Hazard Mitigation Plan

White County, Illinois

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Section 1 - Public Planning Process

1.1 Narrative Description

Hazard Mitigation is defined as any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) has made reducing hazards one of its primary goals. Hazard Mitigation Planning and the subsequent implementation of the projects, measures, and policies developed as part of these plans, 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 a requirement 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.

The Greater Wabash Regional Planning Commission was established in 1964 to serve the Greater Wabash District by providing local, regional, and comprehensive planning, facilitating knowledge enhancement, securing and administering funds, and promoting cooperative solutions to regional issues. The Greater Wabash Regional Planning Commission and White County have joined efforts to develop this mitigation plan, realizing that the recognition of and the protection from hazards that impact the county and its residents contribute to future community and economic development. The team will continue to work together to develop and implement mitigation initiatives developed as part of this plan.

In recognition of the importance of planning in mitigation activities, the Federal Emergency Management Agency (FEMA) has created HAZUS-MH (**Haz**ards **US**A **M**ulti-**H**azard) a powerful geographic information system (GIS)-based disaster risk assessment tool. This tool enables communities of all sizes to predict the estimated losses from floods, hurricanes, earthquakes, and other related phenomena 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 in Illinois. Southern Illinois University at Carbondale (SIU) and The Polis Center (Polis) at Indiana University Purdue University Indianapolis are assisting White County planning staff with performing the hazard risk assessment.

1.2 Planning Team Information

The White County Multi-Hazard Mitigation Planning team is made up of representatives from each of the incorporated areas within the county. All municipalities and police departments are represented. The committee held five meetings to develop the plan. The meetings are as follows:

Meeting 1: Kickoff Meeting

Meeting 2: Hazard Identification

Meeting 3: PUBLIC meeting Historical Hazard presentation: Prioritize Hazards

Meeting 4: Hazard Mitigation Measures

Meeting 5: PUBLIC Meeting Review Draft Plan

Completion date for the plan will be approximately 18 months from the first meeting.

The White County Multi-Hazard Mitigation Planning Team is headed by Brent Hammell, who also serves as the primary point of contact. Members of the planning team include representatives from Carmi, Enfield, Norris City, Crossville, Phillipstown, Burnt Prairie, Maunie, Mill Shoals, Springerton, and Grayville. Table 1-1 identifies the planning team individuals and the organizations they represent.

Table 1-1: Multi Hazard Mitigation Planning Team Members

Attendee	Title	Representing	Jurisdiction
Brent Hammell	Emergency M.A.	White County	White County
Doug Maier	Sheriff	White County Sheriff Department	White County and Crossville
James Renshaw		City of Carmi	City of Carmi
Julie Irwin	E9-11 Executive Director	White County E9-11 Village of Phillipstown	White County and Phillipstown
Kara Gill	Grant Writer	GWRPC	White County
Linda Hill	Director, Ambulance	Grayville Ambulance	City of Grayville
Nancy Mitchell	County Board Member	White County Board	White County
Barry Cleveland	Editor/Publisher	Carmi Times	White County
Ron Wooten	County Board Chairman	White County	White County
Roy Kissel	Mayor	Village of Norris City	Village of Norris City
Tom Harbour	Mayor	Village of Enfield	Village of Enfield
Stan Adams	Water Superintendent	Bt. Prairie, Mill Shoals, & Springerton	Bt. Prairie, Mills Shoals, and Springerton

The Disaster Mitigation Act (DMA) planning regulations and guidance stress that planning team members must be active participants. The White County MHMP committee members were actively involved on the following components:

- Attending the MHMP meetings
- Providing available Geographic Information System (GIS) 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

An MHMP kickoff meeting was held at Greater Wabash Regional Planning Commission on March 17, 2008 at 6:00 p.m. Representatives of Crawford, Edwards, and White Counties attended the meeting. Sarah Mann, Executive Director Greater Wabash Regional Planning Commission, explained the rationale behind the MHMP program and answered questions from the participants. Nicholas Pinter from SIU provided an introduction to hazards and John Buechler and Dave Coats from The Polis Center provided an overview of HAZUS-MH. Nicholas Pinter described the timeline and the process of the mitigation planning project and presented Crawford, Edwards, and White Counties with a Memorandum of Understanding (MOU) for sharing data and information.

The White County Multi-Hazard Mitigation Planning Committee met on June 24, 2008, July 15, 2008, September 23, 2008, November 4, 2008, and April 7, 2009. The meetings were held in the City of Carmi. Each meeting was approximately two hours in length. The meeting agendas, minutes, and attendance sheets are included in Appendix A. 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, and assisted with preparation of the public participation information.

1.3 Public Involvement in Planning Process

The public was invited to Meeting #3 of the planning committee. The meeting was posted in the local papers and throughout the communities. In Meeting #3, Harvey Henson with the Geology Department at SIUC delivered a presentation on hazards. Public input and opinions were sought during this meeting.

An effort was made to solicit public input during the planning process. The public meeting was held September 26 at the White County Extension office in Carmi, Illinois. Appendix A contains the agendas and minutes from each of the public meetings. Appendix B contains articles published by the local newspaper throughout the public input process.

The public was also invited to Meeting #5, the Review of the Draft Plan. The meeting was posted in local papers throughout the communities. In Meeting #5, Kara Gill with Greater Wabash Regional Planning Commission explained the entire process of the plan and distributed the draft plan copies. All members of the meeting were encouraged to look over the plan and return any comments or suggestions within one week.

1.4 Neighboring Community Involvement

The White County planning team invited participation from various representatives of neighboring county and local city and town governments. Brent Hammell, White County EMA Director, provided copies of the plan for all neighboring jurisdictions which included Wayne County, Hamilton County, Edwards County, and Gallatin County in Illinois, as well as Posey County in Indiana, to look over and offer comments.

The plan was also discussed at the Greater Wabash Regional Planning Commission meetings and in the GWRPC quarterly newsletter. GWRPC serves the seven counties of Crawford, Edwards, Lawrence, Richland, Wabash, Wayne, and White. Greater Wabash Regional Planning Commission is working on Edwards and White plans, so it provided copies of both plans for the two committees to review and offer comments to the other county's plan. Edwards County is going through the same process as White County so is fully aware of the multi-hazard mitigation planning process and is cooperating with White County in White County's planning efforts. Details of how neighboring stakeholders were involved are summarized in Table 1-2.

Table 1-2: Neighboring Community Participation

Person Participating	Organization	Jurisdiction	Participation Description
Debbie Judge	Emergency Management Agency	Edwards County	Reviewed and commented on plan
Darryl Stephenson	Wayne County Board	Wayne County	Reviewed and commented on plan
Bill Sandusky		Hamilton County	Reviewed and commented on plan

1.5 Review of Technical and Fiscal Resources

The MHMP planning team has identified representatives from key agencies to assist in the planning process. Technical data, reports, and studies were obtained from these agencies. The organizations and their contributions are summarized in Table 1-3.

Table 1-3: Key Agency Resources Provided

Agency Name	Resources Provided
Greater Wabash Regional Planning Commission	Comprehensive Economic Development Strategy (CEDS), which lists economic and community projects for local governments
Carmi City Council	Zoning ordinance with local zoning laws
White County Emergency Management	Emergency Operations Plan for White County
U.S. Census	County Profile Information such as Population and Physical Characteristics
Department of Commerce and Economic Opportunity	Community Profiles
Illinois Department of Employment Security	Industrial Employment by Sector
National Climatic Data Center	Climate Data
Illinois Emergency Management Agency	2007 Illinois Natural Hazard Mitigation Plan
Illinois Environmental Protection Agency	Illinois 2008 Section 303(d) Listed Waters and watershed maps
United States Geological Survey	Earthquakes Information, Landcover Data, Hydrologic Data
Illinois State Geological Survey	Coal Mining Maps, Geological Maps, Karst Geology, Soil Amplification Maps, Municipal Boundaries
University of Memphis, Center for Earthquake Research and Information	Earthquake Data
Illinois Water Survey and Federal Emergency Management Agency	Flood Rate Information Maps
Illinois Department of Transportation	Roads, Highways, and Railroads
White County	Roads, Municipal Boundaries, and Critical Facilities

1.6 Review of Existing Plans

White County and its associated local communities utilize a variety of planning documents to direct community development. These documents include land use plans, master plans, emergency response plans, municipal ordinances, and building codes. The MHMP planning process incorporated the existing natural hazard mitigation elements from these previous planning efforts. Table 1-4 lists the plans, studies, reports, and ordinances used in the development of the plan.

Table 1-4: Planning Documents Used for MHMP Planning Process

Author(s)	Year	Title	Description	Where Used
National Agricultural Statistics Service	2006–2007	Illinois County Estimates: Corn, Soybeans, and Wheat	This release contains official estimates of acreage, yield and production of corn, soybeans and wheat for counties in Illinois.	Land Use and Development Trends
Greater Wabash Regional Planning Commission	2007	The Comprehensive Plan for the Greater Wabash Region	It offers guidelines for counties, cities and villages in their quest for improved social and economical opportunities for their citizens.	Topography and Land Use and Development Trends
Illinois Emergency Management Agency	2007	Illinois Natural Hazard Mitigation Plan	The Illinois Natural Hazard Mitigation Plan (INHMP) establishes a process for identifying and mitigating the effects of natural hazards in the State of Illinois as required under the Disaster Mitigation Act of 2000.	Topography

Section 2 - Jurisdiction Participation Information

The jurisdictions included in this multi-jurisdictional plan are listed in Table 2-1.

Table 2-1: Participating Jurisdictions

Jurisdiction Name
White County Board
City of Carmi
Village of Phillipstown
Village of Crossville
Village of Enfield
City of Grayville
Village of Norris City
Village of Maunie
Village of Springerton
Village of Mill Shoals
Village of Burnt Prairie

2.1 Adoption by local governing body

The draft plan was made available on September 23, 2008 to the planning team for review. Comments were then accepted. The White County Hazard Mitigation Planning team presented and recommended the plan to the White County Board, which adopted the White County Hazard Mitigation Plan on July 16, 2009. Resolution adoptions are included in Appendix C of this plan.

2.2 Jurisdiction Participation

Each of the incorporated communities within White County was invited to participate on the planning team. When a community was not able to provide representation, it was contacted individually and afforded the opportunity to provide input about its specific jurisdiction. Table 2-2 lists the jurisdictions and how each participated in the construction of this plan.

Table 2-2: Jurisdiction Participation

Jurisdiction Name	Participating Member	Participation Description
White County Board	Ron Wooten	Member, MHMP planning committee
City of Carmi	James Renshaw	Member, MHMP planning committee
City of Grayville	Teresa Brock	Member, MHMP planning committee
Village of Crossville	Doug Maier	Member, MHMP planning committee
Village of Bt. Prairie, Springerton and Mill Shoals	Stan Adams	Member, MHMP planning committee
Village of Norris City	Roy Kissel	Member, MHMP planning committee
Village of Enfield	Tom Harbour	Member, MHMP planning committee
Village of Crossville	Bruce Morlock/ Larry Joe Ridenour	Met with EMA Director at Village Board meeting and attended final public meeting
Village of Maunie	Danny Hale	Met with EMA Director at Village Board meeting and attended final public meeting
Village of Phillipstown	Julie Irwin	Member, MHMP planning committee

All members of the MHMP planning committee were actively involved in attending the MHMP meetings, providing available Geographic Information System (GIS) data and historical hazard information, reviewing and providing comments on the draft plans, coordinating and participating in the public input process, and coordinating the county's formal adoption of the plan. Each meeting culminated with an open forum to invite questions and input from the council members. Appendix A provides further description of the meetings, including dates.

The White County Board, The City of Carmi, Village of Burnt Prairie, Village of Springerton, Village of Mill Shoals, Village of Enfield, Village of Norris City, Village of Phillipstown and the City of Grayville were all represented at the MHMP meetings. The Village of Maunie and The Village of Crossville were briefed about the meetings and mailed the minutes and the draft plan throughout the planning process.

On January 27, 2009, Brent Hammell, EMA Director for White County, visited the Village of Crossville Board Meeting and the Village of Maunie Board Meeting on February 2, 2009 to inform each jurisdiction, respectively, of the plan and seek their approval.

Section 3 - Jurisdiction Information

White County, located in southeastern Illinois, was named after Captain Leonard White, a Gallatin County legislator who is credited with the idea of extending the Illinois-Wisconsin border a few miles north of the southern tip of Lake Michigan. Carmi, the county seat, was founded in 1814 and incorporated in 1816. The second half of the nineteenth century saw the establishment of the towns of Grayville, Norris City, Springerton, Mill Shoals, Epworth, Herald, Burnt Prairie, Crossville, Phillipstown, Concord, Maunie, and Rising Sun.

3.1 Topography

The surface in White County is diversified by prairie and timber; the soil is fertile and well-adapted to the cultivation of soybeans, wheat, and corn. The principal streams, besides the Wabash River on the far southeast corner, are Bonpas Creek on the east and the Little Wabash River on the west. The lowest elevation in White County is <340 feet below sea level and the highest point is 580 feet above sea level.

