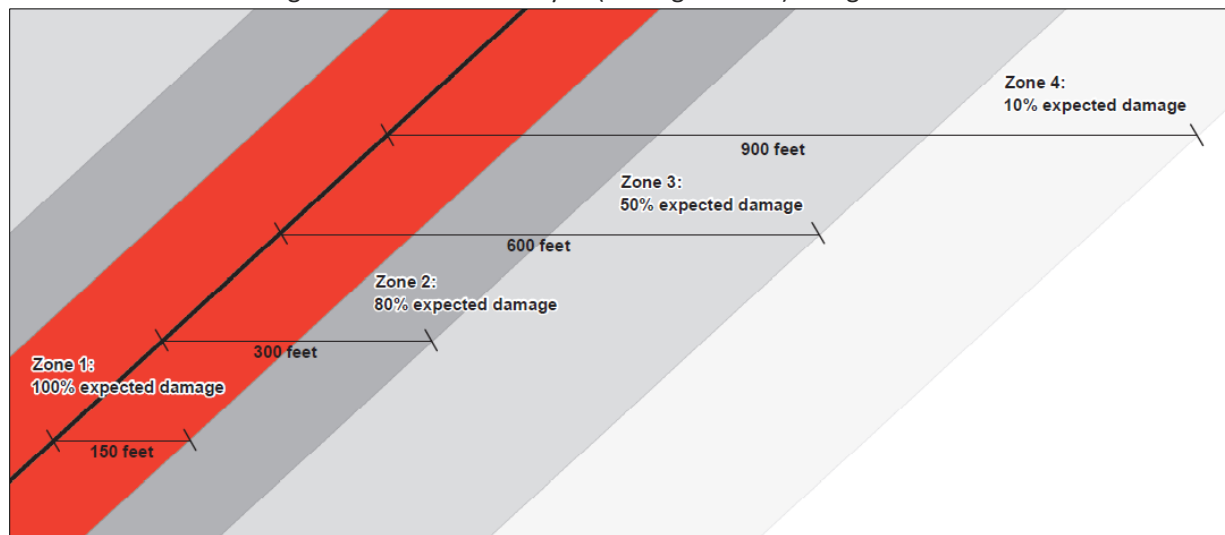
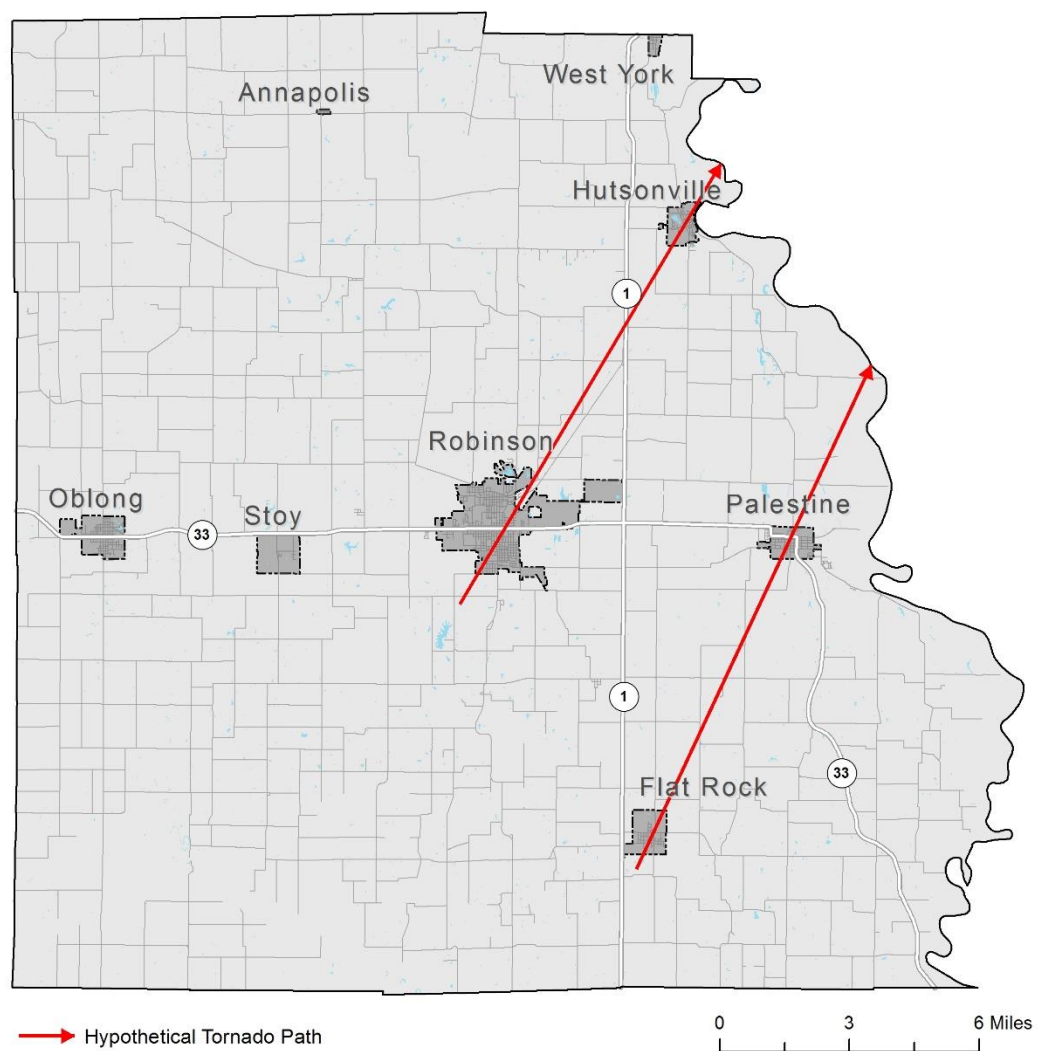


Figure 4-6. Modeled Hypothetical EF4 Tornado Tracks for Crawford County



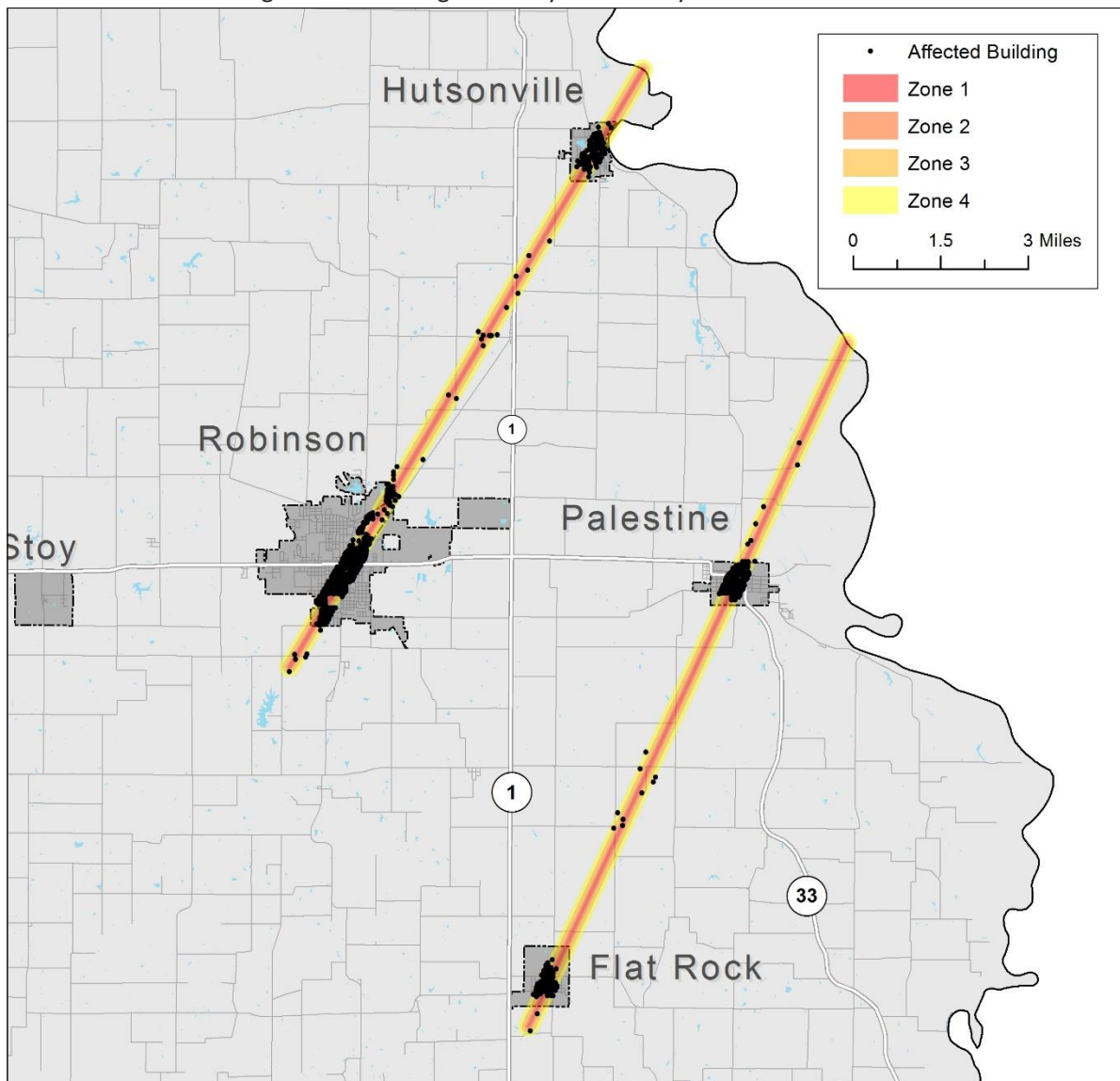
Modeled Impacts of the EF4 Tornadoes

The GIS analysis estimates that the combined modeled EF4 tornadoes would damage 1,377 buildings. The estimated building losses are over \$1.4 billion. The building losses are an estimate of building replacement costs multiplied by the damage percent. Table 4-21 and Figures 4-7 show the results of the EF4 tornado analysis.

Table 4-21. Estimated Building Loss by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	\$13,968,657	\$12,748,946	\$13,235,436	\$2,798,586
Agriculture	\$53,148	\$56,544	\$19,365	\$4,953
Commercial	\$507,021,534	\$263,860,090	\$498,384,654	\$110,921,594
Industrial	\$0	\$6,828	\$0	\$196,419
Total:	\$521,043,339	\$276,672,408	\$511,639,455	\$113,921,552

Figure 4-7. Building Inventory Affected by the EF4 Tornadoes



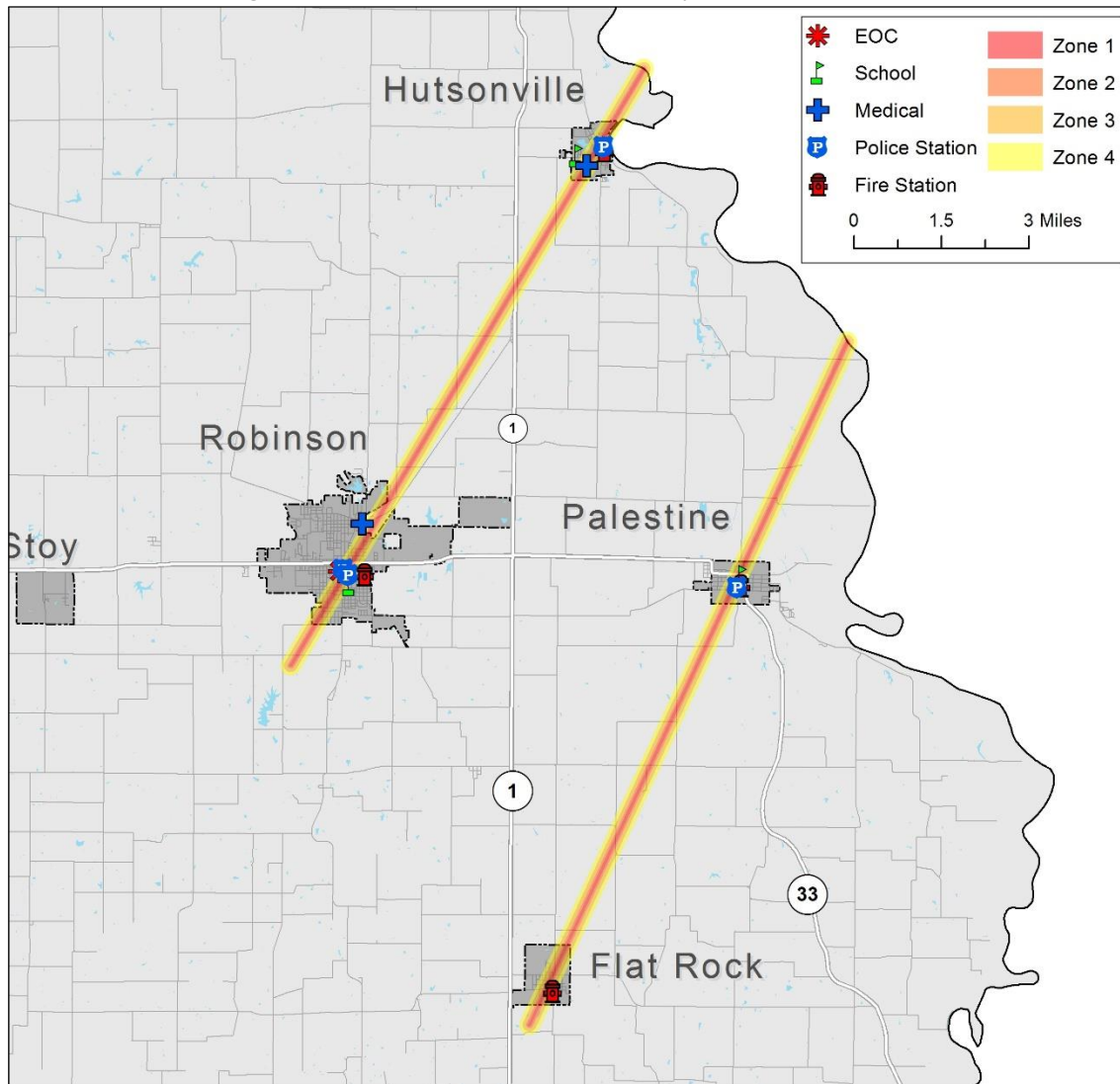
Essential Facilities Damage

There are fourteen essential facility located within 900 feet of the EF4 tornado paths. The affected facilities are identified in Table 4-22, and their geographic locations are shown in Figure 4-8.

Table 4-22. Essential Facilities Affected by the EF4 Tornadoes Modeled for Crawford County

Essential Facility	Facility Name
EOC	Crawford County ESDA
Medical	Heritage Shelter Care
	Cotillion Ridge Nursing Center
Schools	Palestine Grade School
	Lincoln Elementary School
	Hutsonville High School
Fire Departments	Flat Rock Fire Protection
	LaMotte Fire Protection
	Hutsonville Township Fire District
	Robinson Fire Department
Police Departments	Palestine Police Department
	Crawford County Sheriff's Department
	Robinson Chief of Police
	Hutsonville Police Department

Figure 4-8. Essential Facilities Affected by the EF4 Tornadoes



Vulnerability to Future Assets/Infrastructure for Tornado Hazard

The entire population and all buildings are at risk because tornadoes can occur anywhere within the state, at any time. Furthermore, any future development in terms of new construction within the county is at risk. Table 4-8 includes the building exposure for Crawford County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Crawford County and Appendix F displays a large format map of the locations of all critical facilities within the county.

Suggestions for Community Development Trends

Preparing for tornadoes will be enhanced if local officials sponsor a wide range of programs and initiative to address severe storm preparedness. It is suggested that the county should build new structures with more sturdy construction, and harden existing structures to lessen the potential impacts of severe weather. This is particularly important where future economic expansion is expected to take place within the city limits of Robinson. Additional warning sirens can warn the community of approaching storms to ensure the safety of Crawford County residents and minimizing property damage.

4.3.5 Earthquake Hazard

Hazard Definition

An earthquake is the shaking of the earth caused by the energy released when large blocks of rock slip past each other in the earth's crust. Most earthquakes occur at tectonic plate boundaries; however, some earthquakes occur in the middle of plates, for example the New Madrid Seismic Zone or the Wabash Valley Fault System. Both of these seismic areas have a geologic history of strong quakes, and an earthquake from either seismic area could possibly affect Illinois counties. There may be other, currently unidentified faults in the Midwest also capable of producing strong earthquakes.

Strong earthquakes can collapse buildings and infrastructure, disrupt utilities, and trigger landslides, avalanches, flash floods, fires, and tsunamis. When an earthquake occurs in a populated area, it may cause death, injury, and extensive property damage. An earthquake might damage essential facilities, such as fire departments, police departments, and hospitals, disrupting emergency response services in the affected area. Strong earthquakes may also require mass relocation; however, relocation may be impossible in the short-term aftermath of a significant event due to damaged transportation infrastructure and public communication systems.

Earthquakes are usually measured by two criteria: intensity and magnitude (M). Earthquake intensity qualitatively measures the strength of shaking produced by an earthquake at a certain location and is determined from effects on people, structures, and the natural environment. Earthquake magnitude quantitatively measures the energy released at the earthquake's subsurface source in the crust, or epicenter. Table 4-23 provides a comparison of magnitude and intensity, and Table 4-24 provides qualitative descriptions of intensity, for a sense of what a given magnitude might feel like.