3.2 Climate

White County has a moderate climate and four distinct seasons. Average temperatures range from 31°F to 79°F. Annual rainfall averages 46 inches and annual snowfall averages 13 inches.

The prevailing winds in the White County area are from the south. This pattern prevails most of the year, although it is occasionally interrupted by cold fronts that slide south during the winter. Despite these cold periods, the climate overall is more southern than northern. Snowfall varies a great deal from year to year, and significant accumulation (six inches or more) is rare.

Average annual climate statistics include:

- 0°F days – 3
- Freezing days – 103
- 90°F days – 39
- Sunshine days – 203
- Wind speed – 8.3 mph
- Relative humidity – 70%
- Rainfall – 42 inches
- Snowfall – 13 inches

3.3 Demographics

White County has a population of 15,078. According to American FactFinder, from 2000–2006 White County experienced a population decline of 5.1%. The population is spread throughout eight precincts including Carmi, Crossville, Norris City, Enfield, Maunie, Bt. Prairie, Mill

Shoals, Phillipstown, and Grayville. The largest town in White County is Carmi, which has a population of approximately 5,422. The breakdown of population by incorporated areas is included in Table 3-1.

Table 3-1: Population by Community

Community	2000 Population	% of County
City of Carmi	5,422	35.9%
Village of Crossville	782	5.1%
Village of Enfield	625	4.1%
City of Grayville*	1037	6.8%
Village of Phillipstown	28	.001%
Village of Norris City	1057	7.01%
Village of Maunie	177	1.1%
Village of Bt. Prairie	58	.003%

Source: American FactFinder, 2000

* The City of Grayville is divided between Edwards and White Counties. The portion listed is the population in White County.

3.4 Economy

Illinois Department of Employment Security reported for 2007 that .83% of the workforce in White County was employed in the private sector. The breakdown is included in Table 3-2. Educational, health, and social services represents the largest sector, employing approximately .28% of the workforce and generating approximately .12% of the earnings. The 2006 annual per capita income in White County was $29,238 compared to an Illinois average of $38,409.

Table 3-2: Industrial Employment by Sector

Industrial Sector	% of County Workforce (2007)
Agriculture, forestry, fishing, hunting, and mining	.155%
Construction	021%
Manufacturing	059%
Wholesale trade	.046%
Retail trade	.156%
Transportation, warehousing and utilities	.052
Information	.088%
Finance, insurance, real estate, and rental/leasing	.020%
Waste management services	.001%
Educational, health, and social services	.284%

Industrial Sector	% of County Workforce (2007)
Arts, entertainment, recreation, accommodation and food services	.067%
Other services(except public administration)	.061%
Public administration	.048%
Professional, Scientific, and technical services	.017%

Source: Illinois Department of Employment Security, 2007

3.5 Industry

White County major employers and number of employees are listed in Table 3-3. The largest employer is White County Coal, which was established in 1981 and has approximately 231 employees. Trelleborg is the second largest, with 220 full-time employees. Manufacturing is the largest industry in the county.

Table 3-3: Major Employers

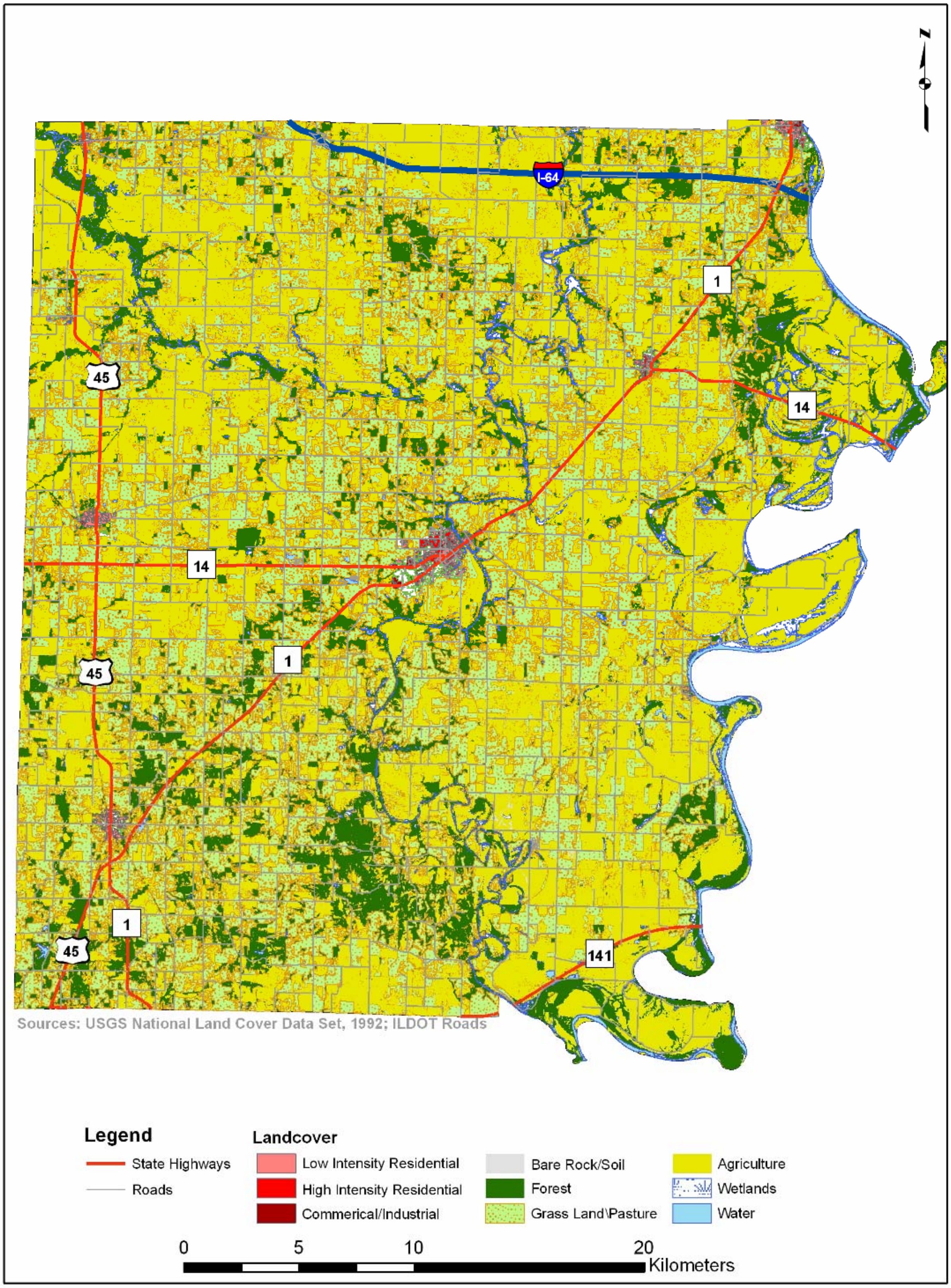
Manufacturing				
Company Name	**Location**	**Established**	**Employees**	**Type of Business**
White County Coal	White County	1981	231	Coal Mine
Martin & Bayley, Inc.	White	1974	112	Food Distributor
Trelleborg YSH	White	1974	220	Rubber Manufacturing
Hoosier Stamping	White	1969	35	Wheel production
Elastec	White	1990	62	Oil Cleanup
Transportation				
Rides Mass Transit	White			Mass Transportation
Other				
Walmart Superstore	White	1985	200	Discount Store
Wabash Christian Retirement Center	White	1958	160	Retirement/Supportive Living
Windsor Oaks Inn	White	1987	75	Motel/Restaurant
Wabash Valley Service Company	White	1930	40	Farm Service/Supply
Carmi Wholesale Distributors	White	2003	64	Grocery Distribution

Source: Carmi County Chamber of Commerce, 2008, WEDG 2008

3.6 Land Uses and Development Trends

Agriculture is the predominant land use in White County: corn is the primary crop, followed by soybeans, winter wheat, hay, and oats. Other significant land uses are industrial and residential. Figure 3-1 depicts White County's land use map.

Figure 3-1: White County Land Uses



3.7 Major Lakes, Rivers and Watersheds

No major lakes are located in the county; however, Wabash and Little Wabash Rivers are located in White County, along with Skillet Fork River and Saline River.

The county crosses four HUC08 watersheds: Upper Great Miami, Whitewater, Mississinewa, and Upper White River. A list of 14-digit Hydrologic Unit Code (HUC) watersheds is included in Table 3-4.

Table 3-4: Watersheds

Watershed Name	HUC Code
Skillet	05120115
Saline	05140204
Little Wabash	05120114
Lower Wabash	05120113

Source: U.S. Geological Survey HUC14 Watersheds, 2006

Section 4 - Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on sound risk assessment. 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 of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of three components—hazard identification, vulnerability analysis, and risk analysis.

4.1 Overall Hazard Ranking

4.1.1 Existing Plans

The White County planning team did not have a previous risk analysis. Additional local planning documents were reviewed to identify historical hazards and help identify risk. To facilitate the planning process, the flood analysis used the following plans: FIRM maps, U.S. Geological Survey digital elevation model, and the One-hundred and Five-hundred Year Flood zones for Unincorporated Areas in Illinois GIS data layer from the Illinois Geological Survey.

4.1.2 Planning Team

During Meeting #2 of the White County Pre-Disaster Mitigation Planning initiative, which occurred on July 15, 2008, the planning team developed a list of hazards that affect the jurisdiction and ranked them: 1) river flooding which occurs on an annual basis during the spring; 2) tornadoes; 3) severe thunderstorms and dam/levee failure; 4) earthquakes; 5) winter storms; and 6) drought/extreme heat. The plan also identified White County's principal technological hazard as spills relating to transportation of hazardous materials.

4.1.3 National Hazard Records

In addition to these identified hazards, the MHMP planning committee reviewed the list of natural hazards prepared by FEMA. To assist the planning team, historical storm event data was compiled from the National Climatic Data Center (NCDC; http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll). This NCDC data included 193 reported events in White County between December 2, 1950 and April 2, 2008. A summary table of events related to each hazard type is included in the hazard profile sections that follow. A full table listing all events, including additional details, is included in this report as Appendix D. In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail were plotted using SPC recorded latitude and longitude. These events are plotted and included as Appendix E. The list of NCDC hazards is included in Table 4-1.

Table 4-1: Climatic Data Center Historical Hazards

Hazard
Tornadoes
Severe Thunderstorms
Drought/Extreme Heat
Winter Storms
Flood/Flash flood

4.1.4 Hazard Ranking Methodology

Based on planning team input, national datasets, and existing plans, Table 4-2 lists the hazards White County will address in this multi-hazard mitigation plan. In addition, these hazards ranked the highest based on the Risk Priority Index discussed in section 4.1.5.

Table 4-2: Planning Team Hazard List

Hazard
Flooding
Tornado
Thunderstorms/High Winds/Hail
Dam/Levee Failure
Hazardous Materials Release
Earthquake
Winter Storms
Drought/Extreme Heat

4.1.5 Calculating the Risk Priority Index

The first step in determining the Risk Priority Index (RPI) was to have the planning team members generate a list of hazards which have befallen or could potentially befall their community. Next, the planning team members were asked to assign a likelihood rating based on the criteria and methods described in the following table. Table 4-3 displays the probability of the future occurrence ranking. This ranking was based upon previous history and the definition of hazard. Using the definitions given, the likelihood of future events is "Quantified" which results in the classification within one of the four "Ranges" of likelihood.

Table 4-3: Future Occurrence Ranking

Probability	Characteristics
4 - *Highly Likely*	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring. (1/1=100%) History of events is greater than 33% likely per year.
3 - *Likely*	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring. (1/3=33%) History of events is greater than 20% but less than or equal to 33% likely per year.
2 - *Possible*	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring. (1/5=20%) History of events is greater than 10% but less than or equal to 20% likely per year.
1 - *Unlikely*	Event is possible within the next ten years. Event has up to 1 in 10 years chance of occurring. (1/10=10%) History of events is less than or equal to 10% likely per year.

Next, planning team members were asked to consider the potential magnitude/severity of the hazard according to the severity associated with past events of the hazard. Table 4-4 gives four classifications of magnitude/severity.

Table 4-4: Hazard Magnitude

Magnitude/Severity	Characteristics
4 - *Catastrophic*	Multiple deaths. Complete shutdown of facilities for 30 or more days. More than 50% of property is severely damaged.
3 - *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.

Finally, the RPI was calculated by multiplying the probability by the magnitude/severity of the hazard. Using these values, the planning team member where then asked to rank the hazards. Table 4-5 identifies the RPI and ranking for each hazard facing White County.