Table 4-23. Comparison of Earthquake Magnitude and Intensity

Magnitude (M)	Typical Maximum Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II – III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.9	VII – IX
7.0 and higher	VIII or higher

Table 4-24. Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
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 of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
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, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

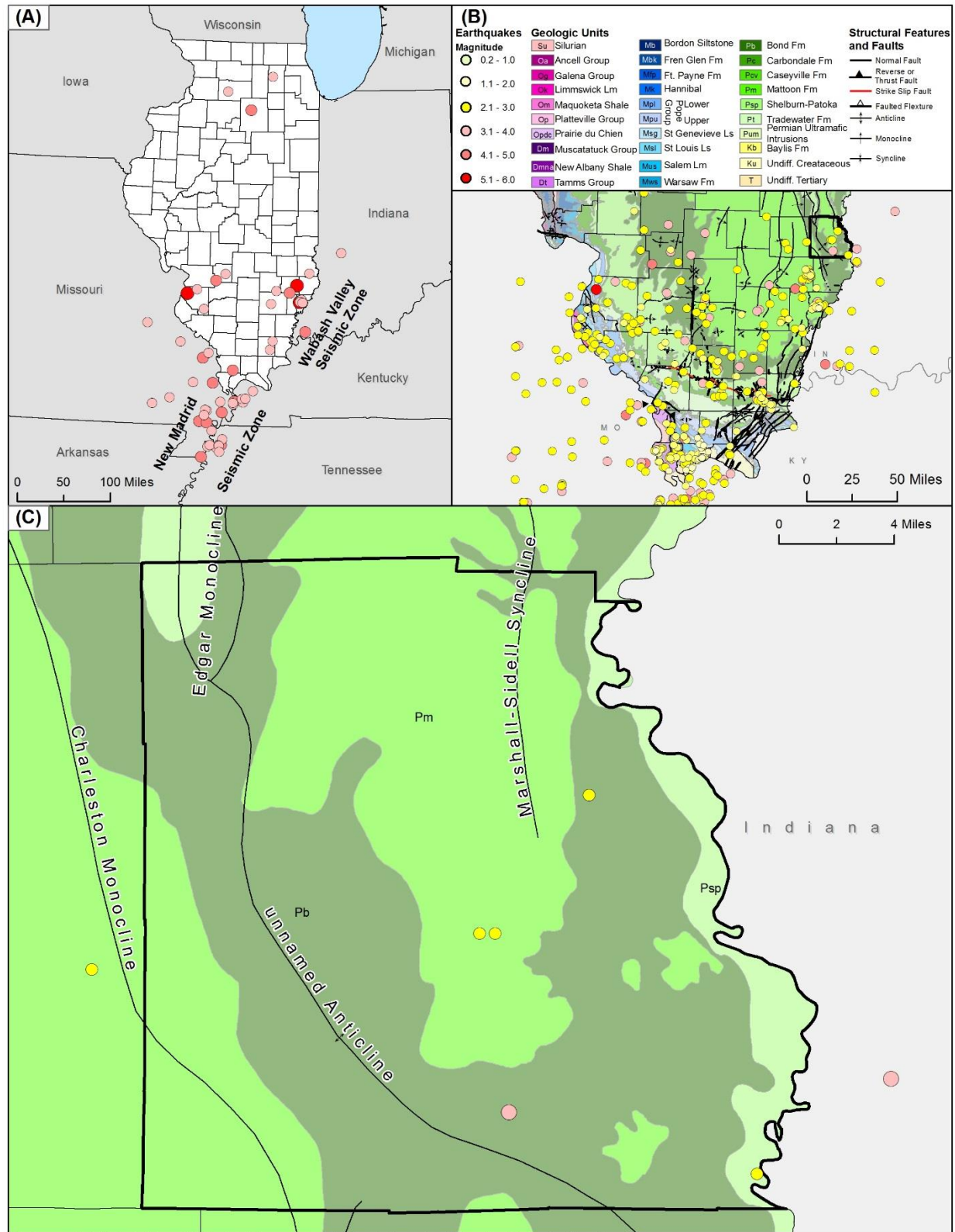
Mercalli Intensity	Description
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable 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.
XI	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.

Previous Occurrences for Earthquakes

Historically, the most significant seismic activity in Illinois is associated with New Madrid Seismic Zone. The New Madrid Seismic Zone produced three large earthquakes in the central U.S. with magnitudes estimated between 7.0 and 7.7 on December 16, 1811, January 23, 1812, and February 7, 1812. These earthquakes caused violent ground cracking and volcano-like eruptions of sediment (sand blows) over an area >10,500 km², and uplifted a 50 km by 23 km zone (the Lake County uplift). The shaking was felt over a total area of over 10 million km² (the largest felt area of any historic earthquake). The United States Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimate the probability of a repeat of the 1811-1812 type earthquakes (M7.5-8.0) is 7%-10% over the next 50 years (USGS Fact Sheet 2006-3125).

Earthquakes measured in Illinois typically vary in magnitude from microseismic events of M=1-3 to larger events up to M=5.4. Figure 4-9 depicts the following: (A) location of notable earthquakes in Illinois region; (B) generalized geologic bedrock map with earthquake epicenters and geologic structures; (C) geologic and earthquake epicenter map of Crawford County. The most recent earthquake in Illinois—as of the date of this report—was a M3.1 event in September 2017, approximately 8 miles W of Mt Carmel in Wabash County. The last earthquake in Illinois to cause minor damage occurred on April 18, 2008 near Mt. Carmel, IL and measured 5.2 in magnitude. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years and are historically concentrated in southern Illinois.

Figure 4-9. Notable Earthquakes in Illinois with Geologic and Earthquake Epicenters in Crawford County



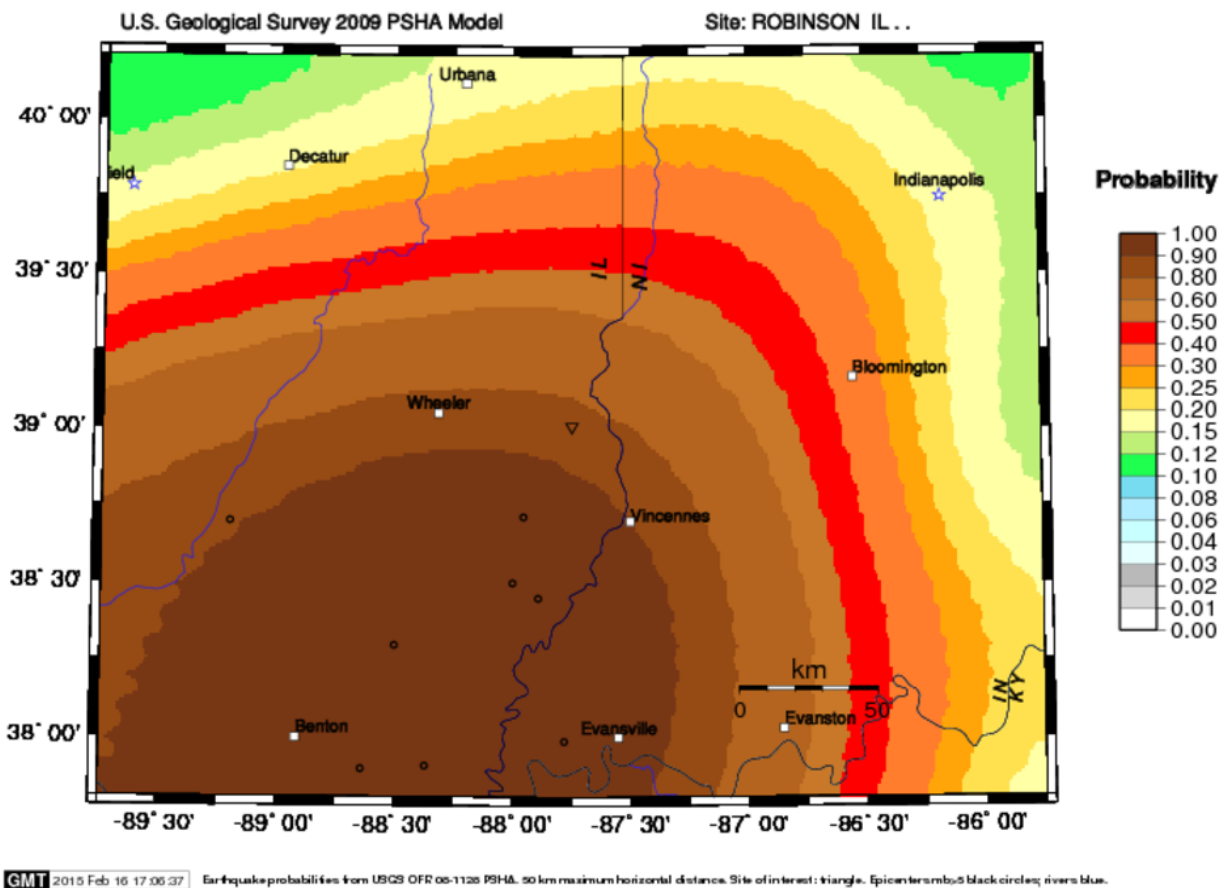
Data Sources: Illinois Geological Survey, U.S. Geological Survey, Center for Earthquake Research and Information at University of Memphis

Geographic Location for Earthquake Hazard

Crawford County is situated in a region susceptible to earthquakes. Since 1974, the epicenters of five small earthquakes (M2.4-M3.8) have been recorded in Crawford County (see Figure 4-9(C)). This local seismic activity is believed to be associated with the Wabash Valley Fault System.

The two most significant zones of seismic activity in Illinois are the New Madrid Seismic Zone and the Wabash Valley Fault System. Return periods for large earthquakes within the New Madrid System are estimated to be ~500–1000 years; moderate quakes between magnitude 5.5 and 6.0 can recur within approximately 150 years or less. The Wabash Valley Fault System extends nearly the entire length of southern Illinois and has the potential to generate an earthquake of sufficient strength to cause damage between St. Louis, MO and Indianapolis, IN. While large earthquakes ($>M7.0$) experienced during the New Madrid Events of 1811 and 1812 are unlikely in Crawford County, moderate earthquakes ($\leq 6.0M$) in or in the vicinity of Crawford County are probable. The USGS estimates the probability of a moderate M5.5 earthquake occurring in Crawford County within the next 500-years at approximately 60-100% (see Figure 4-10).

Figure 4-10. Probability of M5.5 Earthquake occurring in Crawford County within the next 500 years



Hazard Extent for Earthquake Hazard

Earthquake effects are possible anywhere in Crawford County. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. The National Earthquake Hazards Reduction Program (NEHRP) compliant soils map was provided by FEMA for the analysis. This map identifies the soils most susceptible to failure.

Risk Identification for Earthquake Hazard

Based on historical information and current USGS and SIU research and studies, future earthquakes in Crawford County are possible, but large (>M7.0) earthquakes that cause catastrophic damage are unlikely. According to the Crawford County Planning Team's assessment, earthquakes are ranked as the number four hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
2	x	6	=	12

Vulnerability Analysis for Earthquake Hazard

Earthquakes could impact the entire county equally; therefore, the entire county's population and all buildings are vulnerable to an earthquake. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County.

Critical Facilities

All critical facilities are vulnerable to earthquakes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts include structural failure and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure and loss of building function which could result in indirect impacts (e.g., damaged homes will no longer be habitable causing residents to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that shaking could impact include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure was not available for use in the earthquake models, it is important to emphasize that any number of these items could become damaged in the event of an earthquake. The impacts to these items include broken, failed, or impassable roadways, broken or failed utility lines (e.g., loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Hazus-MH Earthquake Analyses

Existing geological information was reviewed prior to the Planning Team selection of earthquake scenarios. A Magnitude 5.5 arbitrary earthquake scenario was performed to provide a reasonable basis for earthquake planning in Crawford County. The other two scenarios included a Magnitude of 7.7 with the epicenter located on the New Madrid Fault Zone and a Magnitude 7.1 with the epicenter located on the Wabash Fault Zone.

The earthquake-loss analysis for the probabilistic scenario was based on ground-shaking parameters derived from U.S. Geological Survey probabilistic seismic hazard curves for the earthquake with the 500-year return period. This scenario evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude typical of that expected for a 500-year return period. The New Madrid Fault Zone runs along the Mississippi River through Arkansas, Tennessee, Missouri, Kentucky and Southern Illinois. The Wabash Valley Fault Zone runs through Southeastern Illinois, Western Kentucky and Southwest Indiana. This represents a realistic scenario for planning purposes.

The earthquake hazard modeling scenarios performed:

- Magnitude 5.5 arbitrary earthquake epicenter in Crawford County
- Magnitude 7.7 event along the New Madrid Fault Zone
- Magnitude 7.1 event along the Wabash Valley Fault Zone

This report presents two types of building losses: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

Results for M5.5 Earthquake Scenario

The results of the M5.5 arbitrary earthquake scenario are depicted in Tables 4-25, 4-26, and Figure 4-11. Hazus-MH estimates that approximately 350 buildings will be at least moderately damaged. This is over 4% of the total number of buildings in the Crawford County. It is estimated that 5 buildings would be damaged beyond repair.

The total building related losses are approximately \$30.5 million dollars. It is estimated that 18% of the losses are related to the business interruption of the region. By far, the largest loss is sustained by the residential occupancies which make up over 57% of the total loss.

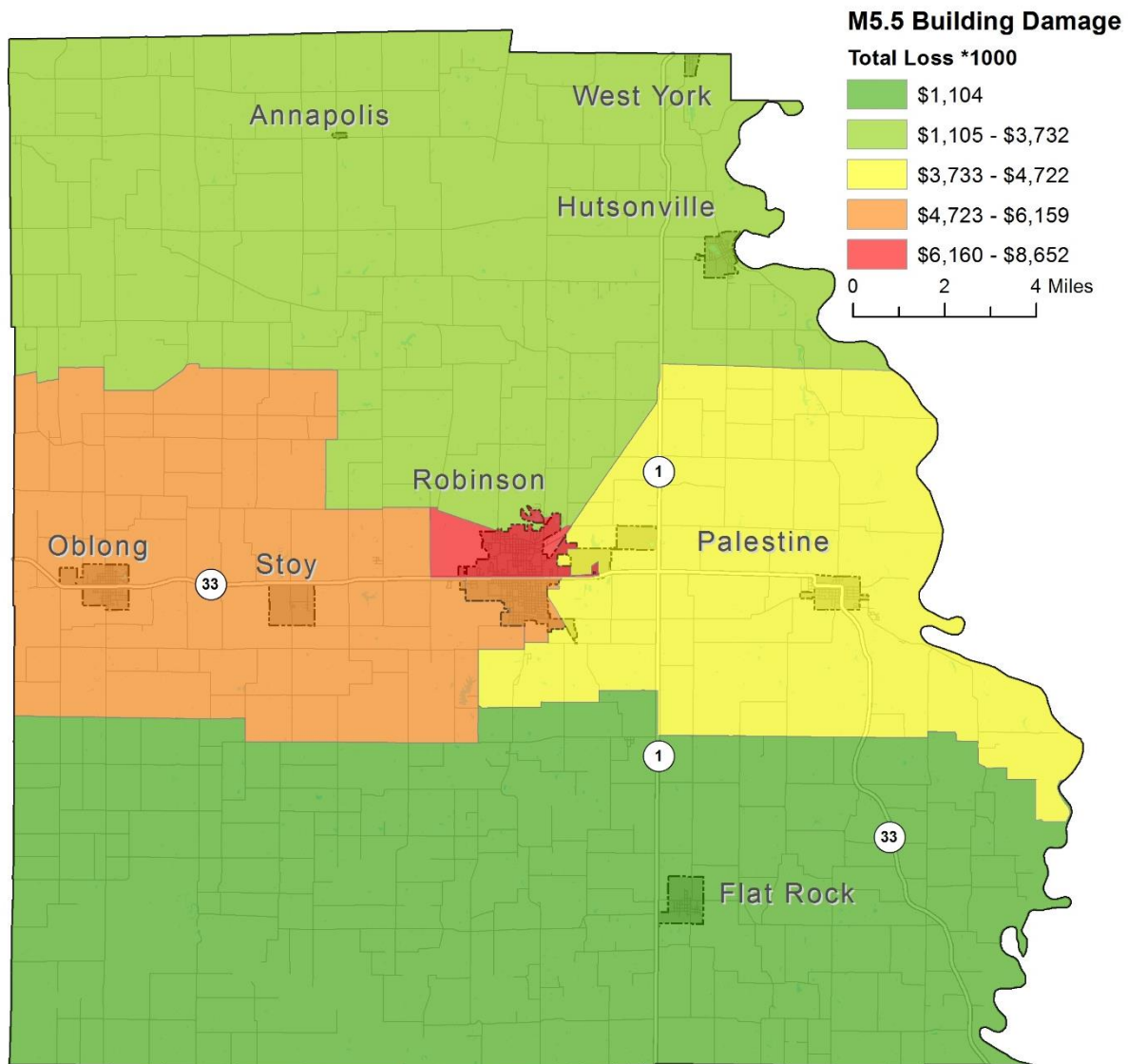
Table 4-25. M5.5 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	8	0.11	1	0.14	1	0.23	0	0.32	0	0.19
Commercial	90	1.27	16	2.01	9	2.86	2	4.05	0	2.91
Educational	2	0.03	0	0.05	0	0.08	0	0.1	0	0.11
Government	7	0.1	1	0.15	1	0.23	0	0.24	0	0.29
Industrial	14	0.2	2	0.29	1	0.48	0	0.69	0	0.4
Other Residential	743	10.46	142	17.82	90	30.08	8	17.28	0	7.77
Religion	13	0	2	0.25	1	0.36	0	0.53	0	0.49
Single Family	6,228	87.65	630	79.28	196	65.68	36	76.79	5	87.83
Total:	7,105		794		299		46		5	

Table 4-26. M5.5 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	\$0.00	\$0.07	\$0.97	\$0.03	\$0.08	\$1.15
	Capital-Related	\$0.00	\$0.03	\$0.77	\$0.02	\$0.03	\$0.85
	Rental	\$0.30	\$0.19	\$0.44	\$0.02	\$0.04	\$0.99
	Relocation	\$1.12	\$0.22	\$0.74	\$0.10	\$0.38	\$2.56
	Subtotal:	\$1.42	\$0.51	\$2.92	\$0.17	\$0.53	\$5.55
Capital Stock Losses	Structural	\$2.47	\$0.56	\$1.06	\$0.32	\$0.64	\$5.05
	Non-Structural	\$7.60	\$1.88	\$2.61	\$0.85	\$1.22	\$14.16
	Content	\$2.46	\$0.47	\$1.46	\$0.58	\$0.68	\$5.65
	Inventory	\$0.00	\$0.00	\$0.03	\$0.08	\$0.02	\$0.13
	Subtotal:	\$12.53	\$2.91	\$5.16	\$1.83	\$2.56	\$24.99
	Total:	\$13.95	\$3.42	\$8.08	\$2.00	\$3.09	\$30.54

Figure 4-11. Crawford County M5.5 Earthquake Building Economic Losses



Results for M7.7 New Madrid Earthquake

The results of the M7.7 New Madrid earthquake scenario are depicted in Tables 4-27, 4-28, and Figure 4-12. Hazus-MH estimates that approximately six buildings will be at least moderately damaged. It is estimated that zero buildings would be damaged beyond repair.