Table 4-5: White County Hazards (RPI)

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Flooding	4 – Highly Likely	3 – Critical	12	1
Tornado	3 – Likely	4 – Catastrophic	12	2
Hazardous Material Release	2 – Possible	3 – Critical	6	3
Thunderstorms/ High Winds/Hail/ Lightning	4 – Highly Likely	1 – Negligible	4	4
Dam/Levee Failure	4 – Highly Likely	1 – Negligible	4	5
Earthquake	1 – Unlikely	4 – Catastrophic	4	6
Winter Storms	3 – Likely	1 – Negligible	3	7
Droughts	2 – Possible	1 – Negligible	2	8

4.1.6 Jurisdictional Hazard Ranking

Because the jurisdictions in White County differ in their susceptibilities to certain hazards—for example, the Village of Maunie within the floodplain of the Wabash River is more likely to experience significant flooding than Norris City which is located a substantial distance away from any large stream or river which could potentially cause significant flooding—the hazards identified by the planning team were ranked by SIUC for each individual jurisdiction using the methodology outlined in Section 4.1.5. The SIUC rankings were based on input from the planning team members, available historical data, and the hazard modeling results described within this hazard mitigation plan. During the five-year review of the plan this table will be updated by the planning team 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).

Table 4-6: Hazard Rankings by Jurisdiction

Jurisdiction	Hazards							
	Tornado	HAZMAT	Earthquake	Thunderstorms	Flooding	Winter Storms	Drought Extreme Heat	Dam/ Levee Failure
Burnt Prairie	1	2	3	5	4	6	7	NA
City of Carmi	2	3	5	4	1	6	7	NA
Crossville	1	4	5	3	2	6	7	NA
Enfield	1	4	3	2	7	5	6	NA
Grayville	1	4	5	3	2	6	7	5
Maunie	3	6	5	4	1	7	8	2
Mill Shoals	1	2	5	4	3	6	7	NA
Norris City	1	3	4	2	7	5	6	NA
Phillipstown	1	2	6	5	3	7	8	4
Springerton	1	3	5	4	2	6	7	NA

Rankings: 1 being the highest concern

NA = Not applicable

4.1.7 GIS and HAZUS-MH

The third step in this assessment is the risk analysis, which quantifies the risk to the population, infrastructure, and economy of the community. Where possible, the hazards were quantified using Geographic Information System (GIS) analyses and HAZUS-MH, a GIS-based risk mitigation tool developed by the Federal Emergency Management Agency (FEMA). This process reflects a Level Two approach to analyzing hazards as defined for HAZUS-MH. The approach includes substitution of selected default data with local data. Level Two analysis significantly improves the accuracy of the model predictions.

HAZUS-MH generates a combination of site-specific and aggregated loss estimates depending upon the analysis options that are selected and upon the input that is provided by the user. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across census blocks/tracts. Therefore, it is possible that overestimates of damage will occur in some areas while underestimates will occur in other areas. With this in mind, total losses tend to be more reliable over larger geographic areas than for individual census blocks/tracts. It is important to note that HAZUS-MH is not intended to be a substitute for detailed engineering studies. Rather, it is intended to serve as a planning aid for communities interested in assessing their risk to flood-, earthquake-, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project. It is only intended to highlight the major steps that were followed during the project.

Site-specific analysis is based upon loss estimations for individual structures. For flooding, analysis of site-specific structures takes into account the depth of water in relation to the structure. HAZUS-MH also takes into account the actual dollar exposure to the structure for the costs of building reconstruction, content, and inventory. However, damages are based upon the assumption that each structure falls into a structural class—for example, small versus large hospitals—and that structures in each class will respond in similar fashion to a specific depth of flooding. Site-specific analysis is also based upon a point location rather than a polygon and therefore the model does not account for the percentage of a building that is inundated. These assumptions suggest that the loss estimates for site-specific structures as well as for aggregate structural losses need to be viewed as approximations of losses that are subject to considerable variability rather than as exact engineering estimates of losses to individual structures.

The following events were analyzed. The parameters for these scenarios were created using GIS, HAZUS-MH, and historical information to predict which communities would be at risk.

Using HAZUS-MH
1. 100-year overbank flooding
2. Earthquake

Using GIS
1. Tornado
2. Hazardous Material Release

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

4.2.1.1 Processes and Sources for Identifying Assets

Default data provided with the HAZUS-MH package is based on best available nationwide data sources. The initial step involved updating the default HAZUS-MH data using more specific state of Illinois data sources when available. At Meeting #1, the planning team members were provided with a plot and report of all HAZUS-MH critical facilities. The planning team took GIS data provided by SIU-Polis, verified the datasets using local knowledge, and allowed SIU-Polis to use their local GIS data for additional verification. SIU-Polis GIS analysts made these updates and corrections to the HAZUS-MH data tables prior to performing the risk assessment. The changes to the HAZUS-MH inventory allow a Level Two analysis. This update process improved the accuracy of the model predictions. The default HAZUS-MH data has been updated as follows:

- The HAZUS-MH defaults, critical facilities, and essential facilities have been updated based on most recent available data sources. Critical and essential point facilities have been reviewed, revised, and approved by local subject matter experts at each county.
- The essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) have been applied to the HAZUS-MH model data. HAZUS-MH reports of essential facility losses reflect updated data.
- Parcels with assessment improvements (buildings) values were used to estimate the number of buildings in the flood-prone areas.
- The analysis is restricted to the county boundaries. Events that occur near the county boundary do not contain damage assessments from the adjacent county.

Essential Facilities List

Table 4-6 identifies the essential facilities that were added or updated for the analysis. A complete list of the critical facilities is included as Appendix C. A map of all the critical facilities is included as Appendix D.

Table 4-7: Essential Facilities List

Facility	Number of Facilities
Care Facilities	6
Emergency Centers	0
Fire Stations	7
Police Stations	4
Schools	15

Facility Replacement Costs

Default HAZUS-MH building stock data were used for the HAZUS-MH analyses. Facility replacement costs and total building exposure are identified in Table 4-7. Table 4-7 also includes the estimated numbers of buildings within each occupancy class.

Table 4-8: Building Exposure (default HAZUS-MH) for White County

General Occupancy	Estimated Total Buildings	Total Building Exposure (X 1000)
Agricultural	114	$18,090
Commercial	386	$145,114
Education	20	$19,597
Government	21	$10,182
Industrial	119	$75,061
Religious/Non-Profit	49	$29,613
Residential	9,146	$750,353
Total	**9,855**	**$1,048,010**

4.3 Future Development

White County is currently not a growing county. Population has been decreasing over the years and a population increase is not expected in the future. New business could potentially locate in the Grayville Industrial Park, which is just north of I-64. Businesses in the I-64 area should not affect a hazard’s impact on the community since the industrial park is located outside of city limits and away from the residential area.

4.4 Hazard Profile

4.4.1 Tornado Hazard

Hazard Definition for Tornado Hazard

Tornadoes pose a great risk to the State of Illinois and its citizens. Tornadoes historically have occurred during any month of the year. The unpredictability of tornadoes makes them one of Illinois's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum velocity at about 300 mph, but higher and lower values can occur. A wind velocity of 200 mph will result in a wind pressure of 102.4 pounds per square foot of surface area, a load that exceeds the tolerance limits of most buildings. Considering these factors, it is easy to understand why tornadoes can be so devastating for the communities they hit.

Tornadoes are defined as 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 very quickly and become a tornado. If the funnel cloud picks up and blows around debris, it has reached the ground and is a tornado.

Tornadoes are classified according to the Fujita tornado intensity scale. The tornado scale ranges from low intensity F0, with effective wind speeds of 40 to 70 mph, to F5 tornadoes with effective wind speeds of over 260 mph. The Fujita intensity scale is included in Table 4-8.

Table 4-9: Fujita Tornado Rating

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, sign boards 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.
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 for Tornado Hazard

There have been several occurrences of tornadoes within White County during recent decades. The National Climatic Data Center (NCDC) database reported 11 tornadoes/funnel clouds in White County since 1965 resulting in six injuries and nearly $3.9 million in property damage. A short-lived tornado on April 19, 1996 caused extensive damage to aircraft hangers and aircraft at the Carmi airport. Ten hangars were destroyed, along with eight small planes and an automobile. The windows were blown out of a church half a mile northeast of the airport, and one of its walls was damaged. Metal debris from the airport littered the church property. This F1 tornado caused $1 million in property damage.

White County tornadoes recorded in the NCDC database are identified in Table 4-9. Additional details for NCDC events are included in Appendix D.

Table 4-10: White County Tornadoes*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	2/9/1965	Tornado	F2	0	0	250K	0
White	6/8/1974	Tornado	F0	0	0	0K	0
White	5/30/1976	Tornado	F2	0	0	25K	0
White	6/1/1981	Tornado	F0	0	0	0K	0
White	5/2/1983	Tornado	F1	0	0	25K	0
White	1/7/1989	Tornado	F2	0	6	2.5M	0
White	1/7/1989	Tornado	F1	0	0	0K	0
White	5/16/1990	Tornado	F1	0	0	3K	0
Carmi Muni Arpt	4/19/1996	Tornado	F1	0	0	1.0M	0
Springerton	10/24/2001	Tornado	F0	0	0	50K	0
Norris City	11/15/2005	Tornado	F0	0	0	0	0
Phillipstown	5/10/2006	Tornado	F0	0	0	0	0

Source: NCDC

*White County’s data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

Geographic Location for Tornado Hazard

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

Hazard Extent for Tornado Hazard

The historical tornadoes listed previously generally move from west to east across the county, although many other tracks are possible, from more southerly to northerly. The extent of the hazard varies both in terms of the extent of the path and the wind speed. Tornadoes can occur at any location within the county.

Calculated Risk Priority Index for Tornado Hazard

Based on historical information, the probability of future tornadoes in White County is likely. Tornadoes with varying magnitudes are expected to happen. According to the RPI, tornadoes ranked as the number two hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	4	=	12

Tornado hazards could impact the entire jurisdiction equally; therefore, the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan will consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in White County are discussed in types and numbers in Table 4-7. In addition, a discussion of the potential impacts for buildings and infrastructure during a tornado are included.

Critical Facilities

All critical facilities are vulnerable to tornadoes. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts will vary based on the magnitude of the tornado, but can include structural failure, debris (trees or limbs) causing damage, 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 4-6 lists the types and numbers of all of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

A table of the building exposure for the entire county is listed in Table 4-7. The buildings within the county can all expect the same impacts, similar to those discussed for critical facilities. These impacts include structural failure, debris (trees or limbs) causing damage, roofs blown off or windows broken by hail or high winds, and loss of building function (e.g. a damaged home will no longer be habitable causing residents to seek shelter).

Infrastructure

During a tornado the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a tornado. 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 fail or become impassable causing risk to traffic.

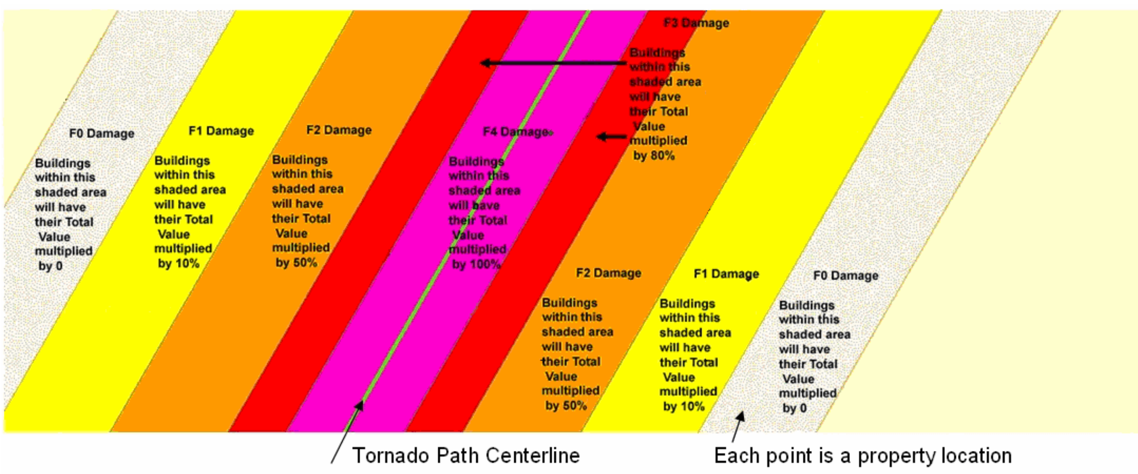
An example scenario is described to illustrate the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure. GIS overlay modeling was used to determine the potential impacts of an F4 tornado. The analysis used a hypothetical path based upon an F4 tornado event that would run for 29 miles just east of Norris City, and through the towns of Carmi and Crossville. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Table 4-10 depicts tornado damage curves as well as path widths.

Table 4-11: Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
F-5	3000	100%
F-4	2400	100%
F-3	1800	80%
F-2	1200	50%
F-1	600	10%
F-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the tornado path. Figure 4-1 and Table 4-11 describe the zone analysis.

Figure 4-1: GIS Analysis Using Tornado Buffers



An F4 tornado has four damage zones. Total devastation is estimated within 150 feet of the tornado path (the darker colored Zone 1). The outer buffer is 900 feet from the tornado path (the lightest colored Zone 4), within which 10% of the buildings will be damaged.

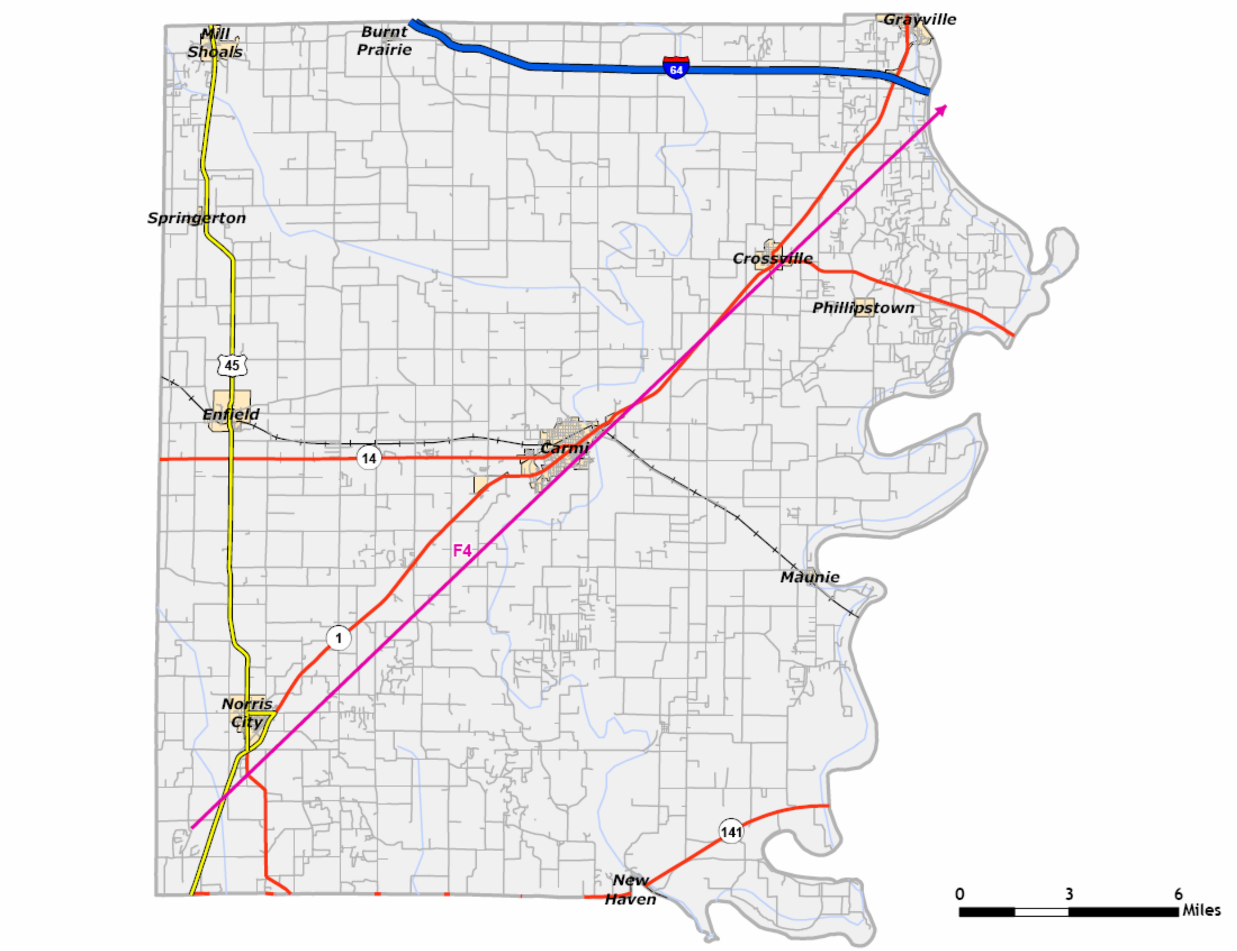
Table 4-12: Tornado Zones and Damage Curves

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

Once the hypothetical route is digitized on the map, several buffers are created to model the damage functions within each zone.

The selected hypothetical tornado path is depicted in Figure 4-2.

Figure 4-2: Historical F1 Tornado Path in White County



Results

The GIS analysis estimates building losses of $41.9 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against census blocks which contain exposure amounts based on occupancy classes. The results of the analysis are depicted in Table 4-12. Figures 4-3 and 4-4 display the damage curve buffers in Norris City and Carmi.

Figure 4-3: Modeled F4 Tornado Damage Buffers in Norris City

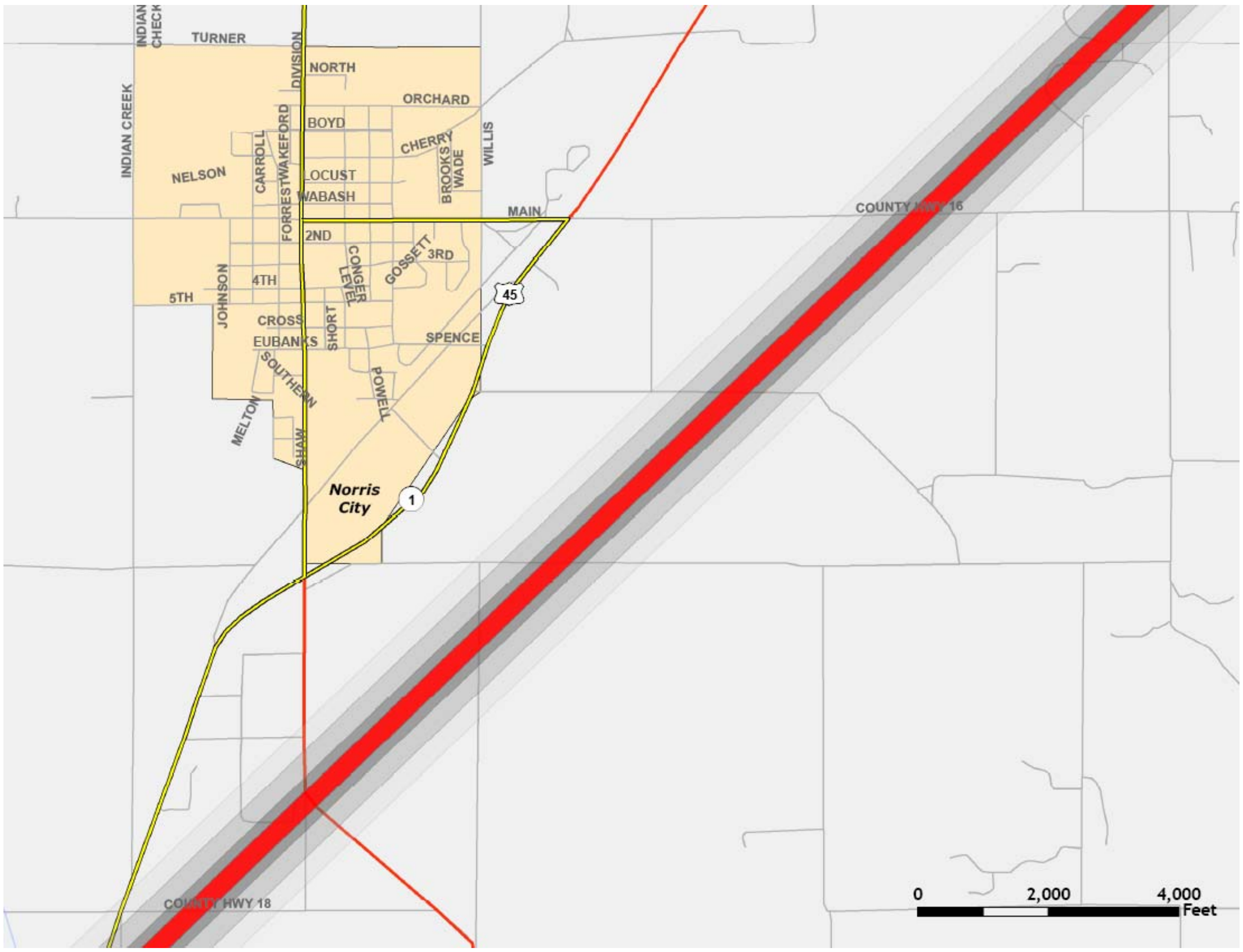


Figure 4-4: Modeled F4 Tornado Damage Buffers in Carmi

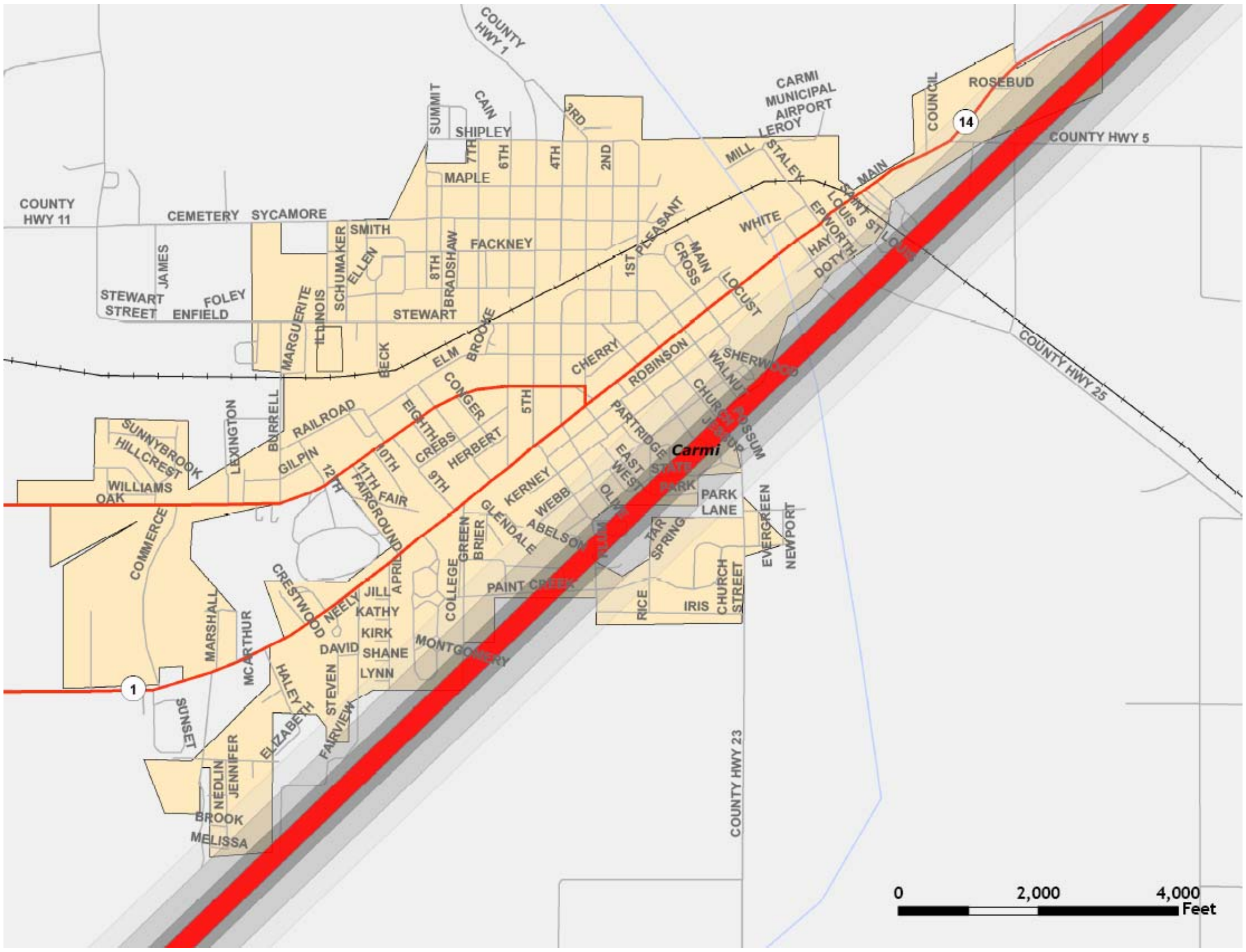


Table 4-13: Estimated Building Losses by Occupancy Type (X 1000)

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$8,609	$7,259	$12,113	$3,972
Commercial	$2,154	$1,657	$2,038	$564
Industrial	$483	$404	$778	$195
Agriculture	$80	$67	$133	$29
Religious	$283	$259	$322	$38
Government	$45	$34	$36	$37
Education	$117	$94	$94	$15
Total	**$11,772**	**$9,776**	**$15,512**	**$4,850**

Essential Facilities Damage

There are three essential facilities located within 900 feet of the hypothetical tornado path. The model predicts that three medical care facilities would experience damage. The affected facilities are identified in Table 4-13, and their geographic locations are shown in Figure 4-5.

Table 4-14: Estimated Essential Facilities Affected

Name
Cornerstone Healthcare Of Illinois
Phoenix Rehabilitation
Wabash Christian Retirement

Figure 4-5: Essential Facilities within Tornado Path

Vulnerability to Future Assets/Infrastructure for Tornado Hazard

The entire population and buildings of White County have been identified as at risk because tornadoes can occur anywhere within the State of Illinois. Furthermore, any future development in terms of new construction within the county will be at risk. The building exposure for White County is included in Table 4-7.