The total building related losses are approximately \$1.07 million dollars. It is estimated that 5% of the losses are related to the business interruption of the region. By far, the largest loss is sustained by the residential occupancies which make up over 50% of the total loss.

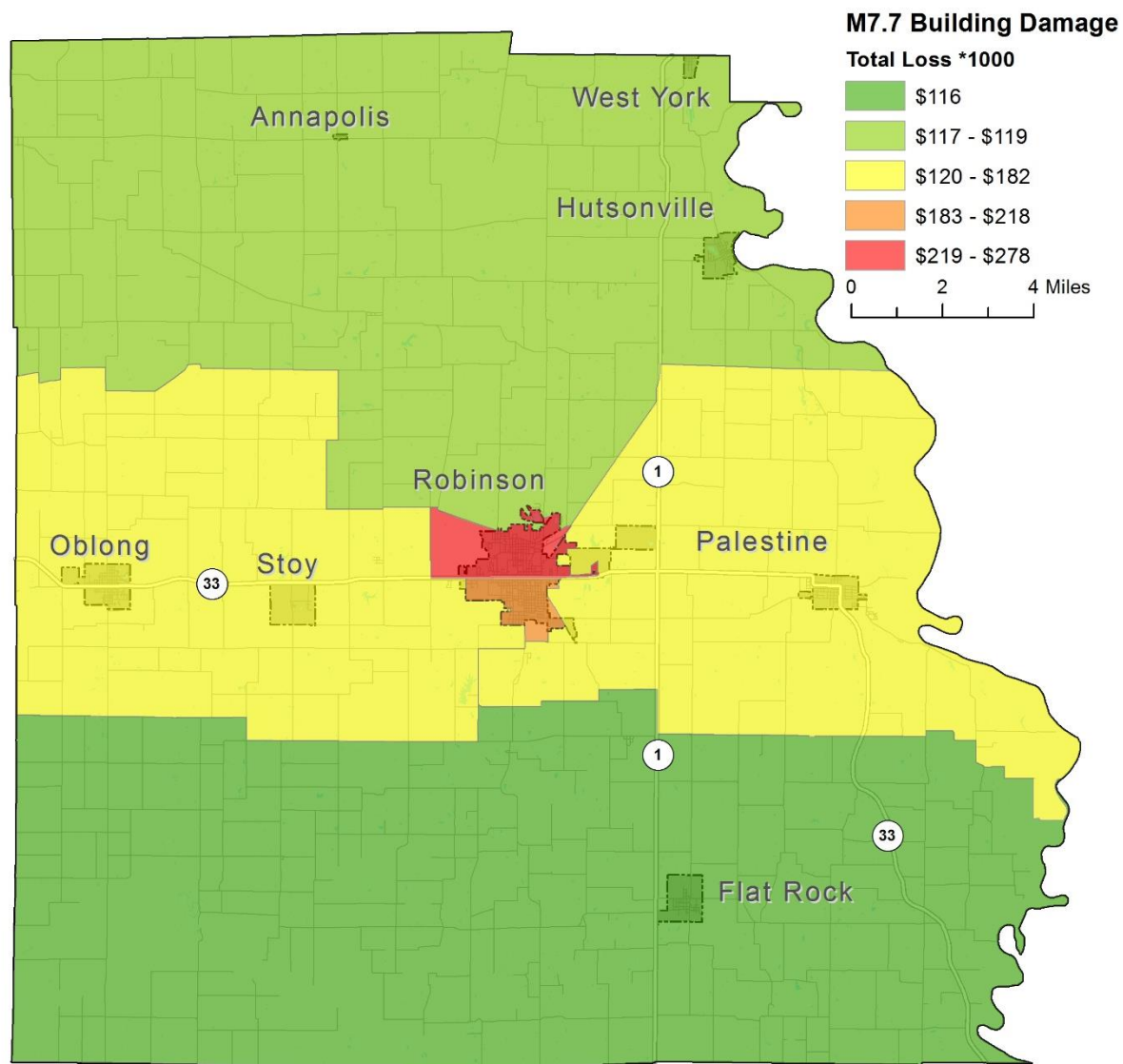
Table 4-27. New Madrid M7.7 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	126	1.14	2	1.62	0	2.55	0	2.76	0	0
Commercial	413	3.71	4	4.8	0	7.09	0	7.72	0	0
Educational	19	0.17	0	0.24	0	0.27	0	0.4	0	0
Government	18	0.16	0	0.2	0	0.26	0	0.34	0	0
Industrial	119	1.07	1	1.44	0	2.39	0	2.32	0	0
Other Residential	3,129	28.13	40	42.61	3	47.48	0	21.79	0	0
Religion	57	0.52	1	0.69	0	0.86	0	1.16	0	0
Single Family	7,243	65.11	45	48.41	2	39.08	0	63.5	0	0
Total:	11,124		93		5		0		0	

Table 4-28. New Madrid M7.7 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00	\$0.01
	Capital-Related	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00	\$0.01
	Rental	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00	\$0.01
	Relocation	\$0.01	\$0.00	\$0.01	\$0.00	\$0.00	\$0.02
	Subtotal:	\$0.01	\$0.00	\$0.04	\$0.00	\$0.00	\$0.05
Capital Stock Losses	Structural	\$0.03	\$0.01	\$0.01	\$0.00	\$0.01	\$0.06
	Non-Structural	\$0.24	\$0.08	\$0.14	\$0.06	\$0.06	\$0.58
	Content	\$0.13	\$0.03	\$0.11	\$0.05	\$0.05	\$0.37
	Inventory	\$0.00	\$0.00	\$0.00	\$0.01	\$0.00	\$0.01
	Subtotal:	\$0.40	\$0.12	\$0.26	\$0.12	\$0.12	\$1.02
	Total:	\$0.41	\$0.12	\$0.30	\$0.12	\$0.12	\$1.07

Figure 4-12. New Madrid M7.7 Earthquake Building Economic Losses



Results M7.1 Magnitude Wabash Valley Earthquake – General Building Stock

The results of the Wabash Valley M7.1 earthquake scenario are depicted in Tables 4-29, 4-30, and Figure 4-13. Hazus-MH estimates that approximately 4,722 buildings will be at least moderately damaged. This is over 42% of the buildings in the county. Fifty-three buildings would be damaged beyond repair.

The building related losses are approximately \$331 million dollars. It is estimated that 13% of the losses are related to the business interruption of the region. By far, the largest loss is sustained by the residential occupancies which make up over 61% of the total loss.

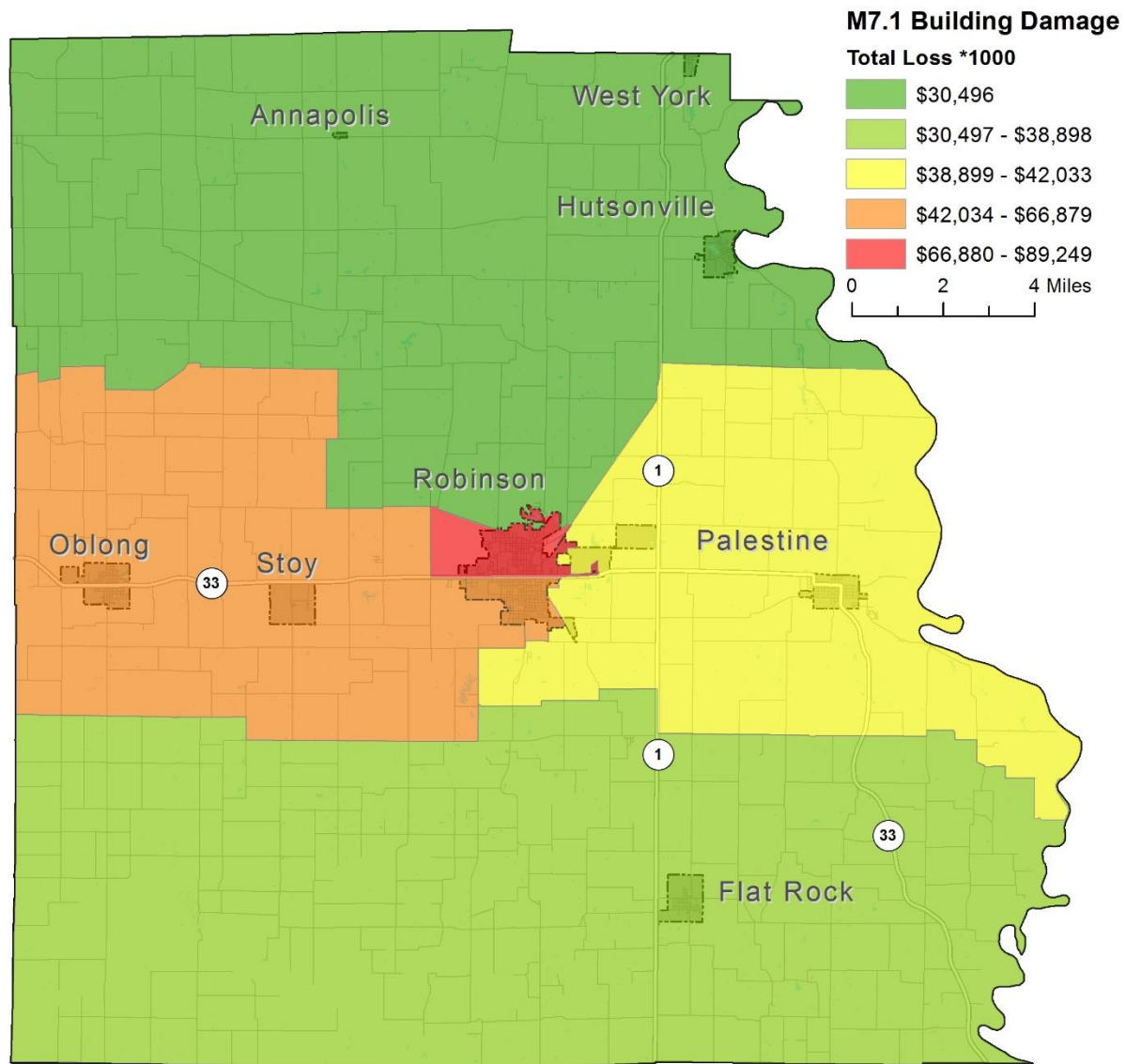
Table 4-29. Wabash Valley 7.1 Magnitude Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	10	0.69	31	0.63	62	1.56	23	3.20	1	2.79
Commercial	40	2.70	128	2.55	185	4.69	61	8.41	4	7.98
Educational	2	0.13	5	0.11	9	0.23	3	0.35	0	0.36
Government	2	0.14	5	0.10	8	0.21	2	0.30	0	0.28
Industrial	10	0.70	31	0.63	56	1.42	21	2.88	1	2.55
Other Residential	371	24.83	1,304	26.03	1221	30.98	259	35.65	17	31.00
Religion	6	0.38	19	0.38	25	0.64	8	1.06	1	1.08
Single Family	1,051	70.44	3,484	69.58	2376	60.27	350	48.15	29	53.96
Total:	1,492		5,007		3,942		727		53	

Table 4-30. Wabash 7.1 Magnitude Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	\$0.00	\$0.63	\$6.32	\$0.20	\$0.49	\$7.64
	Capital-Related	\$0.00	\$0.26	\$5.00	\$0.13	\$0.18	\$5.57
	Rental	\$2.98	\$1.40	\$2.75	\$0.12	\$0.30	\$7.55
	Relocation	\$11.57	\$1.61	\$5.01	\$0.69	\$2.62	\$21.50
	Subtotal:	\$14.55	\$3.90	\$19.08	\$1.14	\$3.59	\$42.26
Capital Stock Losses	Structural	\$13.42	\$2.89	\$4.75	\$1.48	\$3.17	\$25.71
	Non-Structural	\$84.82	\$21.01	\$27.33	\$11.10	\$12.09	\$156.35
	Content	\$51.45	\$8.89	\$23.25	\$9.79	\$10.93	\$104.31
	Inventory	\$0.00	\$0.00	\$0.58	\$1.78	\$0.43	\$2.79
	Subtotal:	\$149.69	\$32.79	\$55.91	\$24.15	\$26.62	\$289.16
	Total:	\$164.24	\$36.69	\$74.99	\$25.29	\$30.21	\$331.42

Figure 4-13. Wabash Valley M7.1 Scenario Building Economic Losses



Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

New construction, especially critical facilities, should accommodate earthquake mitigation design standards.

Suggestions for Community Development Trends

Community development should occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. It is important to harden and protect future and existing structures against the possible termination of public services and systems including power lines, water and sanitary lines, and public communication.

4.3.6 Winter Storm Hazard

Hazard Definition of Winter Storm Hazard

Severe winter weather consists of various forms of precipitation and weather conditions. This may include one or more of the following: freezing rain, sleet, heavy snow, blizzards, icy roadways, extreme low temperatures, and strong winds. These conditions can cause human health risks such as frostbite, hypothermia, or death and cause property damage and disrupt economic activity.

Ice or sleet, even in small quantities, can result in hazardous driving conditions and can cause property damage. Sleet involves raindrops that freeze completely before reaching the ground. Sleet does not stick to trees and wires. Ice storms, on the other hand, involve liquid rain that falls through subfreezing air and/or onto sub-freezing surfaces, freezing on contact with those surfaces. The ice coats trees, buildings, overhead wires, and roadways, sometimes causing extensive damage.

Ice storms are some of the most damaging winter storms in Illinois. Ice storms occur when moisture-laden Gulf air converges with the northern jet stream causing freezing rain that coats power and communication lines and trees with heavy ice. Strong winds can cause the overburdened limbs and cables to snap; leaving large sectors of the population without power, heat, or communication.

Rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility, characterize significant snowstorms. A blizzard is categorized as a snow storm with winds of 35 miles per hour or greater and/or visibility of less than one-quarter mile for three or more hours. Strong winds during a blizzard blow falling and fallen snow, creating poor visibility and impassable roadways. Blizzards potentially result in property damage.

Blizzards repeatedly affect Illinois. Blizzard conditions cause power outages, loss of communication, and transportation difficulties. Blizzards can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous if not deadly.

Severe cold involves ambient air temperatures that drop to 0°F or below. These extreme temperatures can increase the likelihood of frostbite and hypothermia. High winds during severe cold events can enhance the air temperature's effects. Fast winds during cold weather events can lower the wind chill factor (how cold the air feels on your skin). As a result, the time it takes for frostbite and hypothermia to affect a person's body will decrease.

Previous Occurrences of Winter Storm Hazard

The NCDC database reported twenty-eight winter storm and extreme cold events for Crawford County since 1950. The most recent reported event occurred in January 2014 when a bitterly cold airmass spilled into central and southeast Illinois on January 6th and 7th after passage of an Arctic cold front. Due to clearing skies and diminishing winds over a fresh snow cover record low temperatures of -10 to -20 were established across much of the area on the morning of January 6th. In addition to the extremely cold temperatures northwesterly winds created dangerous wind-chill readings of -35 to -45. As a result schools and numerous businesses closed for the day. Several locations also activated warming centers for those without heat. Table 4-31 identifies NCDC-recorded winter storm events that caused damage, death, or injury in Crawford County.

Table 4-31. NCDC-Recorded Winter Storms that Caused Damage, Death, or Injury in Crawford County

Location or County*	Date	Deaths	Injuries	Property Damage
Crawford County	3/24/2013	2	0	\$0
Crawford County	2/1/2011	0	0	\$600,000
Crawford County	12/15/2010	0	1	\$0
	12/13/2000	1	1	\$0
Total:		3	2	\$600,000

Geographic Location of Winter Storm Hazard

Severe winter storms are regional in nature. Most of the NCDC data are calculated regionally or in some cases statewide.

Hazard Extent of Winter Storm Hazard

The extent of the historical winter storms varies in terms of storm location, temperature, and ice or snowfall. A severe winter storm can occur anywhere in the county.

Risk Identification of Winter Storm Hazard

Based on historical information, the probability of future winter storms in Crawford County is likely. The county should expect winter storms with varying magnitudes to occur in the future. Winter storms ranked as the number five hazard according to the Crawford County Planning Team's risk assessment.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
3	x	2	=	6

Vulnerability Analysis of Winter Storm Hazard

Winter storm impacts are equally likely across the entire county; therefore, the entire county is vulnerable to a winter storm and can expect impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County.

Critical Facilities

All critical facilities are vulnerable to winter storms. A critical facility will encounter many of the same impacts as other buildings within the county. These impacts include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow. Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The impacts to the general buildings within the county are similar to the damages expected to the critical facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

Infrastructure

During a winter storm, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important

to emphasize that a winter storm could impact any structure. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

Potential Dollar Losses from Winter Storm Hazard

According to the NCDC, Crawford County has incurred approximately \$600,000 in damages relating to winter storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained; however, based on average property damage in the past decade, SIU estimates that Crawford County incurs property damages of approximately \$10,000 per year related to winter storms, including sleet/ice and heavy snow.