All critical facilities in the county and its communities are at risk. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Analysis of Community Development Trends

Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures should be built with sturdier construction, and existing structures should be hardened to lessen the potential impacts of severe weather. Community sirens to warn of approaching storms are also vital to ensuring the safety of White County residents and minimizing property damage.

4.4.2 Flooding

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 amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates into the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods can be classified as one of two types: 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; another eighteen inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe in the local areas where they occur. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at anytime 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.

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 for Flooding

The National Climatic Data Center (NCDC) database reported 25 flash flood (including urban/small stream flooding) and 59 riverine flood events in White County since 1993. Flooding in White and surrounding counties has been attributed with nearly $3.2 million in property damage. For example, record flooding in January 2005 along the Lower Wabash River occurred, prompting state disaster declarations that included Wabash, White, and Gallatin Counties. Flood-fighting activities included the construction of temporary sandbag levees. An agricultural levee near Calvin (in White County) was breached in three places, inundating thousands of acres of farmland. All access to the small community of Maunie (in White County) was cut off by floodwaters, and half of the community was underwater. Ambulances were sent to rescue three oil field workers who were caught in floodwaters near Crossville. No serious injuries were reported. Combined effects of the Wabash and Little Wabash Rivers resulted in at least $0.5 million in damage to White County roads.

Significant White County floods recorded by the NCDC are shown in Table 4-14. A complete list of flood events and additional information about the significant flood events are included in Appendix D. Historical flood crests and discharges at hydrologic monitoring stations are summarized in Appendix H.

Table 4-15: White County Previous Occurrences of Flooding*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	8/16/1993	Flash Flood	N/A	0	0	0K	0K
White	5/17/1995	Flash Flood	N/A	0	0	10K	0
White	5/17/1995	Flash Flood	N/A	0	0	10K	0
White	5/17/1995	Flash Flood	N/A	0	0	10K	0
White	5/18/1995	Flash Flood	N/A	0	0	10K	0
White	4/26/1996	Flood	N/A	0	0	0	0
Carmi	4/28/1996	Flash Flood	N/A	0	0	100K	0
White	5/1/1996	Flood	N/A	0	0	1.0M	0
Carmi	5/5/1996	Flash Flood	N/A	0	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Enfield	5/10/1996	Flash Flood	N/A	0	0	500K	0
White	6/1/1996	Flood	N/A	0	0	0	0
White	6/13/1996	Flood	N/A	0	0	0	0
White	1/28/1997	Flood	N/A	0	0	0	0
White	2/1/1997	Flood	N/A	0	0	0	0
White	3/3/1997	Flood	N/A	0	0	10K	0
White	4/8/1997	Flood	N/A	0	0	0	0
White	4/15/1998	Flash Flood	N/A	0	0	20K	0
White	5/6/1998	Flood	N/A	0	0	0	0
White	1/22/1999	Flood	N/A	0	0	40K	0
White	1/31/1999	Flash Flood	N/A	0	0	0	0
White	2/1/1999	Flood	N/A	0	0	3K	0
White	4/6/1999	Flood	N/A	0	0	4K	0
Carmi	6/28/1999	Urban/sml Stream Fld	N/A	0	0	0	0
Central Portion	7/1/1999	Flash Flood	N/A	0	0	0	0
White	6/2/2000	Flood	N/A	0	0	0	0
Carmi	6/17/2000	Flash Flood	N/A	0	0	0	0
Carmi	6/18/2000	Flash Flood	N/A	0	0	0	0
White	6/30/2000	Flood	N/A	0	0	0	0
White	7/1/2000	Flood	N/A	0	0	0	0
White	7/1/2000	Flood	N/A	0	0	0	0
Carmi	7/11/2000	Flash Flood	N/A	0	0	50K	0
White	7/14/2000	Flood	N/A	0	0	0	0
White	2/25/2001	Flood	N/A	0	0	0	0
White	2/25/2001	Flood	N/A	0	0	0	0
White	5/1/2001	Flood	N/A	0	0	0	0
Crossville	7/24/2001	Urban/sml Stream Fld	N/A	0	0	0	0
Carmi	10/23/2001	Urban/sml Stream Fld	N/A	0	0	0	0
White	12/17/2001	Flood	N/A	0	0	0	0
White	2/6/2002	Flood	N/A	0	0	0	0
White	3/20/2002	Flood	N/A	0	0	0	0
White	4/1/2002	Flood	N/A	0	0	0	0
White	5/1/2002	Flood	N/A	0	0	158K	0
White	5/8/2002	Flash Flood	N/A	0	0	3K	0
White	5/8/2002	Flood	N/A	0	0	7K	0
White	6/1/2002	Flood	N/A	0	0	0	0
White	2/23/2003	Flood	N/A	0	0	0	0
White	3/1/2003	Flood	N/A	0	0	0	0
White	5/10/2003	Flood	N/A	0	0	0	0
White	5/11/2003	Flood	N/A	0	0	0	0
White	5/20/2003	Flood	N/A	0	0	6.0M	0
White	7/15/2003	Flood	N/A	0	0	0	0
White	9/10/2003	Flood	N/A	0	0	0	0
White	1/5/2004	Flood	N/A	0	0	0	0
White	5/1/2004	Flash Flood	N/A	0	0	0	0
White	5/1/2004	Flood	N/A	0	0	0	0
White	5/25/2004	Flash Flood	N/A	0	0	0	0
White	6/1/2004	Flood	N/A	0	0	0	0
White	6/3/2004	Flood	N/A	0	0	0	0
White	6/20/2004	Flood	N/A	0	0	0	0
White	8/26/2004	Flash Flood	N/A	0	0	30K	0
Carmi	8/28/2004	Flash Flood	N/A	0	0	500K	0
White	8/28/2004	Flood	N/A	0	0	0	0
White	9/1/2004	Flood	N/A	0	0	0	0
White	1/5/2005	Flood	N/A	0	0	1.0M	0
White	1/5/2005	Flood	N/A	0	0	0	0
White	1/6/2005	Flood	N/A	0	0	300K	0
White	1/6/2005	Flood	N/A	0	0	35K	0
White	2/15/2005	Flood	N/A	0	0	0	0
Grayville	11/15/2005	Flash Flood	N/A	0	0	0	0
White	11/15/2005	Flash Flood	N/A	0	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Maunie	3/11/2006	Flood	N/A	0	0	0	0
Carmi	3/11/2006	Flood	N/A	0	0	0	0
Maunie	4/11/2006	Flood	N/A	0	0	0	0
Maunie	4/22/2006	Flood	N/A	0	0	0	0
Carmi	7/21/2006	Flash Flood	N/A	0	0	0	0
Maunie	12/7/2006	Flood	N/A	0	0	0K	0K
Maunie	12/27/2006	Flood	N/A	0	0	0K	0K
Maunie	1/1/2007	Flood	N/A	0	0	0K	0K
Carmi	1/15/2007	Flood	N/A	0	0	0K	0K
Maunie	3/1/2007	Flood	N/A	0	0	0K	0K
Maunie	3/31/2007	Flood	N/A	0	0	0K	0K
Maunie	4/1/2007	Flood	N/A	0	0	0K	0K
Maunie	2/7/2008	Flood	N/A	0	0	0K	0K
Carmi	2/17/2008	Flood	N/A	0	0	0K	0K

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

Previous Occurrences for Dam and Levee Dam Failure

According to the White County planning team, there are no records or local knowledge of any dam or certified levee failure in the county; however, agricultural levees along the Wabash River have breached during large floods in January 2005 and March 2008.

Repetitive Loss Properties

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which 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 25% of the market value of the structure at the time of each flood loss.

Illinois Emergency Management was contacted to determine the locations of repetitive loss structures. White County has two repetitive loss structures within the county. The total amount paid for building replacement and building contents for damages to these repetitive loss structures is $51,501.16. Table 4-15 describes the loss structures in terms of occupancy and jurisdiction.

Table 4-16: White County Repetitive Loss Structures

Jurisdiction	Occupancy Type	Number of Properties	Total Paid
Carmi	Single-Family	2	$51,501.16

Geographic Location for 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 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 White County are the Wabash River, Little Wabash River, Skillet Fork, and Elliot Creek (both tributaries to the little Wabash). Flooding along Skillet Fork, Elliott Creek and the Little Wabash River tend to inundate the northern and central portions of White County including the incorporated areas of Carmi, Mills Shoals, and Crossville. Flooding along the Wabash River impacts the eastern portion of the county and can inundate portions of Grayville and all of Maunie.

Flash flooding in White County typically occurs or is best documented in urban/developed areas. For example in the town of Carmi, flash flooding can result in the closure of US 45, State Route 1 and several side roads. Flash flooding has also closed US 45 near Enfield and Norris City. A digital file of the FIRM maps was used to identify specific stream reaches for analysis. The areas of riverine flooding are depicted on the map in Appendix E.

Geographic Location for Dam and Levee Failure

The National Inventory of Dams identified seven dams in White County. The map in Appendix E illustrates the location of White County dams. Table 4-16 summarizes the National Inventory of Dams information.

Table 4-17: National Inventory of Dams

Name	River	Hazard	EAP
SANDY RUN LAKE DAM	TRIB BEAR CREEK	S	N
NORRIS CITY RESERVOIR DAM	INDIAN CREEK	H	N
PONT-CA LAKE DAM	TRIB LITTLE WABASH RIVER	S	N
CANTRELL LAKE DAM	TRIB FOX RIVER	L	N
GRIFFITH FARM LAKE DAM	TRIB LITTLE WABASH RIVER	S	N
POLLARDS POND DAM	POLLARD CREEK DITCH	L	N
ABSHER LAKE DAM	TRIB LITTLE WABASH RIVER	H	N

A review of the Illinois Department of Natural Resource’s files identified no certified levees within White County.

Hazard Extent for Flooding

The HAZUS-MH flood model is designed to use a flood depth grid and flood boundary polygon from the DFIRM data. HAZUS-MH was used to model the Base Flood Elevation (BFE). The BFE is defined as the area that has a 1% chance of flooding in any given year. Planning team input and a review of historical information provided additional information on specific flood events.

Hazard Extent for Dam and Levee Failure

Dams assigned the low (L) hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant (S) hazard classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Dams classified as 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. Dams assigned the high (H) hazard potential classification are those dams where failure or mis-operation has the highest risk to cause loss of human life and significant damage to buildings and infrastructure.

According to the DNR and the National Inventory of Dams, two dams are classified as a high hazard dams. There was no information of any dams having an Emergency Action Plan (EAP). An EAP is not required by the State of Illinois but is recommended in the 2003 Illinois Dam Safety & Inspection Manual.

Accurate mapping of the risks of flooding behind levees depends on knowing the condition and level of protection the levees actually provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps better reflect the flood protection capabilities of levees and that the maps accurately represent the flood risks posed to areas situated behind them. Levee owners—usually states, communities, or private individuals or organizations such as local levee districts—are responsible for ensuring that the levees they own are maintained to their original design level and condition. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove that the levee meets design, operation, and maintenance standards for protection against the 1% annual probability (100-year) flood.

Calculated Risk Priority Index for Flooding

Based on historical information and the HAZUS-MH flooding analysis results, the probability of flooding in White County is highly likely. According to the Calculated Risk Priority Index (RPI), flooding ranked as the number one hazard in White County.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
4	x	3	=	12

Calculated Risk Priority Index for Dam and Levee Failure

Based on operation and maintenance requirements and local knowledge of the dams in White County, the probability of failure is highly likely. If a high hazard dam were to fail, the magnitude and severity of the damage could be great. The warning time and duration of the dam failure event would be very short. According to the Calculated Risk Priority Index (RPI), dam and levee failure ranked as the number five hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
4	x	1	=	4

Vulnerability Analysis for Flooding

HAZUS-MH generated the flood depth grid for a 100-year return period and made calculations by clipping the USGS 30-m DEM to the 100-year flood boundary. Next, HAZUS-MH estimated the damages for White County by utilizing default aggregate building inventory census data.