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

Any new development within the county will remain vulnerable to these events.

Suggestions for Community Development Trends

Because winter storm events are regional in nature, future development across the county will also face winter storms.

4.3.7 Drought and Extreme Heat Hazard

Hazard Definition for Drought Hazard

Drought is a normal climatic phenomenon that can occur across the state of Illinois and within Crawford County. The meteorological condition that creates a drought is sustained below-normal rainfall. Excessive heat can lead to increased evaporation, which enhances drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low-rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or longer).

The severity of a drought depends on location, duration, and geographical extent. Additionally, drought severity depends on the water supply, usage demands by human activities, vegetation, and agricultural operations. Droughts will affect the quality and quantity of crops, livestock, and other agricultural assets. Droughts can adversely impact forested areas leading to an increased potential for extremely destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that exceed the average high for the area by 10°F or more for the last for several weeks. Such extreme heat can have severe implications for humans. Below are common terms associate with extreme heat:

Heat Wave

Prolonged period of excessive heat often combined with excessive humidity.

Heat Index

A number, in degrees Fahrenheit, which estimates how hot it feels when relative humidity is added to air temperature. Exposure to full sunshine can increase the heat index by 15°F.

Heat Cramps

Muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are often the first signal that the body is having trouble with heat.

Heat Exhaustion

Typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs, resulting in a form of mild shock. If left untreated, the victim's condition will worsen. Body temperature will continue to rise, and the victim may suffer heat stroke.

Heat and Sun Stroke

A life-threatening condition. The victim's temperature control system, which produces sweat to cool the body, stops working. The body's temperature can rise so high that brain damage and death may result if the body is not cooled quickly.

Previous Occurrences for Drought and Extreme Heat

The NCDC database reported eighteen drought/heat wave events in Crawford County since 1950. The most recent recorded event occurred summer 2012. The drought was only eased when remnants of Hurricane Isaac brought widespread rain totals of 2 to 4 inches from September 1st through 3rd. This was followed by additional rainfall throughout the month that resulted in much of the area being downgraded to the Moderate Drought category (D1) or better. Eight west-central Illinois counties along and northwest of a Marshall to Lincoln line remained in the Severe Drought category (D2) through the end of the month. Total crop losses from the extended drought across central and southeast Illinois was estimated to be \$1.2 billion. Thanks to beneficial rainfall of 2 to 4 inches from the remnants of Hurricane Isaac, Crawford County was downgraded to the Moderate Drought category (D1) on September 13th. Total damage to the corn crop was estimated at \$30.4 million. Table 4-32 identifies NCDC-recorded drought/heat wave events that caused damage, death, or injury in Crawford County.

Table 4-32. NCDC-recorded Extreme Heat Events that caused Death, Crop Damage or Injury in Crawford County

Date	Deaths	Injuries	Crop Damage
9/1/2012	0	0	\$30,400,000
7/23/2011	1	0	\$0
Total:	1	0	\$30,400,000

Geographic Location for Drought and Extreme Heat

Droughts are regional in nature. Most areas of the United States are vulnerable to the risk of drought and extreme heat.

Hazard Extent for Drought and Extreme Heat

The extent of droughts or extreme heat varies both depending on the magnitude and duration of the heat and the range of precipitation.

Risk Identification for Drought and/or Extreme Heat

Based on historical information, the occurrence of future droughts and/or prolonged extreme heat is likely. The County should expect extreme heat and prolonged periods of less than average rainfall in the future. Although historical information equates for a more likely chance of drought and/or extreme heat events per year for Crawford County, input from the Planning Team suggests drought and/or extreme heat in this area of great magnitude and severity of damage and loss is a possible event. According to the

Risk Priority Index (RPI) and County input, drought and/or extreme heat are ranked as the number six hazard.

Risk Priority Index				
Probability	x	Magnitude	=	RPI
2	x	2	=	4

Vulnerability Analysis for Drought and Extreme Heat

Drought and extreme heat are a potential threat across the entire county; therefore, the county is vulnerable to this hazard and can expect impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat. Young children, elderly, and hospitalized populations have the greatest risk. The entire population and all buildings are at risk. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County. Even though the exact areas affected are not known, a discussion of the potential impact are detailed below.

Critical Facilities

All critical facilities are vulnerable to drought. A critical facility will encounter many of the same impacts as any other building within the jurisdiction, which should involve little or no damage. Potential impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather. Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather.

Infrastructure

During a drought, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with fire, which could result from hot, dry conditions. Since the county's entire infrastructure is vulnerable, damage to any infrastructure is possible. The impacts to these items include: impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or impassable railways. Bridges could become impassable, causing risk to motorists.

Potential Dollar Losses from Drought and Extreme Heat

According to the NCDC, Crawford County has experienced \$30.4 million in crop damages relating to drought and extreme heat events storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses

related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained.

Vulnerability to Future Assets/Infrastructure from Drought/Extreme Heat Hazard

Future development will remain vulnerable to droughts. Typically, some urban and rural areas are more susceptible than others. For example, urban areas are subject to water shortages during periods of drought. Excessive demands of densely populated areas put a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of heat and drought. Dry conditions can lead to the ignition of wildfires that could threaten residential, commercial, and recreational areas.

Suggestion of Community Development Trends

Because droughts and extreme heat are regional in nature, future development is susceptible to drought. Although urban and rural areas are equally vulnerable to this hazard, those living in urban areas may have a greater risk from the effects of a prolonged heat wave. The atmospheric conditions that create extreme heat tend to trap pollutants in urban areas, adding contaminated air to the excessively hot temperatures and creating increased health problems. Furthermore, asphalt and concrete store heat longer, gradually releasing it at night and producing high nighttime temperatures. This phenomenon is known as the “urban heat island effect.”

Local officials should address drought and extreme heat hazards by educating the public on steps to take before and during the event—for example, temporary window reflectors to direct heat back outside, staying indoors as much as possible, and avoiding strenuous work during the warmest part of the day.

4.3.8 Hazardous Material Storage and Transportation Hazard

Hazard Definition

Illinois has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances across county and state lines every day. Transporting chemicals and substances along interstate routes is commonplace in Illinois. The rural areas of Illinois have considerable agricultural commerce, meaning transportation of fertilizers, herbicides, and pesticides is common on rural roads. These factors increase the chance of hazardous material releases and spills throughout the state of Illinois.

The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion can potentially cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. Emergency response may require fire, safety/law enforcement, search and rescue, and hazardous materials units.

Previous Occurrences of Hazardous Materials Storage and Transportation Hazard

Crawford County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in multiple deaths or serious injuries.

The Illinois Emergency Management Agency maintains a comprehensive Hazardous Materials Incident Report Database for the State of Illinois. The database contains information on all Hazardous Materials

Reports since 1987 but does not include an assessment of economic and property losses in terms of dollars of damage. The database reported 616 incidents in Crawford County as of February 2015. The most recent event occurred in September 2014 following an incident in Oblong when involving the Crawford County Oil LLC's pipeline. A release was caused by a split in the pipe due to fatigue. It is estimated that 5 or 6 barrels of oil and an unknown amount of salt water was released into Brush Creek and surrounding contaminated soil. The soil was remediated and the Brush Creek was bermed and flushed. VAC trucks were used to collect free product. Additional details of individual hazard events are on the IEMA website.

Industries regulated by The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) are required to report incidents which meet or exceed established reporting criteria. The data for reported incidents are available on the PHMSA website via the U.S. Department of Transportation Hazmat Intelligence Portal. The database reported 27 incidents in Crawford County as of February 2015. Table 4-33 identifies PHMSA reported incidents that caused damage, death, or injury in Crawford County. Additional details of individual hazard events are on the PHMSA website.

The most damaging event occurred in 2003 when a semi driver in Allerton neglected to close a valve while pumping off. Approximately 200 gallons of diesel fuel spilled. The product did not reach waterways or sewers. Damage estimates are approximately \$46,000. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses.

Table 4-33. Selected PHMSA-Recorded Hazardous Material Incidents that Caused Damage, Death, or Injury

Location	Date	Mode of Transportation	Hazardous Material Class	Death	Injuries	Damages*
Robinson	10/30/2003	Highway	Flammable - Combustible Liquid	0	0	\$46,300
Hutsonville	6/21/1994	Highway	Miscellaneous Hazardous Material	1	0	\$32,800
Robinson	4/6/1990	Highway	Corrosive Material	0	0	\$7,494
Robinson	1/15/2009	Highway	Combustible Liquid	0	0	\$5,715
Hutsonville	6/10/2002	Highway	Nonflammable Compressed Gas	0	0	\$2,496
Robinson	8/30/1990	Highway	Corrosive Material	0	0	\$1,050
Robinson	9/12/2002	Highway	Combustible Liquid	0	0	\$1,000
Totals:				1	0	\$96,855

Source: U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration

*Damages includes the cost of the material lost, carrier damage, property damage, response costs, and remediation cleanup costs.

Geographic Location of Hazardous Materials Storage and Transportation Hazard

Hazardous material hazards are countywide and are primarily associated with the transport of materials via highway, railroad, and/or river barge.

Hazard Extent of Hazardous Materials Storage and Transportation Hazard

The extent of the hazardous material hazard varies both in terms of the quantity of material being transported as well as the specific content of the container.

Risk Identification of Hazardous Materials Storage and Transportation Hazard

Based on input from the Planning Team, future occurrence of hazardous materials accident in Crawford County is likely. According to the Risk Priority Index (RPI) and County input, hazardous materials storage and transportation hazard is ranked as the number seven hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
2	x	2	=	4

Vulnerability Analysis for Hazardous Materials Storage and Transportation Hazard

The entire county is vulnerable to a hazardous material release and can expect impacts within the affected area. The main concern during a release or spill is the affected population. This plan will therefore consider all buildings located within the county as vulnerable. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Crawford County.

Critical Facilities

All critical facilities and communities within the county are at risk. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged police station can no longer serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure due to fire or explosion or debris, and loss of function of the building (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

During a hazardous material release, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that a hazardous materials release could damage any number of these items. The impacts to these items include: broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); and railway failure from broken or impassable railways. Bridges could become impassable causing risk to motorists.

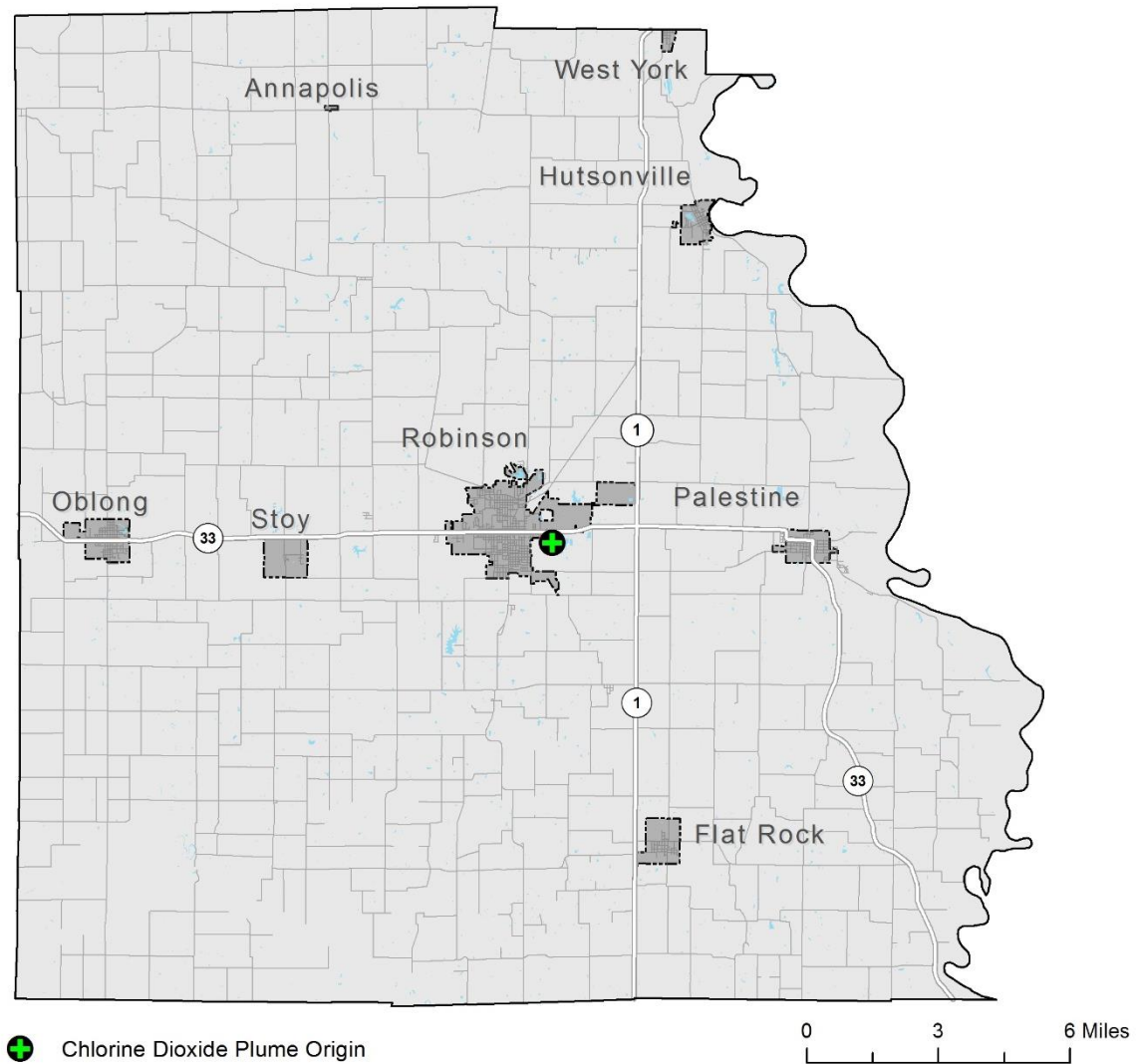
ALOHA Hazardous Chemical Release Analysis

The U.S. Environmental Protection Agency's ALOHA (Areal Locations of Hazardous Atmospheres) model was used to assess the impacted area for chlorine release at Marathon Petroleum Refining Plant in Robinson. ALOHA is a computer program designed for response to chemical accidents, as well as emergency planning and training. The Crawford County Planning Team selected the Marathon Petroleum Refining Plant in Robinson because crude oil is processed and refined into more useful products such as gasoline, distillates, propane, aromatics, slurry, anode-grade coke, propylene and sulfur. Approximately

212,000 barrels per day are refined at the plan. The products are distributed via pipeline, transport truck and rail through Crawford County. Chlorine is a common chemical transported via truck and rail.

For the chlorine scenario, SIU assumed average atmospheric and climatic conditions for the spring season with a breeze from the southeast. SIU considered the seasonal conditions upon the request of the Planning Team and obtained average monthly conditions for the Lawrenceville Airport from NOAA's Monthly Weather Summary. Figures 4-14 depicts the plume origin of the modeled hazardous chemical release in Crawford County. The ALOHA atmospheric modeling parameters for the chlorine release, depicted in Figure 4-15, were based upon a southeasterly speed of 9.2 miles per hour. The temperature was 56°F with 75% humidity and a cloud cover of five-tenths skies. SIU used average weather conditions for the month of April reported from NOAA for wind direction, wind speed, and temperature to simulate spring conditions.

Figure 4-14. ALOHA Modeled Hazardous Chemical Plume Origin in Crawford County



The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to 8 feet and the length set to 33 feet (12,408 gallons). At the time of its release, it was estimated that the tank was 75% full. The chlorine in this tank is in its liquid state. This release was based on a leak from a 2.5-inch-diameter hole, 12 inches above the bottom of the tank. According to these ALOHA parameters, this scenario would release approximately 9,350 pounds of material per minute. Figure 4-15 shows the plume modeling parameters in greater detail.