Building Inventory

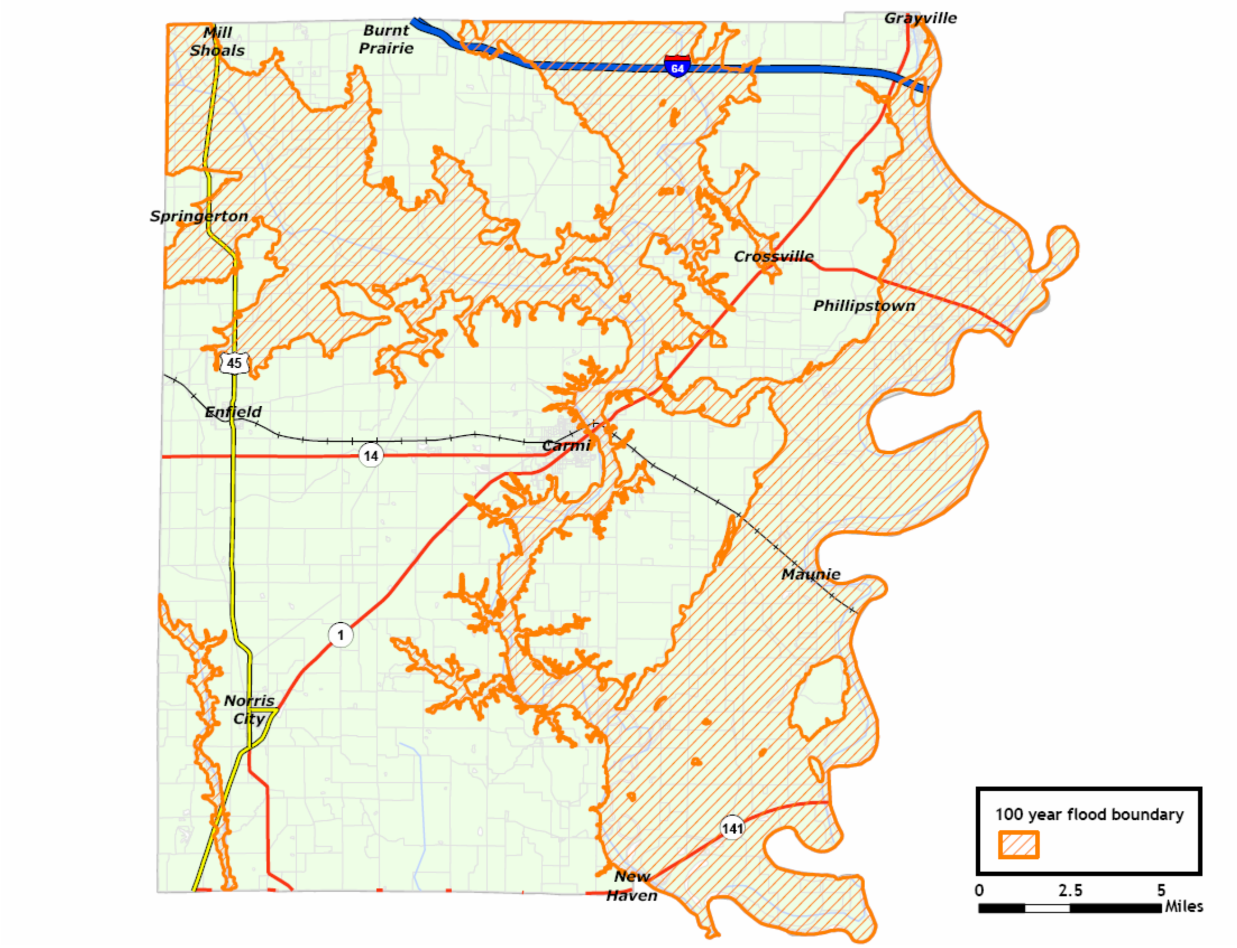
A table of the building replacement costs (types and numbers of buildings) for the facilities identified in the 100-year flood areas are listed in Table 4-17. These buildings can expect impacts similar to those discussed for the critical facilities. These include structural failure, extensive water damage to the facility, and loss of facility functionality (i.e. residential buildings may no longer be able to provide shelter to their inhabitants).

Table 4-18: White County HAZUS-MH Analysis Total Economic Loss (100-Year Flood)

General Occupancy	Total Damaged Buildings	Building Loss (X 1000)	Total Economic Loss (X 1000)
Agricultural	0	$642	$2,530
Commercial	2	$3,629	$12,763
Education	0	$0	$0
Government	0	$72	$583
Industrial	3	$7,520	$38,490
Religious/Non-Profit	0	$273	$1,421
Residential	56	$14,710	$22,692
Total	**61**	**$26,846**	**$78,479**

The reported building counts should be interpreted as degrees of loss rather than exact numbers of buildings exposed to flooding. These numbers were derived from aggregate building inventories, which were assumed to be dispersed evenly across census blocks. HAZUS-MH requires that a predetermined amount of square footage of a typical building sustains damage in order to produce a damaged building count. If only a minimal amount of building damage is predicted, it is possible to see no damaged building counts, even while seeing economic losses.
Figure 4-6 depicts the flood boundary from the HAZUS-MH analysis. HAZUS-MH estimates the 100-year flood would damage 61 buildings, totaling $26.9 million in building losses and $78.5 million in economic losses.

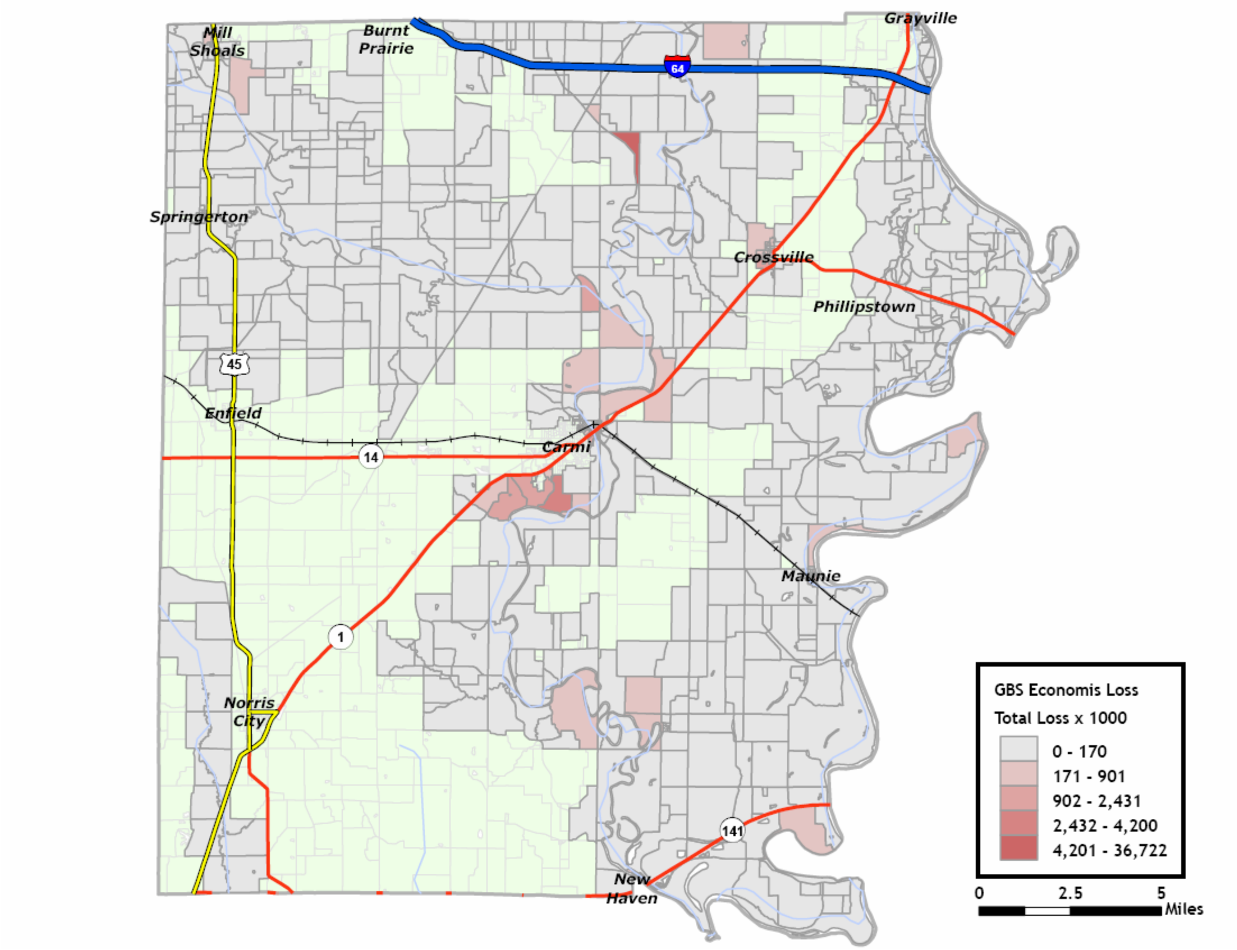
Figure 4-6: White County HAZUS-MH Analysis (100-Year Flood)



HAZUS-MH estimates seven census blocks affected by the modeled flood event, with losses exceeding $1 million. The distribution of losses is shown in Figure 4-7.

HAZUS-MH aggregate loss analysis is evenly distributed across a census block. Census blocks of concern should be reviewed in more detail to determine the actual percentage of facilities that fall within the flood hazard areas. The aggregate losses reported in this study may be overstated.

Figure 4-7: White County Total Economic Loss (100-Year Flood)



Essential Facilities

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 (i.e. a damaged police station will no longer be able to serve the community). A complete list of all the essential facilities, including replacement costs, is included in Appendix C. A map of the critical facilities is included in Appendix D.

The HAZUS-MH analysis identified no essential facilities that may be subject to flooding.

Vulnerability Analysis for Flash Flooding

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G. Table 4-7 lists the economic exposure and building counts from the building inventory by general occupancy for the county.

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.

Vulnerability to Future Assets/Infrastructure for Flooding

Flash flooding may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable to flash flooding. Currently, the White County Planning Commission reviews new development for compliance with the local zoning ordinance. At this time no construction is planned within the area of the 100-year floodplain. Therefore, there is no new construction, which will be vulnerable to a 100-year flood.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

The White County Planning Commission reviews new development for compliance with local zoning ordinances.

Analysis of Community Development Trends

Areas with recent development within the county may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible, which can cause the 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. Controlling floodplain development is the key to reducing flood-related damages.

4.4.3 Earthquake Hazard

Hazard Definition for Earthquake Hazard

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, plate tectonics has shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. At their boundaries, the plates typically are locked together and unable to release the accumulating energy. When this energy grows strong enough, the plate boundary breaks free and causes the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern United States. The most seismically active area in the Midwest U.S. is the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the Central U.S. capable of producing damaging earthquakes. The Wabash Valley fault system in Illinois and Indiana manifests evidence of large earthquakes in its geologic history, and there may be other, as yet unidentified, faults that could produce strong earthquakes.

Ground shaking from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated materials and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage. Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs, and a single earthquake will have a single magnitude to quantify its strength. Earthquake intensity measures the strength of shaking produced by the earthquake at a certain location. Intensity is determined from effects on people, human structures, and the natural environment, and a single earthquake will have a wide range of intensity values at different locations around the epicenter. Table 4-23 is a description of earthquake intensity using an abbreviated Modified Mercalli Intensity scale, and Table 4-24 lists earthquake magnitudes and their corresponding intensities.
(Source: *http://earthquake.usgs.gov/learning/topics/mag_vs_int.php*)

Historical Earthquakes that have Affected White County

Numerous instrumentally-measured earthquakes have occurred in Illinois. In the past few decades, with many precise seismographs positioned across Illinois, measured earthquakes have varied in magnitude from very low microseismic events of M=1-3 to larger events up to M=5.4. Microseismic events are usually only detectable by seismographs and rarely felt by anyone. The most recent earthquake in Illinois—as of the date of this report—occurred on June 1, 2008 at 8:56:12 local time about 35 km (25 miles) southeast of Olney, IL and measured 1.6 in magnitude.

The consensus of opinion among seismologists working in the Midwest is that a magnitude 5.0 to 5.5 event could occur virtually anywhere at any time throughout the region. Earthquakes occur in Illinois all the time, although damaging quakes are very infrequent. Illinois earthquakes causing minor damage occur on average every 20 years, although the actual timing is extremely variable. Most recently, a magnitude 5.2 earthquake shook southeastern Illinois on April 18, 2008, causing minor damage in the Mt Carmel, IL area. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years. Tables 4-18 and 4-19 describe the Mercalli Intensity Scale used to measure earthquake magnitude.

Table 4-19: 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 motor cars 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 motor cars 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.
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, 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.

Table 4-20: Earthquake Magnitude vs. Modified Mercalli Intensity Scale

Earthquake Magnitude	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

First on the list of historical earthquakes that have affected Illinois and first on the list on continuing earthquake threats at present and into the future is seismic activity on the New Madrid Seismic Zone of south-eastern Missouri. On December 16, 1811 and January 23 and February 7 of 1812, three earthquakes struck the central U.S. with magnitudes estimated to be 7.5-8.0. These earthquakes caused violent ground cracking and volcano-like eruptions of sediment (sand blows) over an area of >10,500 km^2, and uplift of a 50 km by 23 km zone (the Lake County uplift). The shaking rang church bells in Boston, collapsed scaffolding on the Capitol in Washington, D.C., and was felt over a total area of over 10 million km^2 (the largest felt area of any historical earthquake). Of all the historical earthquakes that have struck the U.S., an 1811-style event would do the most damage if it recurred today.