Figure 4-15. ALOHA Modeling Parameters for Chlorine Release

```
SITE DATA:
Location: ROBINSON, ILLINOIS
Building Air Exchanges Per Hour: 0.89 (unsheltered single storied)
Time: February 5, 2015 1356 hours CST (user specified)

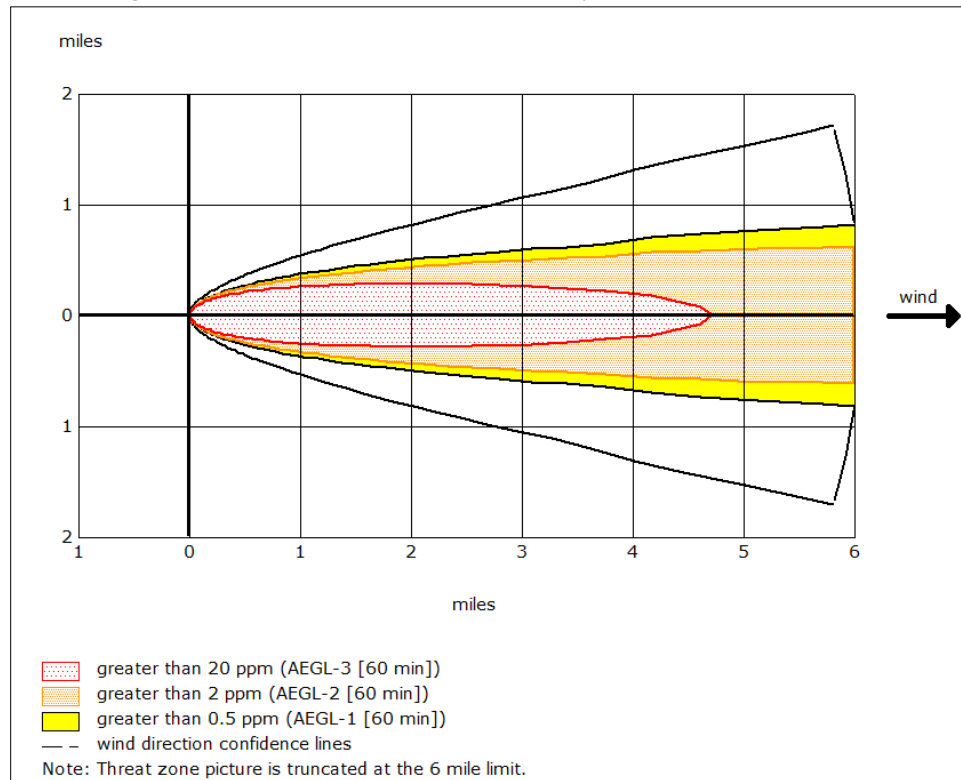
CHEMICAL DATA:
Chemical Name: CHLORINE                      Molecular weight: 70.91 g/mol
AEGL-1 (60 min): 0.5 ppm  AEGL-2 (60 min): 2 ppm  AEGL-3 (60 min): 20 ppm
IDLH: 10 ppm
Ambient Boiling Point: -30.0° F
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 9.2 miles/hour from ESE at 10 feet
Ground Roughness: open country                Cloud Cover: 5 tenths
Air Temperature: 56° F                        Stability Class: D
No Inversion Height                           Relative Humidity: 75%

SOURCE STRENGTH:
Leak from hole in horizontal cylindrical tank
Non-flammable chemical is escaping from tank
Tank Diameter: 8 feet                        Tank Length: 33 feet
Tank volume: 12,408 gallons
Tank contains liquid                         Internal Temperature: 56° F
Chemical Mass in Tank: 55.7 tons             Tank is 75% full
Circular Opening Diameter: 2.5 inches
Opening is 12 inches from tank bottom
Release Duration: 18 minutes
Max Average Sustained Release Rate: 9,350 pounds/min
(averaged over a minute or more)
Total Amount Released: 103,231 pounds
Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).
```

Using the parameters in Figure 4-13, approximately 103,231 pounds of material would be released. The image in Figure 4-14 depicts the plume footprint generated by ALOHA. As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million.

Figure 4-14. ALOHA Generate Plume Footprint of Chlorine Scenario



The AEGL-3 threat zone travels 4.7 miles and the remaining threat zones extend greater than 6 miles from the point of release. The dashed line depicts the level of confidence within the confines of the entire plume footprint. The ALOHA model is 95% confident that the release will stay within this boundary.

Acute Exposure Guideline Levels (AEGL) are intended to describe the risk to humans resulting from once-in-a-lifetime, or rare exposure to airborne chemical ([U.S. EPA AEGL Program](#)). The National Advisory Committee for the Development of Acute Exposure Guideline Levels for Hazardous Substances (AEGL Committee) is involved in developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills, or other catastrophic exposures. AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. The three AEGLs have been defined as follows:

AEGL-1: the airborne concentration, expressed as parts per million or milligrams per cubic meter (ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2: the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3: the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Airborne concentrations below the AEGL-1 represent exposure levels that can produce mild and progressively increasing but transient and non-disabling odor, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL. Although the AEGL values represent threshold levels for the general public, including susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses, it is recognized that individuals, subject to unique or idiosyncratic responses, could experience the effects described at concentrations below the corresponding AEGL.

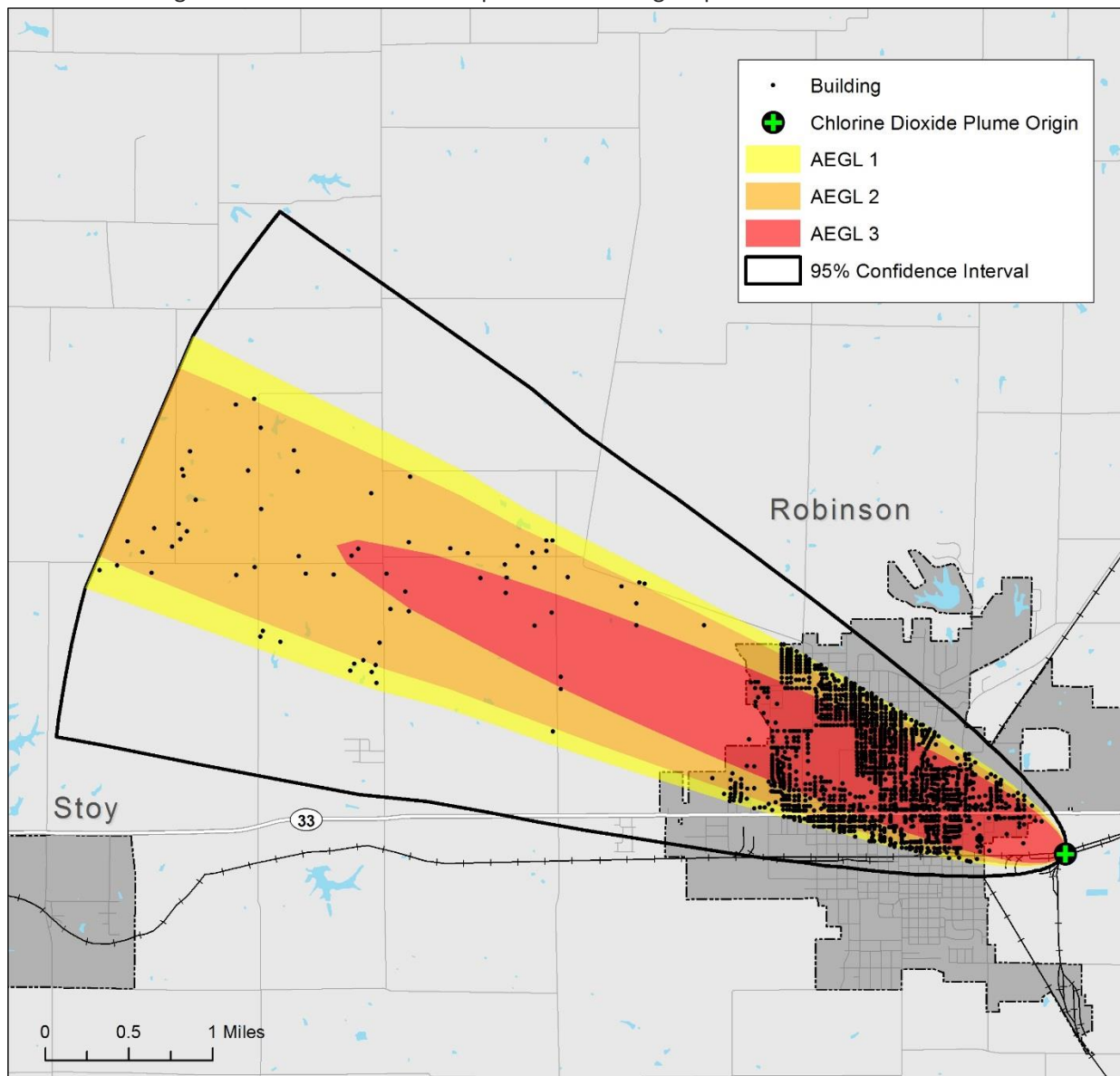
Results for Chlorine Release

An estimate of property exposed to the chlorine spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels (AEGL 3: ≥ 4800 ppm, AEGL 2: ≥ 1200 ppm and AEGL 1: ≥ 250 ppm). The Crawford County assessment and parcel data was utilized for this analysis. There are 1,567 buildings within the chlorine plume. It should be noted that the results should be interpreted as potential degrees of loss rather than exact number of buildings damaged to the chlorine release. Table 4-34 lists the total amount of building exposure to each AEGL zone and Table 4-35 lists the essential facilities within the Chlorine Plume Footprint. Figure 4-15 depicts the chlorine spill footprint and location of the buildings exposed. The GIS overlay analysis estimates that the full replacement cost of the buildings exposed to the chlorine plume is approximately \$1.8 billion.

Table 4-34. Estimated Building Exposure as a Result of the Chlorine Release

Occupancy	Building Exposure			Number of Buildings		
	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL3
Residential	\$11,845,092	\$27,292,320	\$45,765,339	205	359	700
Commercial	\$3,866,949	\$281,017,383	\$1,472,222,421	26	63	200
Industrial	\$18,786	\$782,859	\$43,046,244	1	1	7
Agricultural	\$0	\$44,070	\$4,320	0	4	1
Total:	\$15,730,827	\$309,136,632	\$1,561,038,324	232	427	908

Figure 4-15. ALOHA Plume Footprint and Buildings Exposed to Chlorine Release



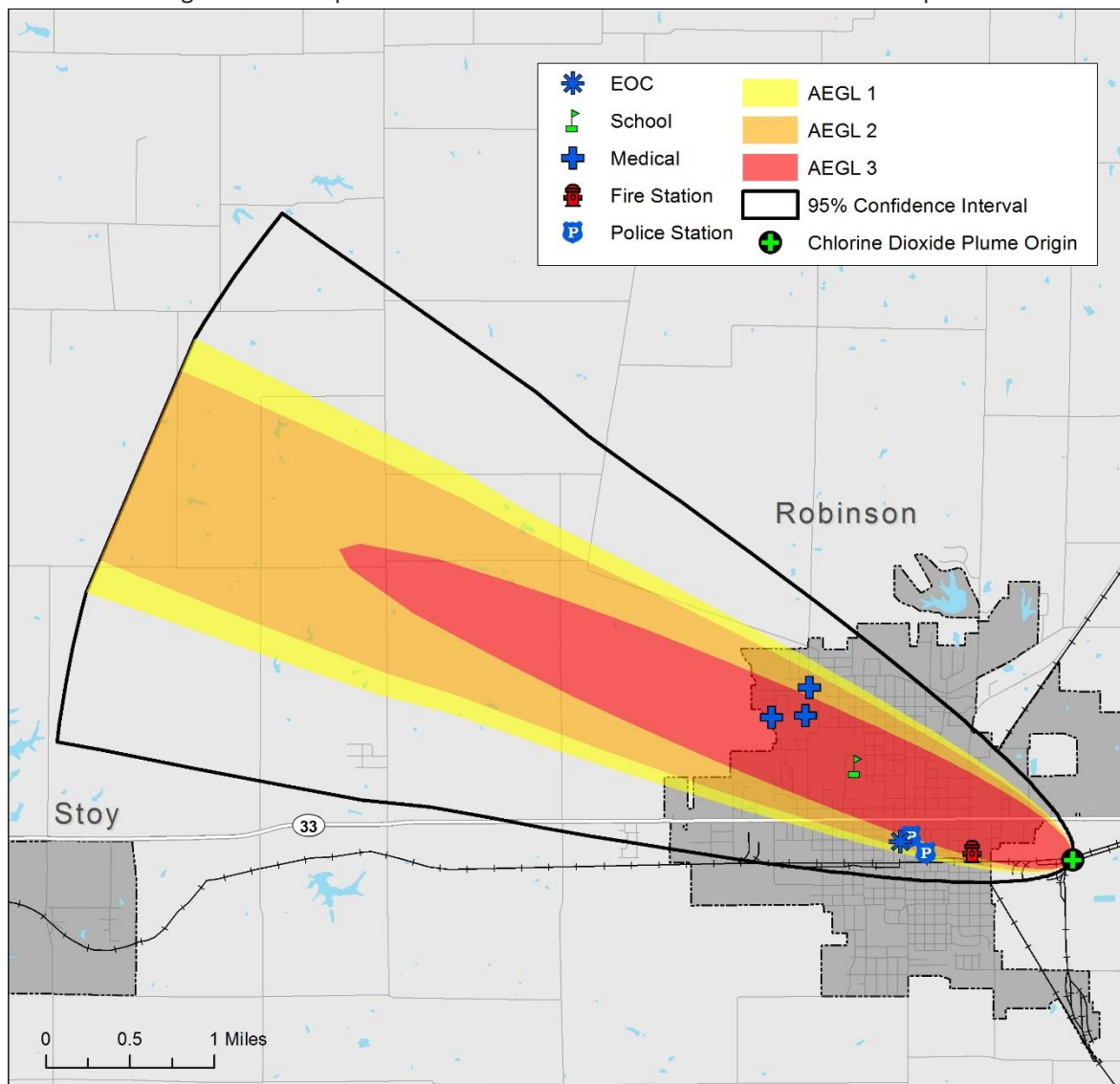
Essential Facilities Damage

There are eight essential facilities within the limits of the chlorine scenario. Table 4-26 and Figure 4-16 identifies the affected facilities.

Table 4-35. Essential Facilities within the Chlorine Plume Footprint

Essential Facility	Facility Name
Fire Department	Robinson Fire Department
Police Department	Crawford County Sheriff
	Robinson Police Dept.
Schools	Washington Elementary School
EOC	Crawford County EOC
Medical	Crawford Memorial Hospital
	D. Miller Innovative Care
	Brookstone Estates

Figure 4-16. Map of Essential Facilities within the Chlorine Plume Footprint



Vulnerability to Future Assets/Infrastructure for Hazardous Materials Storage and Transportation Hazard

Crawford County is expected to see future economic expansion within the city limits of Robinson. These areas are particularly vulnerable to chemical releases because of transportation of hazardous materials along railways, and Illinois Routes 33 and 1.

Suggestion for Community Development Trends

Because the hazardous material hazard events may occur anywhere within the county, future development is susceptible to the hazard. The major transportation routes and the industries located in Crawford County pose a threat of dangerous chemicals and hazardous materials release. Regional areas particularly vulnerable are within the city limits of Robinson within close proximity to transportation corridors such as Illinois Routes 33 and 1.

4.3.9 Dam and Levee Failure

Hazard Definition for Dam and Levee Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, creating the potential for failure. The same potential exists for levees when they serve their purpose, which is to confine flood waters within the channel area of a river and exclude that water from land or communities land-ward of the levee. Dams and levees can fail due to either: 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, security leads to new construction, added infrastructure, and increased population over time. Levees in particular are built to hold back flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that maximum is exceeded by more than the design safety margin, then the levee will be overtopped or otherwise fail, inundating communities in the land previously protected by that levee. It has been suggested that climate change, land-use shifts, and some forms of river engineering may be increasing the magnitude of large floods and the frequency of levee-failure situations.

In addition to failure that results from extreme floods above the design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require constant monitoring and regular maintenance to assure their integrity. Many structures across the U.S. have been under-funded or otherwise neglected, leading to an eventual day of reckoning in the form either of realization that the structure is unsafe or, sometimes, an actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Previous Occurrences of Dam and Levee Failure

According to Crawford County historical records, there are no records or local knowledge of any dam or certified levee failure in the county.

Geographic Location of Dams and Levees in Crawford County

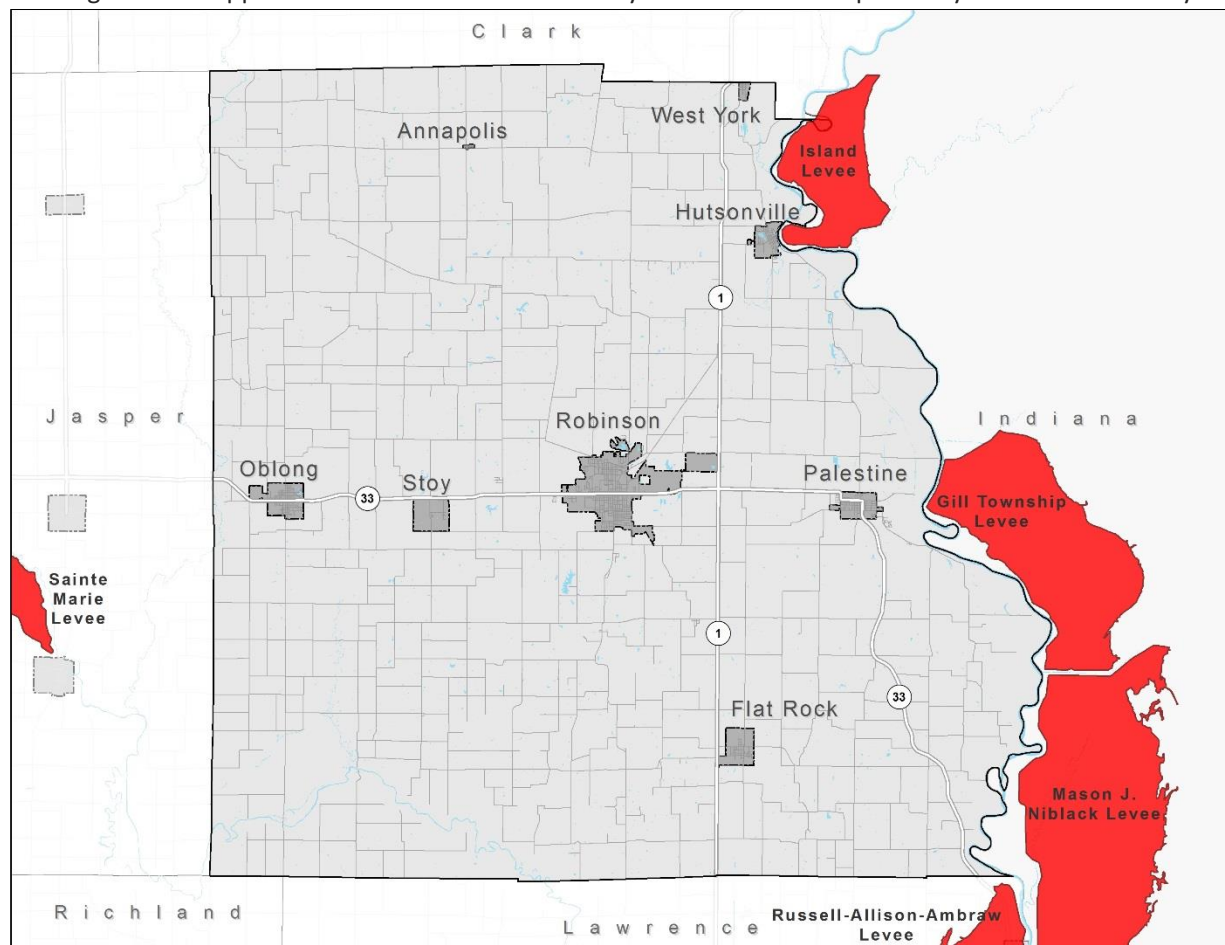
A review of the US Army Corps of Engineers National Levee Database and IDNR records revealed four levee systems within close proximity to Crawford County on the Wabash River. Table 4-36 lists the levees within close proximity to Crawford County and their respective U.S. Army Corps of Engineers (USACE) inspection rating. The approximate location of the levee systems are shown in Figure 4-17.