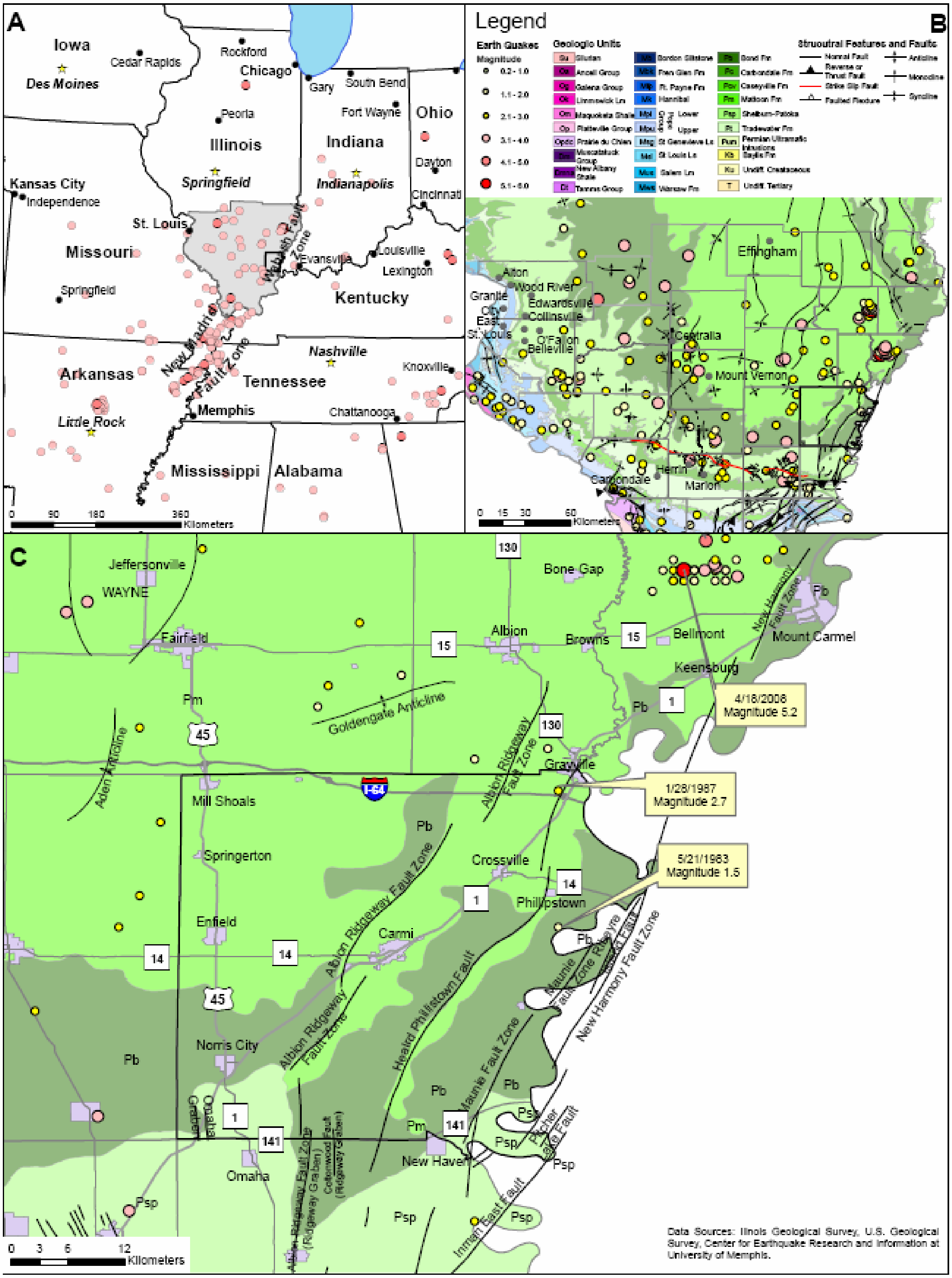
The New Madrid earthquakes are especially noteworthy because the seismic zone is in the center of the North American Plate. Such intraplate earthquakes are felt, and do damage, over much broader areas than comparable earthquakes at plate boundaries. The precise driving force responsible for activity on the New Madrid seismic zone is not known, but most scientists infer that it is compression transmitted across the North American Plate. The compression is focused on New Madrid because it is the site of a Paleozoic structure—the Reelfoot Rift—which is a zone of weakness in the crust.

The US 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 (magnitude 7.5–8.0) is 7%–10% over the next 50 years (*USGS Fact Sheet 2006-3125*.) Frequent large earthquakes on the New Madrid seismic zone are geologically puzzling because the region shows relatively little deformation. Three explanations have been proposed: 1) recent seismological and geodetic activity is still a short-term response to the 1811–12 earthquakes; 2) activity is irregular or cyclic; or 3) activity began only in the recent geologic past. There is some dispute over how often earthquakes like the 1811–12 sequence occur. Many researchers estimate a recurrence interval of between 550 and 1100 years; other researchers suggest that either the magnitude of the 1811–12 earthquakes have been over-stated, or else the actual frequency of these events is less. It is fair to say, however, that even if the 1811–12 shocks were just magnitude ~7 events, they nonetheless caused widespread damage and would do the same if another such earthquake or earthquake sequence were to strike today.

[Above: New Madrid earthquakes and seismic zone modified from N. Pinter, 1993, Exercises in Active Tectonic history adapted from *Earthquake Information Bulletin*, 4(3), May-June 1972. *http://earthquake.usgs.gov/regional/states/illinois/history.php*]

Figures 4-8a, 4-8b, and 4-8c depict the following: a) Location of notable earthquakes in the Illinois region with inset of White County; b) Generalized geologic bedrock map with earthquake epicenters, geologic structures, and inset of White County; c) Geologic and earthquake epicenter map of White County.

Figure 4-8 a, b, and c: White County Earthquakes



The earliest reported earthquake in Illinois was in **1795**. This event was felt at Kaskaskia, IL for a minute and a half and was also felt in Kentucky. At Kaskaskia, subterranean noises were heard. Due to the sparse frontier population, an accurate location is not possible, and the shock may have actually originated outside the state.

An intensity VI-VII earthquake occurred on **April 12, 1883**, awakening several people in Cairo, IL. One old frame house was significantly damaged, resulting in slight injury to the inhabitants. There is only record of injury in the state due to earthquakes.

On **October 31 1895** a large M6.8 occurred at Charleston, Missouri, just south of Cairo. Strong shaking caused eruptions of sand and water at many places along a line roughly 30 km (20 mi) long. Damage occurred in six states, but most severely at Charleston, with cracked walls, windows shattered, broken plaster, and chimneys fallen. Shaking was felt in 23 states from Washington, D.C. to Kansas and from southernmost Canada to New Orleans, LA.

A Missouri earthquake on **November 4, 1905**, cracked walls in Cairo. Aftershocks were felt over an area of 100,000 square miles in nine states. In Illinois, it cracked the wall of the new education building in Cairo and a wall at Carbondale, IL.

Among the largest earthquakes occurring in Illinois was the **May 26, 1909** shock, which knocked over many chimneys at Aurora. It was felt over 500,000 square miles and strongly felt in Iowa and Wisconsin. Buildings swayed in Chicago where there was fear that the walls would collapse. Just under two months later, a second Intensity VII earthquake occurred on **July 18, 1909**, damaged chimneys in Petersburg, IL, Hannibal, MO, and Davenport, IA. Over twenty windows were broken, bricks loosened and plaster cracked in the Petersburg area. This event was felt over 40,000 square miles.

On **November 7, 1958**, a shock along the Indiana border resulted in damage at Bartelso, Dale and Maunie, IL. Plaster cracked and fell, and a basement wall and floor were cracked.

On **August 14, 1965**, a sharp but local shock occurred at Tamms, IL, a town of approximately 600 people. The magnitude 5 quake damaged chimneys, cracked walls, knocked groceries from the shelves, and muddied the water supply. Thunderous earth noises were heard. This earthquake was only felt within a 10 mile radius of Tamms, in communities such as Elco, Unity, Olive Branch, and Olmstead, IL. Six aftershocks were felt.

An earthquake of Intensity VII occurred on **November 9, 1968**. This magnitude 5.3 shock was felt over an area of 580,000 square miles in 23 states. There were reports of people in tall buildings in Ontario and Boston feeling the shock. Damage consisted of bricks being knocked from chimneys, broken windows, toppled television antennae, and cracked plaster. There were scattered reports of cracked foundations, fallen parapets, and overturned tombstones. Chimney damage was limited to buildings 30 to 50 years old. Many people were frightened. Church bells rang at Broughton and several other towns. Loud rumbling earthquake noise was reported in many communities.

Dozens of other shocks originating in Missouri, Arkansas, Kansas, Nebraska, Tennessee, Indiana, Ohio, Michigan, Kentucky, and Canada have been felt in Illinois without causing damage. There have been three earthquakes slightly greater than magnitude 5.0 and Intensity level VII which occurred in 1968, 1987 and 2008 and that were widely felt throughout southern Illinois and the midcontinent.

Preceding text adapted from *http://earthquake.usgs.gov/regional/states/illinois/history.php* and from *Seismicity of the United States, 1568-1989 (Revised), C.W. Stover and J.L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington: 1993.*

Geographic Location for Earthquake Hazard

White County occupies a region susceptible to earthquakes. Regionally, the two most significant zones of seismic activity are the New Madrid Seismic Zone and the Wabash Valley Fault System. Several faults are mapped within White County. These faults are believed to be associated with the Wabash Valley Fault System. However, the epicenters of only two instrumentally measured earthquakes with magnitudes of 1.5 and 2.7 have been detected within White County. These earthquakes are also believed to be associated with the Wabash Valley Fault.

Hazard Extent for Earthquake Hazard

The extent of the earthquake is countywide.

Calculated Risk Priority Index for Earthquake Hazard

Based on historical information as well as current USGS and SIU research and studies, future earthquakes in White County are possible. According to the RPI, earthquake is ranked as the number six hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	**4**	=	**12**

Vulnerability Analysis for Earthquake Hazard

This hazard could impact the entire jurisdiction equally; therefore, the entire county’s population and all buildings are vulnerable to an earthquake and can expect the same impacts within the affected area. To accommodate this risk this plan will consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in White County are discussed in types and numbers below. In addition, a discussion of the potential impacts for buildings and infrastructure during an earthquake are also included.

Critical Facilities

All critical facilities are vulnerable to earthquakes. A critical facility would encounter many of the same impacts as any other building within the county. These impacts include structural failure and loss of facility functionality (i.e. damaged police station will no longer be able to serve the community). A complete list of all of the critical facilities, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-7 shows 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 and loss of building function which could result in indirect impacts (e.g. damaged homes will no longer be habitable, causing residence to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since a full inventory of infrastructure is not available for this plan, 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 (i.e. loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic. Typical scenarios are described below to gauge the anticipated impacts of earthquakes in the county in terms of number and types of buildings and infrastructure.

The SIU-Polis team reviewed existing geological information and recommendations for earthquake scenarios. Three earthquake scenarios—two based on USGS modeled scenarios and one based on deterministic scenarios were developed to provide a reasonable basis for earthquake planning in White County. The two USGS analyses were a M7.7 event on the New Madrid fault zone and M7.1 earthquake on the Wabash Valley Seismic Zone Shake maps provided by FEMA were used in HAZUS-MH to estimate losses for White County based on these events. The final scenario was a Moment Magnitude of 5.5 with the epicenter located in White County. Note that a deterministic scenario, in this context, refers to hazard or risk models based on specific scenarios without explicit consideration of the probability of their occurrences. This scenario was selected based upon a rupture on the Cottage Grove Fault System, a local fault that presents a realistic earthquake scenario for planning purposes.

Modeling a deterministic scenario requires user input for a variety of parameters. One of the most critical sources of information required for accurate assessment of earthquake risk is soils data. FEMA provided a NEHRP (National Earthquake Hazards Reduction Program) soil classification map for Illinois, which portrays the degree of shear-wave amplification that can occur during ground shaking.

FEMA provided a liquefaction map for Illinois. Low-lying areas in floodplains with a water table within five feet of the surface are particularly susceptible to liquefaction. These areas contain Class F soil types. For this analysis, a depth to water table of five meters was used.

An earthquake depth of 10.0 kilometers was selected based on input from Geophysicist Harvey Henson (SIU). HAZUS-MH also requires the user to define an attenuation function unless ground motion maps are supplied. Because White County has experienced smaller earthquakes, the decision was made to use the Toro et al. (1997) attenuation function.

The building losses are subdivided into two categories: 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

Earthquake Analysis

Results for 7.7 Magnitude Earthquake New Madrid Scenario

The results of the 7.7 New Madrid earthquake are depicted in Tables 4-20, 4-21, and Figure 4-9. HAZUS-MH estimates that approximately 325 buildings will be at least moderately damaged. This is more than 5% of the total number of buildings in the region. It is estimated that 193 buildings will be damaged beyond repair.

The total building-related losses totaled $54.03 million; 10% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which comprised more than 64% of the total loss.

The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable. For purposes of analysis, the total number of buildings and the building replacement costs for government, religious/non-profit, and education should be lumped together.