Table 4-36. Crawford County Levee Inventory

Levee System	Levee Area Acreage	USACE Levee Inspection Rating*
Gill Township Levee System	12,152	Minimally Acceptable
Island Levee System	20,670	Minimally Acceptable
Mason J. Niblack Levee System	5,310	Minimally Acceptable
Russell-Allison-Ambraw Levee System	41,385	Minimally Acceptable

*Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. If a levee system comprises of one or more levee segments (if there are different levee sponsors for different parts of the levee) then the overall levee system rating is the lowest of the segment ratings.

Figure 4-17. Approximate Location of the Levee Systems within close proximity of Crawford County



The U.S. Army Corps of Engineers maintains the National Inventory of Dams (NID) which identified nine dams in Crawford County. According to NID records, zero of the dams in Crawford County are classified as high hazard and zero dams have Emergency Action Plans (EAP). Table 4-37 list of the dams located in Crawford County and their respective classification level.

Table 4-37. Crawford County Dam Inventory

Dam Name	Stream/River	Hazard Rating	EAP
Newlin Lake Dam	Trib. Sugar Creek	L	N
Brooks Lake Dam	Trib. West Branch Honey Creek	L	N
West Lake Dam	Trib. Bennett Creek	S	N
Burcham Pond Dam	Trib. Big Creek	L	N
Athey Lake Dam	Trib. Big Creek	L	N
Hutsonville Fly Ash Pond Dam	Wabash River - Offstream	L	N
Ridgeway Lake Dam	Trib. Big Creek	L	N
Campbell Lake Dam	Trib. Carter Creek - Offstream	L	N
Allen Lake Dam	W. Trib. - Sugar Creek	L	N

Hazard Extent for Dam and Levee Failure

Dams are assigned a low hazard potential classification means that failure or incorrect operation of the dam will result in no human life losses and no economic or environmental losses. Losses are principally limited to the owner's property. A significant hazard classification means that failure or incorrect operation results in no probable loss of human life; however, dam or levee failure can cause economic loss, environmental damage, and disruption of lifeline facilities. Significant hazard potential dams are often located in predominantly rural or agricultural areas, but could be located in populated areas with a significant amount of infrastructure. A high hazard potential classification means that failure or incorrect operation has the highest risk to cause loss of human life and to significantly damage buildings and infrastructure.

According to NID records, zero dams in Crawford County are classified as high hazard and zero dams have Emergency Action Plans (EAP). An EAP is not required by the State of Illinois but is recommended in the 2003 Illinois Dam Safety & Inspection Manual.

Risk Identification for Dam and Levee Failure

Based on operation and maintenance requirements and local knowledge of the dams and levees in Crawford County, the probability of failure is possible. However, the warning time and duration of a dam failure event would be very short. Based on input from the Planning Team, future occurrence of hazardous materials accident in Crawford County is likely. According to the Risk Priority Index (RPI) and County input, flooding is ranked as the number eight hazard.

<u>Risk Priority Index</u>				
Probability	x	Magnitude	=	RPI
2	x	1	=	2

Vulnerability Analysis for Dam and Levee Failure

An Emergency Action Plan (EAP) is required to assess the effect of dam failure on these communities. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must

provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the 1% annual probability flood.

Because all floodplains are susceptible to flooding in Crawford County; therefore, the population and all buildings located within the floodplain are vulnerable to dam and levee failure. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable. Failure of dams and levees in the planning area would result in those floodplains adjacent to or downstream of the river to have the greatest impact. For example, if West Lake Dam (located outside the Village of Stoy) were to fail there would be less impact to the floodplains of Hutsonville and Palestine upstream of the dam.

To help clarify the potential impacts from dam and levee failure, the gap in the lack of inundation maps must be closed and perhaps identified as a mitigation action for this hazard by communities.

Critical Facilities

All critical facilities within the floodplain are vulnerable to dam and levee failure. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

All buildings within the floodplain are vulnerable to floods as a result of dam and/or levee failure. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located within 100-year flood plain as vulnerable.

Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. The impacts to these items include: broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Hazus-MH Flood Analysis

See section 4.3.2 Flooding Hazard for the results of the Hazus-MH Flood Analysis.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

Flooding as a result of dam or levee failure may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable. Table 4-8 includes the building exposure for Crawford County. All essential facilities in the county are at risk. Appendix E includes a list of the essential facilities in Crawford County and Appendix F displays a large format map of the locations of all critical facilities within the county. Currently, the municipal planning commission reviews new developments for compliance with the local flood zoning ordinance. At this time no new construction is planned with the 100-year floodplain.

Suggestions for Community Development Trends

Reducing floodplain development is crucial to reducing flood-related damages. Areas with recent development may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible to drainage issues. Damage to these can cause back-up of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

Section 5. Mitigation Strategies

The goal of mitigation is to reduce the future impacts of a hazard, including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist with recovery. Throughout the planning process, the Crawford County Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential losses identified in the risk assessment (section 4).

5.1 Existing Hazard Mitigation Policies, Programs and Resources

This section documents each jurisdiction's existing authorities, policies, programs and resources related to hazard mitigation and the ability to improve these existing policies and programs. It is important to highlight the work that has been completed in Crawford County that pertains to hazard mitigation. In addition, the following information also provides an evaluation of these abilities to determine whether they can be improved in order to more effectively reduce the impact of future hazards.

5.1.1 Successful Mitigation Projects

To be successful, mitigation must be a recurrent process that is continually striving to lessen the impact of natural hazards within the county. Crawford County has not implemented any mitigation projects since after the 2009 Multi-Hazard Mitigation Plan was formally adopted. Crawford County has not had any mitigation projects since the floods of 2008.

5.1.2 National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. This section covers the County's NFIP status, flood insurance policy and claim statistics, repetitive loss structures, and Community Rating System status.

NFIP Status

In Crawford County, four incorporated communities participate in the NFIP. Table 5-1 includes a summary of information for Crawford County participation in the NFIP. The communities of Flat Rock and Stoy were mapped with a flood risk but were sanctioned in June 2, 2012. Sanctioned communities do not qualify for flood-related Federal disaster assistance for acquisition, construction, or reconstruction purposes in Special Flood Hazard Areas. This may have serious consequences for the community's real estate market and economic viability, as each federally regulated lender must notify the purchaser or lessee that Federal disaster assistance is not available for that property in the event of a flood. Crawford County will continue to provide information to its non-participating jurisdictions regarding the benefits of the National Flood Insurance Program.

No communities in Crawford County are mapped as Non-Special Flood Hazard Areas (NSFHA). NSFHA areas have a moderate-to-low risk flood zone and is not in any immediate danger from flooding caused

by overflowing rivers or hard rains. However, it's important to note that structures within a NSFHA are still at risk. In fact, nearly 1 in 4 NFIP flood claims occur in these moderate- to low-risk areas.

Table 5-1: Information on Crawford County's Participation in the NFIP

Community	Participate in the NFIP	Initial Flood Hazard Boundary Map Identified	Initial FIRM Identified	Current Effective FIRM Date
CRAWFORD COUNTY	Yes	01/05/79	06/03/86	06/02/11
HUTSONVILLE	Yes	12/17/73	03/15/84	06/02/11
PALESTINE, VILLAGE OF	Yes	11/23/73	09/04/85	06/02/11
ROBINSON, CITY OF	Yes	05/31/74	04/06/84	06/02/11(M)
FLAT ROCK, VILLAGE OF	No		06/02/11	
STOY, VILLAGE OF	No		06/02/11	
OBLONG, VILLAGE OF	No			

NFIP status and information are documented in the Community Status Book Report updated on 08/26/2016.

NSFHA – No Special Flood Hazard Area

(M) – No Elevation Determined – All Zone A, C and X

Flood Insurance Policy and Claim Statistics

As of June 2016, 48 households paid flood insurance, insuring \$6,525,300 in property value. The total premiums collected for the policies amounted to \$31,607. Since the establishment of the NFIP in 1978, 33 flood insurance claims were filed in Crawford County, totaling in \$571,514.56 in payments. Table 5-2 summarizes the claims since 1978.

Table 5-2: Policy and Claim Statistics for Flood Insurance in Crawford County

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
Crawford County	8	7	0	1	\$91,535.06
Hutsonville	14	14	0	0	\$401,448.37
Palestine	7	6	0	1	\$33,894.10
Robinson	4	4	0	0	\$44,637.03

*NFIP policy and claim statistics since 1978 until the most recently updated date of 06/30/2016. Closed Losses refer to losses that are paid; open losses are losses that are not paid in full; CWOP losses are losses that are closed without payment; and total losses refers to all losses submitted regardless of status. Lastly, total payments refer to the total amount paid on losses.

Repetitive Loss Structures

There are 3 structures in Crawford County (2 single-family, 1 non-residential) and 3 structures in Hutsonville (2 single-family, 1 non-residential) that have experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is $\geq 25\%$ of the market value of the structure at the time of each flood loss. Currently there are over 122,000 Repetitive Loss properties nationwide.

The Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Crawford County. Records indicate that there are 6 repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is \$326,833.47. Table 5-3 describes the repetitive loss structures for each jurisdiction.

Table 5-3. Repetitive Loss Structures for each Jurisdiction in Crawford County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Crawford County	3	6	\$86,433.75
Hutsonville	3	8	\$240,399.72
Total:	6	14	\$326,833.47

Community Rating System Status

Crawford County and its incorporated areas do not participate in the NFIP's Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, 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. More than 1,200 communities from all 50 states participate in the CRS. Although joining the CRS is free, completing CRS activities and maintain a CRS rating will require a degree of commitment from the community, including dedicating staff. Joining the CRS could be one way Crawford County or its incorporated communities improve their existing floodplain management policies and further reduce the flood hazard risk.

5.1.3 Jurisdiction Ordinances

Hazard Mitigation related ordinances, such as zoning, burning, or building codes, have the potential to reduce the risk from known hazards. These types of regulations provide many effective ways to address resiliency to known hazards. Table 5-4 list Crawford County's current ordinances that directly pertain, or can pertain, to hazard mitigation. It is important to evaluate the local building codes and ordinances to determine if they have the ability to reduce potential damages caused by future hazards. The Crawford County Planning Team worked to identify gaps in the current list of ordinances and suggested changes/additions in Section 5.3.

Table 5-4: Crawford County's Jurisdiction Ordinances

Community	Zoning	Storm water Mgmt	Flood	Subdivision Control	Burning	Seismic	Erosion Mgmt	Land Use Plan	Building Codes
Oblong	Y	Y	N	Y	N	N	N	N	N
Crawford County	N	N	N	N	N	N	N	N	N
Hutsonville	Y	Y	N	Y	N	N	N	N	Y
Robinson	Y	N	Y	Y	Y	N	Y	Y	Y
Palestine	N	Y	Y	N	N	N	N	N	N

*Only those jurisdictions that have ordinances are included in the table.

The adoption of new ordinances, including the adoption of new development standards or the creation of hazard-specific overlay zones tied to existing zoning regulations, present opportunities to discourage hazardous construction and manage the type and density of land uses in areas of known natural hazards. Adopting and enforcing higher regulatory standards for floodplain management (i.e., those that go beyond the minimum standards of the NFIP) is another effective method for minimizing future flood losses, particularly if a community is experiencing growth and development patterns that influence flood hazards in ways that are not accounted for on existing regulatory floodplain maps. Revisions to existing building codes also present the opportunity to address safe growth. Many state and local codes are based

off national or industry standard codes which undergo routine evaluations and updates. The adoption of revised code requirements and optional hazard-specific standards may help increase community resilience.

5.1.4 Fire Insurance Ratings

By classifying communities' ability to suppress fires, the Insurance Service Office (ISO) Public Protection Classification Program helps communities evaluate their public fire-protection services. The program provides a countrywide standard that helps fire departments in planning and budgeting for facilities, equipment, and training. Information is collected on municipal fire-protection efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data using a Fire Suppression Rating Schedule. Rating are assigned from 1 to 10 where Class 1 generally represents superior property fire protection, and Class 10 indicates that the area's fire-suppression program doesn't meet ISO's minimum criteria. Table 5-5 displays each Fire Departments' insurance rating and total number of employees.

Table 5-5: Crawford County Fire Departments, Insurance Ratings, and Number of Employees/Volunteers

Fire Department	Fire Insurance Rating	Number of Employees
Flat Rock Fire Protection District	5	20
Hutsonville Township FPD	6	23
LaMotte Fire Protection District	5	50
Oblong Fire Protection District	5	27
Prairie-Licking FPD	9	22
Robinson Fire Department	4	32

5.2 Mitigation Goals

In Section 4 of this plan, the risk assessment identified Crawford County as prone to several hazards. The Planning Team members understand that although they cannot eliminate hazards altogether, Crawford County can work towards building disaster-resistant communities. Below is a generalized list of goals, objectives, and actions. The goals represent long-term, broad visions of the overall vision the county would like to achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

Goal 1: Lessen the impacts of hazards to new and existing infrastructure

Objective: Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.

Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards.

Objective: Minimize the amount of infrastructure exposed to hazards.

Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.

Objective: Improve emergency sheltering in Crawford County.

Goal 2: Create new or revise existing plans/maps for Crawford County

Objective: Support compliance with the NFIP for each jurisdiction in Crawford County.

Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.

Objective: Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate Crawford County residents on the hazards

Objective: Raise public awareness on hazard mitigation.

Objective: Improve education and training of emergency personnel and public officials.

5.3 Multi-Jurisdictional Mitigation Strategies

After reviewing the Risk Assessment, the Mitigation Planning Team was presented with the task of individually listing potential mitigation activities using the FEMA STAPLEE evaluation criteria (see table 5-6). FEMA uses their evaluation criteria STAPLEE (stands for social, technical, administrative, political, legal, economic and environmental) to assess the developed mitigation strategies. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. The Planning Team brought their mitigation ideas to Meeting 3.

Table 5-6. FEMA's STAPLEE Evaluation Criteria

S ocial	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T echnical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A dministrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P olitical	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L egal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E conomic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E nvironmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Table 5-7 contains a comprehensive range of specific mitigation actions and projects for each jurisdiction, with an emphasis on new and existing buildings and infrastructure. At least two identifiable mitigation action items have been addressed for each hazard listed in the risk assessment. Each of the incorporated communities within and including Crawford County was invited to participate in brainstorming sessions in which goals, objectives, and strategies were discussed and prioritized. Each participant in these sessions was armed with possible mitigation goals and strategies provided by FEMA, as well as information about mitigation projects discussed in neighboring communities and counties.

All potential strategies and goals that arose through this process are included in Table 5-7. The mitigation strategies are arranged by hazard they directly address. In some cases, certain mitigation strategies can address all hazards. If provided by the jurisdiction, each mitigation strategy contains specific details

pertaining to the implementation, responsible and/or organizing agency, and potential funding source. Potential funding sources are identified by Federal, State, Local, or Private. A code is assigned to each mitigations strategy for ease of reference when reviewing the prioritization of each mitigations strategies in Section 5.4.

Table 5-7: Crawford County's Multi-Jurisdictional Mitigation Strategies

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
ALL HAZARDS					
AH1	Enhance Emergency Communication System Infrastructure <i>Crawford County will seek local and state funding to continue enhancing emergency communication system infrastructure. Hutsonville will seek federal funding to extend the use of Reverse 911 and other community warning systems to strengthen the communication and ability of county emergency services. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Crawford County EMA, Hutsonville	Ongoing	L, S, F	Crawford County EMA, Hutsonville
AH2	Obtain multiuse equipment <i>Hutsonville will look into having access to multipurpose equipment such as a Unimog truck with a front loader for use in emergencies requiring clearing debris from roads or traversing flooded areas.</i>	Hutsonville	Proposed	F	Hutsonville
AH3	Develop social media techniques to provide critical weather updates and disseminate critical information <i>Hutsonville, Palestine, and Palestine CUSD #3 will each develop their social media presence to offer the community critical weather updates and warnings. If funding is available, implementation is forecasted to be initiated within one year.</i>	Hutsonville, Palestine, Palestine CUSD #3	Ongoing	L, F	Crawford County EMA
AH4	Support local emergency planning committee <i>Crawford County LEPC will continue meeting and discussing local emergency plans.</i>	Crawford County EMA	Ongoing	L	Crawford County EMA
AH 5	Develop alternative traffic routes <i>Palestine will seek local funding to continue the development of alternative traffic routes for emergency scenarios.</i>	Palestine	Ongoing	L	Village of Palestine
AH6	Develop mutual aid agreements <i>Crawford County EMA, Law enforcement, and all emergency services in and around the county will continue using local funds to discuss emergency plans to maintain currency of mutual aid agreements.</i>	Crawford County EMA, Palestine, Robinson	Ongoing	L	Crawford County EMA
AH7	Create additional heating/cooling shelter <i>The village of Palestine currently has two locations plus several churches. One village location has generator power backup. If funding is available, Palestine will develop more shelters and supplement the current locations. Implementation is forecasted to be initiated within 1-3 years pending funding.</i>	Village of Palestine	Ongoing	F	Village of Palestine
AH8	Acquire portable lighting and other necessities for mass casualty preparation <i>Pending funding, Palestine and Flat Rock will acquire necessary materials for mass casualty preparation as participation in the MABAS Division responsible for Crawford County. If funding is available, implementation is forecasted to be initiated within one year.</i>	Palestine, Flat Rock	Proposed	S, F	Crawford County EMA
AH9	Purchase emergency signage for closures and instruction <i>Participating jurisdictions will pursue local funding for the purchase of additional signage to be used in emergency situations. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Palestine, Oblong, Flat Rock	Proposed	L	Palestine, Oblong, Flat Rock
AH10	Distribute NOAA weather radios <i>Involved jurisdictions will pursue funds to purchase NOAA radios to provide to local residents. If funding is available, implementation is forecasted to be initiated within one year.</i>	Village of Palestine, Robinson, Palestine CUSD #3, Oblong CUSD #4, Village of Stoy	Proposed	L, S, F	Village of Palestine, Robinson, Palestine CUSD #3, Oblong CUSD #4, Village of Stoy
AH11	Development and maintain comprehensive plan to incorporate natural hazards <i>Palestine CUSD #3 and Hutsonville CUSD #1 would like to have an emergency readiness plan in place for all natural disasters. If funding is available, implementation is forecasted within the next year.</i>	Palestine CUSD #3, Hutsonville CUSD #1	Ongoing	L	Palestine CUSD #3, Hutsonville CUSD #1

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
AH12	Promote disaster resilience through workshops, education materials, and planning guides <i>Involved jurisdictions will oversee this strategy. If funding is available, implementation is forecasted within the next year.</i>	Hutsonville CUSD #1, Oblong CUSD #4, Robinson CUSD #2, Lincoln Trail College, Crawford Memorial Hospital	Ongoing	L	Hutsonville CUSD #1, Oblong CUSD #4, Robinson CUSD #2, Lincoln Trail College, Crawford Memorial Hospital
AH13	Devote section of website to hazard mitigation <i>Lincoln Trail College will seek to devote a section of their website to mitigating for all hazards. If funding is available, implementation is forecasted to be initiated within one year.</i>	Lincoln Trail College	Ongoing	L, S	Lincoln Trail College
AH14	Establish liaison/groups that meet regularly to discuss hazard mitigation <i>Lincoln Trail College and Oblong will oversee this strategy. If funding is available, implementation is forecasted to be initiated within the next three years.</i>	Lincoln Trail College, Oblong	Ongoing/ Proposed	L	Lincoln Trail College, Oblong
AH15	Establish an Incident Management Team <i>Oblong will oversee this strategy. If funding is available, implementation is forecasted within 1-3 years.</i>	Oblong	Proposed	L, S	Oblong
AH16	Improve EMA training, staff, resources, and equipment <i>Oblong will oversee this strategy. If funding is available, implementation is forecasted within 1-3 years.</i>	Oblong	Proposed	L, S, F	Oblong
AH17	Develop vulnerable population list <i>Oblong will oversee this strategy. If funding is available, implementation is forecasted within the one year.</i>	Oblong	Proposed	L	Oblong
AH18	Create alternative emergency operations center <i>Oblong will oversee this strategy. If funding is available, implementation is forecasted within 1-3 years.</i>	Oblong	Proposed	L, S, F	Oblong
AH19	Equip critical facilities with back-up generators <i>The Village of Stoy will research and purchase back-up generators at their facilities. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.</i>	Village of Stoy	Proposed	S, F	Crawford County EMA
AH20	Maintain centralized geographical database including natural hazard/risk assessment <i>Crawford County EMA will oversee this project. After each mitigation update, the geographical database is updated to include new information about hazardous events and the number of structures within the 100-year floodplain. If funding is available, implementation is forecasted within the next 3-5 years.</i>	Crawford Memorial Hospital	Proposed	L, S, F	Crawford County EMA
TORNADO / SEVERE THUNDERSTORMS					
ST1	Provide jurisdiction-wide siren warning coverage <i>Hutsonville installed emergency warning system/siren system to alert residents of severe weather. Palestine has an electronic emergency storm siren installed at Village Hall which rotates 360 degrees. Crawford County EMA have been working with Marathon Pet. on expanding their system.</i>	Crawford County EMA, Hutsonville Palestine	Proposed/ Ongoing	L	Crawford County EMA
ST2	Construct new safe rooms <i>Crawford County EMA will oversee this project. Trailer Parks, Churches and Hospitals throughout the county will be encouraged to build safe rooms. If funding is available, the county will build safe rooms in or near these locations. Implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Robinson CUSD #2, Crawford Memorial Hospital	Proposed	L	Crawford County EMA
ST3	Equip critical facilities with lightning protection devices <i>Crawford County EMA will oversee this project. Churches in the area need something besides NOAA radios. The county will seek to equip critical buildings with lightning protection devices. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L	Crawford County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
ST4	Develop ordinance to require new development to place all new utility lines underground <i>Hutsonville will encourage buried power lines to minimize the amount of infrastructure exposed to hazards. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Hutsonville	Proposed	L	Hutsonville
ST5	Install lightning detection system <i>Involved jurisdictions will seek funds to install a lightning detection system to better track severe weather in the area. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Robinson, Hutsonville CUSD #1, Oblong CUSD #4, Robinson CUSD #2	Proposed	L, S, F, P	Robinson, Hutsonville CUSD #1, Oblong CUSD #4, Robinson CUSD #2
FLOODING / DAM AND LEVEE FAILURE					
F1	Work towards participating in the NFIP's Community Rating System (CRS) to acquire discounted flood insurance rates <i>The county EMA will explore the steps needed to raise the county's evaluation in the NFIP Community Rating System. Crawford County EMA will oversee this project. If funding is available, implementation is forecasted to be initiated within 3-5 years.</i>	Crawford County EMA	Proposed	S, F	Crawford County EMA
F2	Maintain participating status in NFIP by enforcing the Flood Damage Prevention Ordinance <i>The Village of Hutsonville will continue to devote funds to maintain participating status in NFIP.</i>	Hutsonville	Ongoing	L	Hutsonville
F3	Update Flood Insurance Rate Map (FIRM) <i>The Village of Hutsonville last updated their Flood Insurance Rate Map June 2, 2011. They will continue updating the map as needed to maintain currency.</i>	Hutsonville	Ongoing	F	Hutsonville
F4	Adopt the International Building Code (IBC) and International Residential Code (IRC) <i>Robinson will work towards adopting building codes to keep up with international standards.</i>	Robinson	Ongoing	L	Robinson
F5	Conduct watershed analysis of runoff and drainage systems to predict insufficient capacity in storm drain/natural creek systems <i>Robinson will continue to oversee the implementation of this project. Local, State, and Federal funding will be sought.</i>	Robinson	Ongoing	L, S, F	Robinson
WINTER STORMS					
WS1	Establish a network of 4WD/off-road vehicles to access stranded people <i>The county EMA will use local fire departments as the main network of off-road vehicles. The Village of Palestine will develop a list of residents/ farmers who have 4WD vehicles for transport in case of stranded families or motorists. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Crawford County EMA, Village of Palestine, Oblong	Ongoing/ Proposed	L	Crawford County EMA
WS2	Enhance ordinances to exceed minimum construction standards/ techniques in regards to high winds <i>Hutsonville will encourage buried power lines to minimize the amount of infrastructure exposed to hazards. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Hutsonville	Ongoing	L	Hutsonville
WS3	Install signs that direct traffic toward shelters and safe travel routes <i>The Village of Palestine has been installing "Snow Route" signage and using the local website to advertise the local warming shelter. If funding is available, they will work to expand coverage within 1-3 years.</i>	Village of Palestine	Ongoing	L	Palestine
EARTHQUAKES					
EQ1	Require private owners to inform all existing/prospective tenants that they live in an unreinforced masonry building and to the standard to which they have been retrofitted <i>The County EMA will oversee this project. Considering the many old structures around the county that are not retrofitted to endure earthquakes, this strategy would both raise awareness and promote retrofitting. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L	Crawford County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
EQ2	Provide information to residents on structural and non-structural retrofitting <i>Hutsonville has a number of brick two-story buildings over a century old and will pursue funds to continue informing residents on structural and non-structural retrofitting. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Hutsonville	Ongoing	L, F, P	Crawford County EMA
EQ3	Retrofit unreinforced masonry structures <i>The County EMA will oversee this project. Many masonry structures in the county need to be reinforced to better withstand earthquakes. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Hutsonville	Proposed	L, S, F	Crawford County EMA
EQ4	Retrofit/harden critical facilities <i>The County EMA will oversee this project. Many critical facilities in the county need to be retrofitted or hardened to better withstand earthquakes. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Hutsonville	Proposed	L, S, F	Crawford County EMA
EQ5	Develop Earthquake Emergency Action Plan <i>The county EMA has incorporated earthquakes in the County EOP. This plan will continue to be developed over the next five years.</i>	Crawford County EMA	Ongoing	L	Crawford County EMA
EQ6	Sponsor Seismic Code Training for area architects, engineers, and contractors <i>Robinson will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Robinson	Proposed	L, S	Robinson
EQ7	Adopt the 2009 International Existing Building Code or the latest applicable standard for the design of building retrofits for seismically vulnerable buildings <i>Robinson will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Robinson	Proposed	L	Robinson
HAZARDOUS MATERIALS RELEASE					
HAZ1	Update hazmat emergency response plan <i>The county EMA will continually update the hazmat section of the County EOP. Hutsonville will incorporate 911 Reverse and community emergency siren systems to warn public in case of emergency, update and continually evaluate hazmat response plan. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Hutsonville	Ongoing	L	Crawford County EMA
HAZ2	Conduct hazardous materials commodity flow study <i>The county EMA will oversee the implementation of this project. The County EOP will benefit from a commodity flow study of hazardous materials. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L	Crawford County EMA
HAZ3	Improve regulations to reduce train speed along rail lines in populated areas <i>The county EMA will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L	Crawford County EMA
HAZ4	Equip critical facilities with centralized positive-pressure HVAC systems <i>The county EMA will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L, S, F	Crawford County EMA
HAZ5	Acquire protective gear <i>The county EMA will oversee the implementation of this project. Oblong will pursue local funding for protective gear. Palestine will pursue funding to continue acquiring protective gear to be used in hazmat situations. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA, Palestine, Oblong	Ongoing/ Proposed	L	Crawford County EMA, Palestine, Oblong

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
HAZ6	Update hazardous material facilities to current regulations <i>The county EMA will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within one year.</i>	Crawford County EMA	Proposed	L, P	Crawford County EMA
HAZ7	Develop database of potential locations of hazmat release <i>The county EMA will oversee the implementation of this project. Hutsonville will develop a list of existing maps and locations with potential hazmat releases for reference by first responders</i>	Hutsonville	Proposed	L	Crawford County EMA
DROUGHT / EXTREME HEAT					
H1	Retrofit water supply systems <i>The county EMA will work with the local fire stations to update water supply systems. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Crawford County EMA	Proposed	L	Crawford County EMA
H2	Purchase fans for use during extreme heat <i>The county EMA will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within 1-3 years.</i>	Crawford County EMA	Proposed	L	Crawford County EMA
H3	Audit water loss and incentivize water reuse <i>Hutsonville will oversee the implementation of this project. They will monitor monthly water loss and report findings to the Board of Trustees. Local funds will be used to make timely repairs of all leaks.</i>	Hutsonville	Ongoing	L	Hutsonville
H4	Develop/enforce burn bans <i>Village of Hutsonville will follow county issued burn ban restrictions during drought/extreme heat situations. Palestine has burn ordinances and schedules in place in the Village Ordinance Books.</i>	Hutsonville, Village of Palestine	Ongoing	L	Hutsonville, Palestine

* F – Federal, S – State, L – Local, P – Private

5.4 Prioritization of Multi-Jurisdictional Mitigation Strategies

Implementation of the mitigation strategies is critical to the overall success of the mitigation plan. It is important to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is vital. It is important to note that some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action. It is also critical to take into account the amount of time it will take the community to complete the mitigation project.

Table 5-8 displays the priority ranking for each mitigation strategy. Each code refers to a specific mitigations strategy listed in Table 5-7. For each participating jurisdiction a rating (high, medium, or low) was assessed for each mitigation item. The ranking is the result of the STAPLEE evaluation and the timeframe the community is interested in completing the strategy: H - High 1-3 years; M - Medium 3-5 years; and L - Low 5+years.

Table 5-8. Prioritization of the Crawford County Mitigation Strategies

Code	Priority Ranking												
	Crawford County	Flat Rock	Hutsonville	Palestine	Robinson	Stoy	Hutsonville CUSD #1	Oblong CUSD #4	Palestine CUSD #3	Robinson CUSD #2	Lincoln Trail College	Oblong	Crawford Memorial
AH1	M	-	M	-	-	-	-	-	-	-	-	-	-
AH2	-	-	L	-	-	-	-	-	-	-	-	-	-
AH3	-	-	H	H	-	-	-	-	H	-	-	-	-
AH4	H	-	-	-	-	-	-	-	-	-	-	-	-
AH 5	-	-	-	H	-	-	-	-	-	-	-	-	-
AH6	H	-	-	H	H	-	-	-	-	-	-	-	-
AH7	-	-	-	M	-	-	-	-	-	-	-	-	-
AH8	-	L	-	H	-	-	-	-	-	-	-	-	-
AH9	-	L	-	M	-	-	-	-	-	-	-	M	-
AH10	-	-	-	H	H	L	-	M	H	-	-	-	-
AH11	-	-	-	-	-	-	H	-	H	-	-	-	-
AH12	-	-	-	-	-	-	H	H	-	H	H	-	H
AH13	-	-	-	-	-	-	-	-	-	-	H	-	-
AH14	-	-	-	-	-	-	-	-	-	-	M	M	-
AH15	-	-	-	-	-	-	-	-	-	-	-	H	-
AH16	-	-	-	-	-	-	-	-	-	-	-	H	-
AH17	-	-	-	-	-	-	-	-	-	-	-	H	-
AH18	-	-	-	-	-	-	-	-	-	-	-	M	-
AH19	-	-	-	-	-	L	-	-	-	-	-	-	-
AH20	-	-	-	-	-	-	-	-	-	-	-	-	M
ST1	M	-	M	M	-	-	-	-	-	-	-	-	-
ST2	H	-	-	-	-	-	-	-	-	M	-	-	M
ST3	H	-	-	-	-	-	-	-	-	-	-	-	-
ST4	-	-	M	-	-	-	-	-	-	-	-	-	-
ST5	-	-	-	-	M	-	M	M	-	M	-	-	-
F1	L	-	-	-	-	-	-	-	-	-	-	-	-
F2	-	-	H	-	-	-	-	-	-	-	-	-	-
F3	-	-	H	-	-	-	-	-	-	-	-	-	-
F4	-	-	-	-	M	-	-	-	-	-	-	-	-
F5	-	-	-	-	M	-	-	-	-	-	-	-	-
WS1	M	-	-	M	-	-	-	-	-	-	-	M	-
WS2	-	-	M	-	-	-	-	-	-	-	-	-	-
WS3	-	-	-	M	-	-	-	-	-	-	-	-	-
EQ1	H	-	-	-	-	-	-	-	-	-	-	-	-
EQ2	H	-	H	-	-	-	-	-	-	-	-	-	-
EQ3	H	-	H	-	-	-	-	-	-	-	-	-	-
EQ4	H	-	H	-	-	-	-	-	-	-	-	-	-
EQ5	H	-	-	-	-	-	-	-	-	-	-	H	-
EQ6	-	-	-	-	M	-	-	-	-	-	-	-	-
EQ7	-	-	-	-	M	-	-	-	-	-	-	-	-
HAZ1	H	-	H	-	-	-	-	-	-	-	-	-	-
HAZ2	H	-	-	-	-	-	-	-	-	-	-	-	-

Code	Priority Ranking												
	Crawford County	Flat Rock	Hutsonville	Palestine	Robinson	Stoy	Hutsonville CUSD #1	Oblong CUSD #4	Palestine CUSD #3	Robinson CUSD #2	Lincoln Trail College	Oblong	Crawford Memorial
HAZ3	H	-	-	-	-	-	-	-	-	-	-	-	-
HAZ4	H	-	-	-	-	-	-	-	-	-	-	-	-
HAZ5	H	-	-	-	-	-	-	-	-	-	-	M	-
HAZ6	H	-	-	-	-	-	-	-	-	-	-	-	-
HAZ7	-	-	L	-	-	-	-	-	-	-	-	-	-
H1	M	-	-	-	-	-	-	-	-	-	-	-	-
H2	M	-	-	-	-	-	-	-	-	-	-	-	-
H3	-	-	M	-	-	-	-	-	-	-	-	-	-
H4	-	-	M	-	-	-	-	-	-	-	-	-	-

*Ranking based on STAPLEE evaluation and estimated timeframe: H – High (1-2 years), M – Medium (3-5 years), and L – Low (5+ years)

Section 6. Plan Implementation and Maintenance

6.1 Implementation through Existing Programs

Throughout the planning process, the Crawford County Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential losses identified in the Risk Assessment (Section 4). The ultimate goal of this plan is to incorporate the mitigation strategies proposed into ongoing planning efforts within the County. The Crawford County Emergency Management Agency will be the local champion for the mitigation actions. The Crawford County Board and the city and village councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified action.

Continued public involvement is also critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the Crawford County Emergency Management Agency and forwarded to the Planning Team for discussion. Education efforts for hazard mitigation will be an ongoing effort of Crawford County. The public will be notified of periodic planning meetings through notices in the local newspaper. Once adopted, a copy of the MHMP will be maintained in each jurisdiction and in the Crawford County Emergency Management Agency.

6.2 Monitoring, Evaluation, and Updating the MHMP

Throughout the five-year planning cycle, the Crawford County Emergency Management Agency will reconvene the Planning Team to monitor, evaluate, and update the plan on an annual basis. Additionally, a meeting will be held in 2022 to address the five-year update of this plan. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If the need for a special meeting, due to new developments or the occurrence of a declared disaster in the county, the team will meet to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

As part of the update process, the Planning Team will review the county goals and objectives to determine their relevance to changing situations in the county. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The team will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The plan revision will also reflect changes in local development and its relation to each hazard. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the MHMP during the five-year planning process will require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the committee deems appropriate and necessary, and as approved by the Crawford County Board.

The GIS data used to prepare the plan was obtained from existing county GIS data as well as data collected as part of the planning process. This updated Hazus-MH GIS data has been returned to the county for use and maintenance in the county's system. As newer data becomes available, these updated data will be used for future risk assessments and vulnerability analyses.

Definitions

100-year Floodplain	Areas subject to inundation by the 1-percent-annual-chance flood event.
Critical Facility	A structure, because of its function, size, service area, or uniqueness, that has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. This includes, but are not limited to, water and wastewater treatment facilities, municipal buildings, education facilities, and non-emergency healthcare facilities.
Community Rating System (CRS)	A voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management.
Comprehensive Plan	A document, also known as a "general plan," covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all the physical elements that will determine the community's future developments.
Disaster Mitigation Act of 2000 (DMA 2000)	The largest legislation to improve the planning process. It was signed into law on October 30, 2000. This new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.
Essential Facility	A subset of critical facilities that represent a substantial hazard to human life in the event of failure. This includes (but not limited to) hospital and fire, rescue, ambulance, emergency operations centers, and police stations.
Federal Emergency Management Agency	An independent agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.
Hazard	A source of potential danger or adverse condition.
Hazard Mitigation	Any sustained action to reduce or eliminate long-term risk to human life and property from hazards.

Hazard Mitigation Grant Program (HMPG)	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration.
Hazus-MH	A geographic information system (GIS)-based disaster risk assessment tool.
Multi-Hazard Mitigation Planning	Identify policies and actions that can be implemented over the long term to reduce risk and future losses from various hazardous events.
National Flood Insurance Program	Administered by the Federal Emergency Management Agency, which works closely with nearly 90 private insurance companies to offer flood insurance to property owners and renters. In order to qualify for flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards.
Planning Team	A group composed of government, private sector, and individuals with a variety of skills and areas of expertise, usually appointed by a city or town manager, or chief elected official. The group finds solutions to community mitigation needs and seeks community acceptance of those solutions.
Risk Priority Index	Quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards.
Risk Assessment	Quantifies the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.
Strategy	A collection of actions to achieve goals and objectives.
Vulnerability	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.

Acronyms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A AEGL – Acute Exposure Guideline Levels
ALOHA – Areal Locations of Hazardous Atmospheres

C CERI – Center for Earthquake Research and Information
CRS – Community Rating System

D DEM – Digital Elevation Model
DFIRM – Digital Flood Insurance Rate Map
DMA – Disaster Mitigation Act of 2000

E EAP – Emergency Action Plan
EMA – Emergency Management Agency
EPA – Environmental Protection Agency

F FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map

G GIS – Geographic Information System

H Hazus-MH – Hazards USA Multi-Hazard
HMGP – Hazard Mitigation Grant Program
HUC – Hydrologic Unit Code

I IA – Individual Assistance
IDNR – Illinois Department of Natural Resources
IDOT – Illinois Department of Transportation
IEMA – Illinois Emergency Management Agency
ISO – Insurance Service Office
ISGS – Illinois State Geological Survey
ISWS – Illinois State Water Survey

M MHMP – Multi-Hazard Mitigation Plan

N NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NSFHA – Non-Special Flood Hazard Area

P PA – Public Assistance
PHMSA – Pipeline and Hazardous Materials Safety Administration
PPM – Parts Per Million

R RPI – Risk Priority Index

S SIU – Southern Illinois University Carbondale
SPC – Storm Prediction Center
STAPLEE – Social, Technical, Administrative, Political, Legal, Economic, and Environmental

U USGS – United States Geological Survey

Appendices

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Appendix A. MHMP Meeting Minutes

Formal Mitigation Planning Meetings

Meeting 1 – November 6th, 2014

Meeting 2 – February 24th, 2015

Meeting 3 – December 1st, 2015
April 12th, 2016

Meeting 4 – November 9th, 2016

Meeting 1 – November 6th, 2014**Crawford County Multi-Hazard Mitigation Plan Meeting 1**

Chairman: Ken Pryor (EMA Coordinator)

Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: November 6th, 2014

Meeting Time: 10:00 am

Place: Commertium Building- 301 S Cross Street Robinson, IL

Attendance: 23

Introduction to the Multi-Hazard Mitigation Planning Process

The planning team was welcomed by Amanda Dampitz, project manager from SIU. Amanda Dampitz gave an overview of the planning process and discussion of schedule and milestones. She explained that the objective of this project is to update Crawford County's 2009 Multi-Hazard Mitigation Plan (MHMP) to meet the requirements of the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA). The grant requires a 25% match from the county but will be met by sweat equity by an accumulation of time spent at the meetings, on research assignments, surveys, along with the time spent reviewing and producing the planning document.

The first task of the meeting was to assemble a list of disaster-related threats facing the community. A power point presentation was presented by Amanda and she discussed the historical disasters that have occurred in Crawford County. Amanda also covered the significant natural hazard events that occurred during 2009 through 2013 (the life span the 2009 MHMP). This information was used to guide the Hazard Ranking Exercise that the County and each participating jurisdiction must complete.

The next task of the meeting was to assemble a list of disaster-related threats facing Crawford County. Using the hazards ranked in the 2009 MHMP, the Planning Team evaluated each hazard based on the probability/likelihood each hazard would occur and the impact/severity it would have on Crawford County. Below are the results for the Crawford County Risk Assessment:

Hazard	Probability	Severity	Risk Index	Ranking
Earthquakes	2	6	12	4
Flooding	4	2	8	1
Thunderstorm/Severe Wind	4	2	8	2
Tornadoes	2	4	8	3
Winter Storm	3	2	6	5
Extreme Heat/Drought	2	2	4	6
Hazmat Release	2	2	4	7
Dam/Levee Failure	2	1	2	8

After some discussion, the Planning Team decided to change the outcome of the Risk Index and place Earthquakes at 4, moving Flooding, Thunderstorms, and Tornadoes up in ranking.

Each jurisdiction within the county is responsible for filling out a separate Risk Assessment and submit it to SIU.

The next meeting will be the public meeting where SIU will present the results of the risk assessment, describe the GIS and Hazus models. This which will give the public a chance to voice their opinions regarding the plan. After the public meeting the team will meet and review the Risk Assessment.

Meeting was adjourned.

37	Bob Berty	PCOA	618-544-1414	301 S. Cross St.	Berty Rembrandt	2000
38	J.D. Branson	Marathon Petroleum Flat Rock SO	618-584-3500	502 W. Second St. Flat Rock, IL. 62472	Jacobsen & Fitchett	Fire Chief
39	Chris Bule	Cumby Trail Camp	618-544-8557 R 1183		Truck & Rec. off.	Meeting Pl. 100 Council
40	Scotty Harris	Lincoln Trail City	618-544-9657	W 220 S W 25 N Hwy 1	harris & g. rec. off.	President
41	Donna Hahn	Crystal Mt. Memorial Hospital	711-21 618-544-2505	1000 N. Hwy 51 Pekin, IL 62450	glen. hahn & smulders m.d.s	Director Emergency Department
42	D. H. Ashman	Robinson Police	618-514-2017	300 South Lincoln	Chief of Robinson	Chief of Police
43	Wanda Dantz	STU				
44		STU				
45						

[illegible]

Meeting 2 – February 24th, 2015**IEMA Multi-Hazard Mitigation Plan**

Assembly of the Crawford County Planning Team Meeting 2

Chairman: Ken Pryor

Plan Directors: Southern Illinois University and Greater Wabash Region Planning Commission

Meeting Date: February 24th, 2015

Meeting Time: 10:00am

Place: Robinson Community Center, 300 S Lincoln Street, Robinson, IL

Planning Team/Attendance: 19

Public Meeting and County Risk Assessment

The meeting is called to order

Prof. Nicholas Pinter opened the meeting by explaining that the planning team is here today to update the 2009 Crawford County Multi-Hazard Mitigation Plan. He introduced the planning partners: Southern Illinois University and Greater Wabash Regional Planning Commission. A PowerPoint presentation was present that included: historic accounts of natural disasters that have affected Crawford County and the results from the risk assessment report.

A draft of the Crawford County Mitigation Plan was also given to each planning team member for review. It was explained by Prof. Pinter that the each planning team member should review the plan and consider the risk assessment before attending the next meeting. The next meeting will take place in April/May. This meeting will involve developing mitigation strategies to address each ranked hazard.

Prof. Pinter then asked the audience for questions and comments. Changes to the plan were suggested:

- Correct spelling of planning members (page 3)
- Change Howey Creek to Honey Creek

Project Manager Amanda Dampitz noted the changes and promised to make all corrections before the next meeting. Prof. Pinter thanked those who came and closed the presentation.

Meeting was adjourned

[illegible][illegible]

Meeting 3 – December 1st, 2015

Crawford County Multi-Hazard Mitigation Plan Meeting 3

Chairman: Ken Pryor (EMA Coordinator)

Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: December 1, 2015

Meeting Time: 2:00 p.m.

Place: Robinson Community Center- Robinson, IL

Attendance: see sign in sheet

This meeting consisted of a brainstorming session in which the planning team met with SIU and GWRPC to provide local knowledge that identified and prioritized mitigation strategies and projects that can address the threats identified in the risk assessments. Each participant was given a handout for their jurisdiction to fill out mitigation strategies specific to each hazard.

GWRPC will work with the County to get all forms completed and turned in for every jurisdiction. This meeting will be held again due to lack of participation.

Crawford County PDMP Meeting
December 1, 2015 at 2 pm

Robinson Community Center, Robinson, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
1	Karen Kykendall	GINRC	618-445-3612	Albion	KarenKykendall@gmail.com	Grandmother	Con
2	Tim Kopp	SIV	631-805-5772	Carbondale	timkopp@siu.edu	Grad Student	—
3	Levi Milliron	SIV	765-860-1286	Carbondale	milliron15@siu.edu	Grad Student	60
4	Kevin Miller	CEUA	618-335-2175	Carbondale	kmiller@siu.edu	Grad Student	2
5	David Miller	PD	618-597-3217	Carbondale	dmiller@siu.edu	Grad Student	—
6							
7							
8							
9							
10							
11							
12							
13							
14							
15	Name	Representing	Phone Number	Address	Email Address	Job Description	

Meeting 3 (Redo) – April 12th, 2016

Crawford County Multi-Hazard Mitigation Plan Meeting 3- Redo

Chairman: Ken Pryor (EMA Coordinator)

Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: April 12, 2016

Meeting Time: 10:00 a.m.

Place: Robinson Community Center

Attendance: see sign in sheet

This meeting consisted of a brainstorming session in which the planning team met with SIU and GWRPC to provide local knowledge that identified and prioritized mitigation strategies and projects that can address the threats identified in the risk assessments. Each participant was given a handout for their jurisdiction to fill out mitigation strategies specific to each hazard.

GWRPC will work with the County to get all forms completed and turned in for every jurisdiction.

[illegible]

Meeting 4 – November 9th, 2016

Crawford County Multi-Hazard Mitigation Plan Meeting 4

Chairman: Ken Pryor (EMA Coordinator)

Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: November 9, 2016

Meeting Time: 10:00 a.m.

Place: Robinson Community Center

Attendance: see sign in sheet

SIU and GWRPC met with the team and presented the DRAFT plan. Each member of the team was given a draft plan and instructed to read through the plan and send any revisions to GWRPC. Other draft plans were given to Ken Pryor to pass out to other team members who were not in attendance to review.

Crawford County PDMP Meeting
November, 9 2016 at 2 pm

City Hall, Robinson, IL

Name	Representing	Phone Number	Address	Email Address	Job Description	Image
1. David Niblett	Crawford Co. EMA	618-247-0565	Robinson IL 62454	dniblett@crawfordco.il.us	Coordinator	
2. SHEAR RUMAN	CRAW. CO. S.O.	618-500-3824	PO BOX 538250 ROBINSON, IL	shear@crwdco.org	SALESMAN	
3. TED Attkerry	Robinson Fire	618-544-2955	400 S. Jackson	chief@robcofire.com	Chief	
4. Ken Ryden	CC EMA	618-335-2874	PO Box 132 Robinson, IL 62454	kenryden@robcofire.com	Volunteer	
5. Tina Delaney	Village of St. Charles	618-533-4710	1135 Main St St. Charles, IL 62278	hille@stcharles.il.us	Treas.	
6. Roger Feltner	City of Robinson	618-344-7416	3005 Lincoln	admin@cityofrobinson.com	Mayor	
7. Kara K. Kunkin	GWRPC					
8.						
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15.						

Call Log Sheet**Crawford County Multi-Hazard Mitigation Plan**

Chairman: Ken Pryor (EMA Coordinator)

Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Members of the Crawford County Planning Team held phone sessions to work with several jurisdictions to help identify and prioritize mitigation strategies and projects outside of meetings.

Call Log

Date	Name	Representing	Job Description	Call Duration	Crawford County Planning Team Member
2/22/17	Larry Keeler	Flat Rock	Village President	1 hour	GWRPC
2/23/17	Jeff Patchett	Oblong CUSD #4	Superintendent	2 hours	GWRPC
2/23/17	Chris Long	Palestine CUSD #3	Superintendent	2 hours	GWRPC
2/23/17	Josh Quick	Robinson CUSD #2	Superintendent	2 hours	GWRPC
2/23/17	John Baud	Stoy	Village President	1 hour	GWRPC

Appendix B. Local Press Release and Newspaper Articles

PUBLISHER'S CERTIFICATE

I, Kathleen Lewis, publisher of the Robinson Daily News, do hereby certify that I am the publisher of the Robinson Daily News, a daily secular newspaper of general circulation regularly published in the City of Robinson, County of Crawford and State of Illinois; and I further certify that the notice, a copy of which is attached here to; in the matter of:

Crawford Co. MHMP Steering Committee

was published once in said newspaper, the insertion being on the 16th day of February A.D. 2015, and I further certify that the said Robinson Daily News was regularly published continuously for more than one year in the City of Robinson in said county, next preceding the first publication of said notice, and that I am duly authorized to make proof of matters published in the said Robinson Daily News.

Given under my hand at Robinson, Illinois, this 18th day of February A.D. 2015.



PUBLIC HEARING
The Crawford County Multi-Hazard Mitigation Plan (MHMP) Steering Committee will host a public information meeting on Tuesday, February 24, 2015 at 10:00 a.m. at the Community Center, 300 S. Lincoln, Robinson, IL 62454. Through a grant funded by FEMA, the county has formed an alliance with SIU and Greater Wabash Regional Planning Commission to identify potential natural hazards and produce an updated to the 2009 MHMP. The public is invited to attend this meeting to learn about the MHMP process and provide input regarding natural hazards that occur in Crawford County. For more information, refer to GWRPC website www.gwrpc.com.
Gareld Bilyew
Crawford County Board Chairman

Appendix C. Adopting Resolutions

See Attached Adopting Resolutions

Appendix D. Historical Hazards

See Attached Newspaper Clippings and Map

Appendix E. List of Essential Facilities

Not all data is available for every facility. Other facility specifics may be available upon request.

Emergency Operations Center Facilities

Facility Name	Address	City
Crawford County ESDA	301 South Cross Street	Robinson

Fire Station Facilities

Facility Name	Address	City
Flat Rock Fire Protection District	205 South Main Street	Flat Rock
Hutsonville Township FPD	406 East Cherry Street	Hutsonville
LaMotte Fire Protection District	104 East Harrison Street	Palestine
Oblong Fire Protection District	111 West Main Street	Oblong
Prairie-Licking FPD	700 th 2000 th N	Annapolis
Robinson Fire Department	400 South Jackson Street	Robinson

Police Station Facilities

Facility Name	Address	City
Oblong Police Department	202 South Range Street	Oblong
Crawford County Sheriff's Department	203 South Jefferson Street	Robinson
Robinson Chief of Police	300 South Lincoln Street	Robinson
Palestine Police Department	301 South Main Street	Palestine
Hutsonville Police Department	113 South Main Street	Hutsonville

School Facilities

Facility Name	Address	City
New Hebron Christian School	10755 East 700 th Avenue	Robinson
Oblong Elementary School	600 West Main Street	Oblong
Oblong High School	700 South Range Street	Oblong
Palestine Grade School	102 North Main Street	Palestine
Palestine High School	203 South Washington Street	Palestine
Lincoln Elementary School	301 East Poplar Street	Robinson
Nuttall Middle School	400 Rustic Street	Robinson
Robinson High School	2000 North Cross Street	Robinson
Washington Elementary School	507 Condit Street	Robinson
Westside Christian Academy	8635 East 1050 th Avenue	Robinson
Hutsonville High School	500 West Clover	Hutsonville
Hutsonville Elementary School	500 West Clover	Hutsonville
Lincoln Trail College	11220 State Highway 1	Robinson

Medical Care Facilities

Facility Name	Address	City
Crawford Memorial Hospital	1000 North Allen	Robinson
Heritage Shelter Care	207 Wood Lane	Hutsonville
Ridgeview Care Center	413 Ridge Lane	Oblong
Cotillion Ridge Nursing Center	600 East Robinwood Drive	Robinson
D. Miller Innovative Center	902 West Mefford Street	Robinson
South Haven	500 South Reed Street	Robinson
Brookstone Estates	1101 North Monroe	Robinson

Appendix F. Critical Facilities Map

See Attached Large Format Map of Critical Facilities.