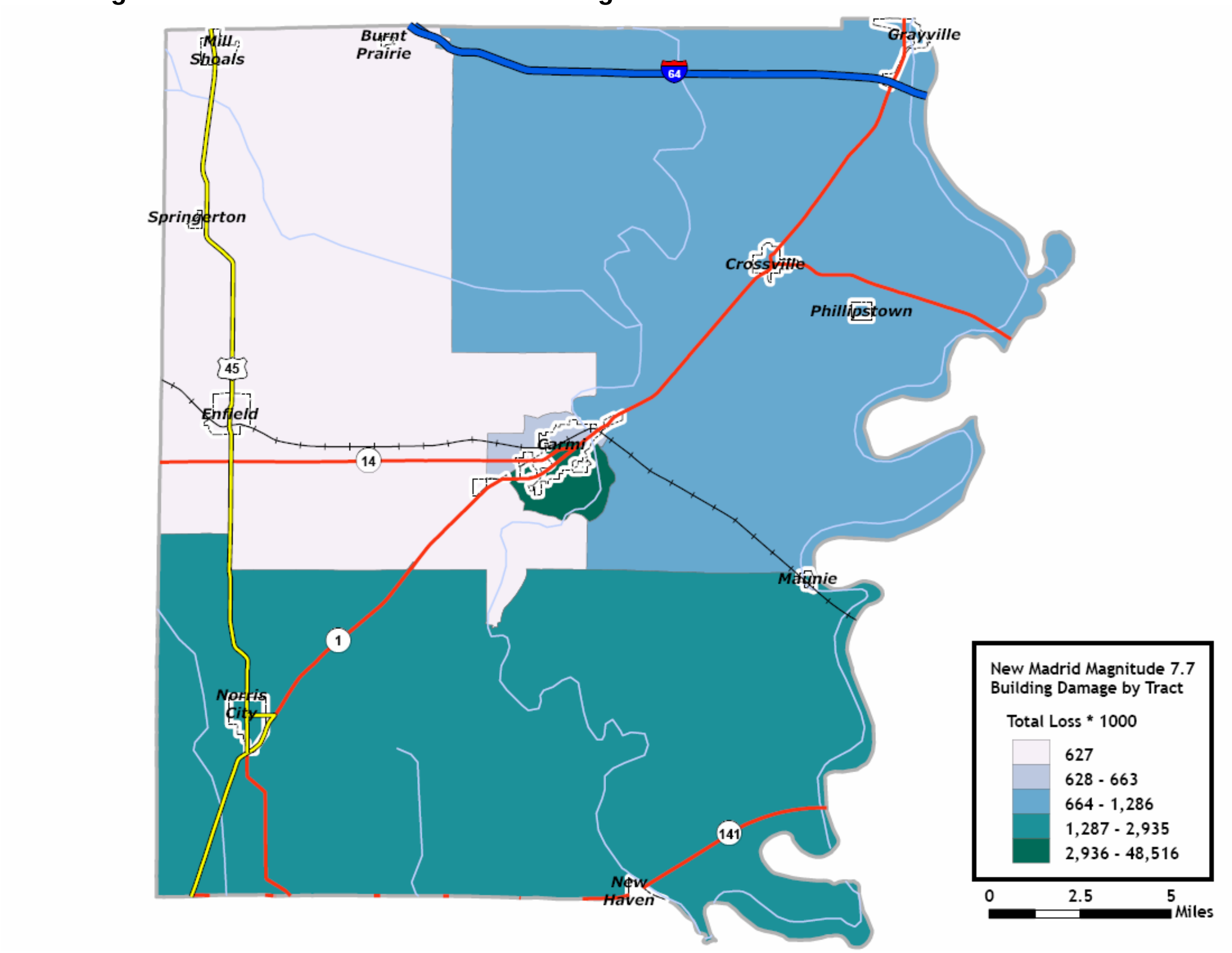
Table 4-21: New Madrid Scenario-Damages Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	8	0.12	1	0.17	0	0.23	0	0.52	0	0.07
Commercial	78	1.23	5	1.14	2	1.18	0	2.56	4	2.12
Education	5	0.08	0	0.09	0	0.08	0	0.12	0	0.14
Government	9	0.14	0	0.11	0	0.09	0	0.11	0	0.07
Industrial	26	0.41	2	0.39	1	0.51	0	1.19	1	0.27
Other Residential	969	15.16	215	49.07	91	70.64	2	51.66	17	8.91
Religion	12	0.18	1	0.16	0	0.16	0	0.31	0	0.21
Single Family	5,281	82.67	214	48.88	35	27.10	2	43.52	170	88.21
Total	6,388		437		128		4		193	

Table 4-22: New Madrid Scenario-Building Economic losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.52	1.42	0.02	0.09	2.05
	Capital-Related	0.00	0.21	1.13	0.02	0.03	1.39
	Rental	0.80	0.57	0.47	0.01	0.04	1.89
	Relocation	0.09	0.01	0.03	0.00	0.02	0.15
	Subtotal	**0.89**	**1.32**	**3.05**	**0.05**	**0.18**	**5.49**
Capital Stock Loses							
	Structural	4.53	1.18	1.20	0.18	0.57	7.65
	Non_Structural	15.63	5.62	5.49	1.23	2.18	30.14
	Content	4.35	1.32	2.90	0.83	1.14	10.54
	Inventory	0.00	0.00	0.07	0.12	0.02	0.21
	Subtotal	**24.51**	**8.11**	**9.66**	**2.36**	**3.90**	**48.54**
	Total	**25.39**	**9.42**	**12.72**	**2.41**	**4.09**	**54.03**

Figure 4-9: New Madrid Scenario-Building Economic Losses in Thousands of Dollars



New Madrid Scenario-Essential Facility Losses

Before the earthquake, the region had 471 care beds available for use. On the day of the earthquake, the model estimates that only 152 care beds (32%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 85% of the beds will be back in service. By day 30, 93% will be operational. The HAZUS analysis calculated no essential facility losses for this event.

Results for 7.1 Magnitude Earthquake Wabash Valley Scenario

The results of the 7.1 Wabash Valley earthquake are depicted in Table 4-22, Table 4-23, and Figure 4-10. HAZUS-MH estimates that approximately 265 buildings will be at least moderately damaged. This is more than 4% of the total number of buildings in the region. It is estimated that 204 buildings will be damaged beyond repair.

The total building related losses totaled $60.28 million; 9% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up more than 62% of the total loss.

The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable. For purposes of analysis, the total number of buildings and the building replacement costs for government, religious/non-profit, and education should be lumped together.

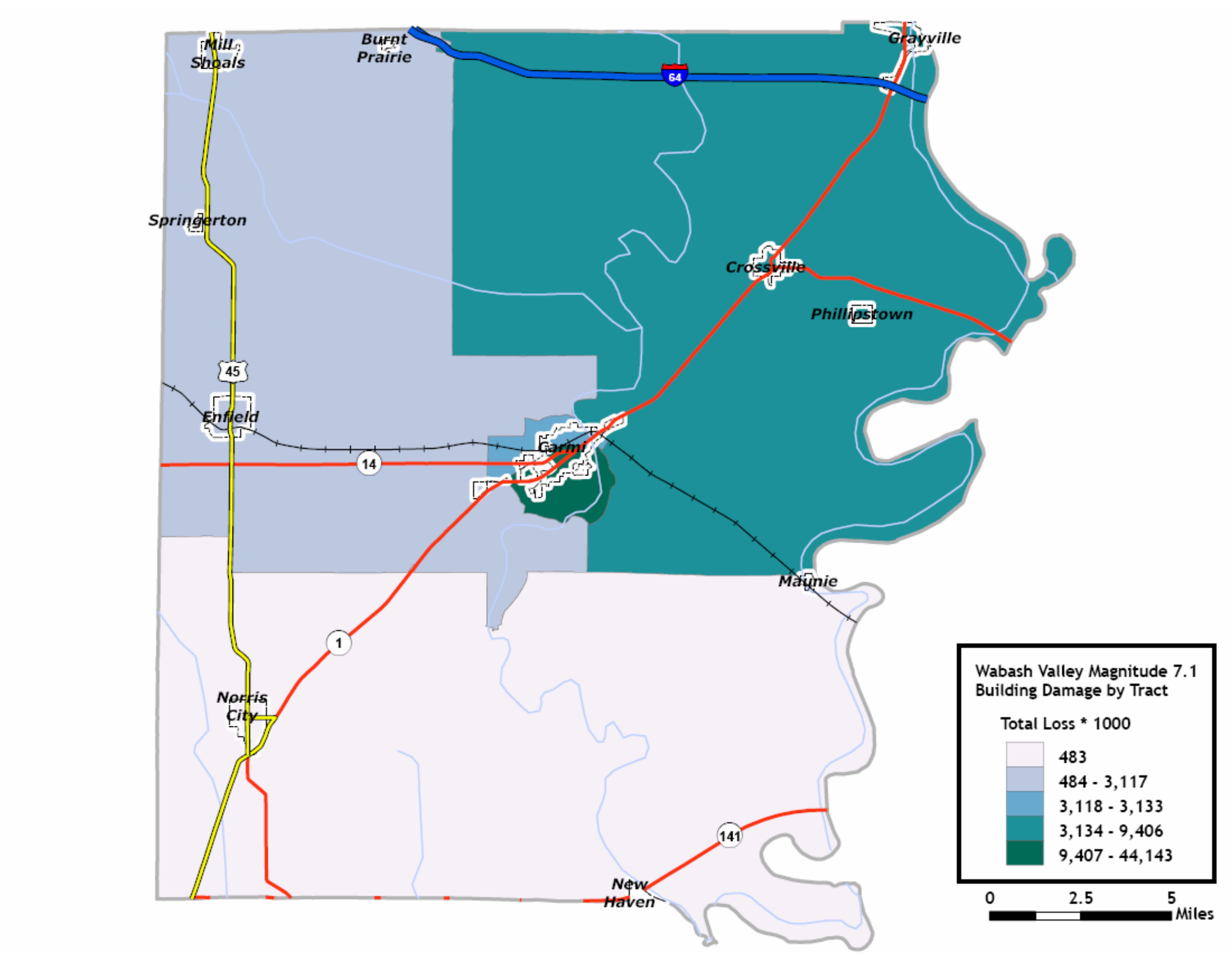
Table 4-23: Wabash Valley Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	8	0.12	1	0.24	0	0.41	0	0.23	0	0.08
Commercial	80	1.21	4	1.44	1	2.15	0	1.53	4	1.99
Education	5	0.08	0	0.09	0	0.12	0	0.09	0	0.13
Government	9	0.14	0	0.16	0	0.20	0	0.21	0	0.09
Industrial	25	0.38	2	0.85	1	1.60	0	0.85	1	0.31
Other Residential	1,153	17.45	96	34.30	22	42.03	2	17.88	21	10.31
Religion	11	0.17	1	0.31	0	0.46	0	0.29	0	0.20
Single Family	5,315	80.45	175	62.61	28	53.03	7	78.92	178	86.90
Total	6,606		280		52		9		204	

Table 4-24: Wabash Valley Scenario-Building Economic losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.51	1.38	0.04	0.11	2.03
	Capital-Related	0.00	0.21	1.11	0.03	0.04	1.38
	Rental	0.84	0.58	0.47	0.02	0.04	1.95
	Relocation	0.10	0.01	0.03	0.00	0.02	0.16
	Subtotal	**0.93**	**1.31**	**2.99**	**0.08**	**0.20**	**5.52**
Capital Stock Loses							
	Structural	4.71	1.12	1.21	0.34	0.61	8.00
	Non_Structural	17.03	5.85	5.82	2.30	2.47	33.47
	Content	5.12	1.48	3.19	1.68	1.40	12.88
	Inventory	0.00	0.00	0.09	0.29	0.04	0.41
	Subtotal	**26.87**	**8.46**	**10.32**	**4.61**	**4.51**	**54.76**
	Total	**27.80**	**9.77**	**13.30**	**4.69**	**4.71**	**60.28**

Figure 4-10: Wabash Valley Scenario-Building Economic Losses in Thousands of Dollars



Wabash Valley Scenario-Essential Facility Losses

Before the earthquake, the region had 471 care beds available for use. On the day of the earthquake, the model estimates that only 181 care beds (38%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 83% of the beds will be back in service. By day 30, 90% will be operational. The HAZUS analysis calculated no essential facility losses for this event.

Results for 5.5 Magnitude Earthquake in White County

The results of the initial analysis, the 5.5 magnitude earthquake with an epicenter in the center of White County, are depicted in Table 4-24 and 4-25 and Figure 4-11. HAZUS-MH estimates that approximately 1,915 buildings will be at least moderately damaged. This is more than 27% of the total number of buildings in the region. It is estimated that 533 buildings will be damaged beyond repair.

The total building related losses totaled $199.9 million; 10% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which comprised more than 63% of the total loss.

The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable. For purposes of analysis, the total number of buildings and the building replacement costs for government, religious/non-profit, and education should be lumped together.

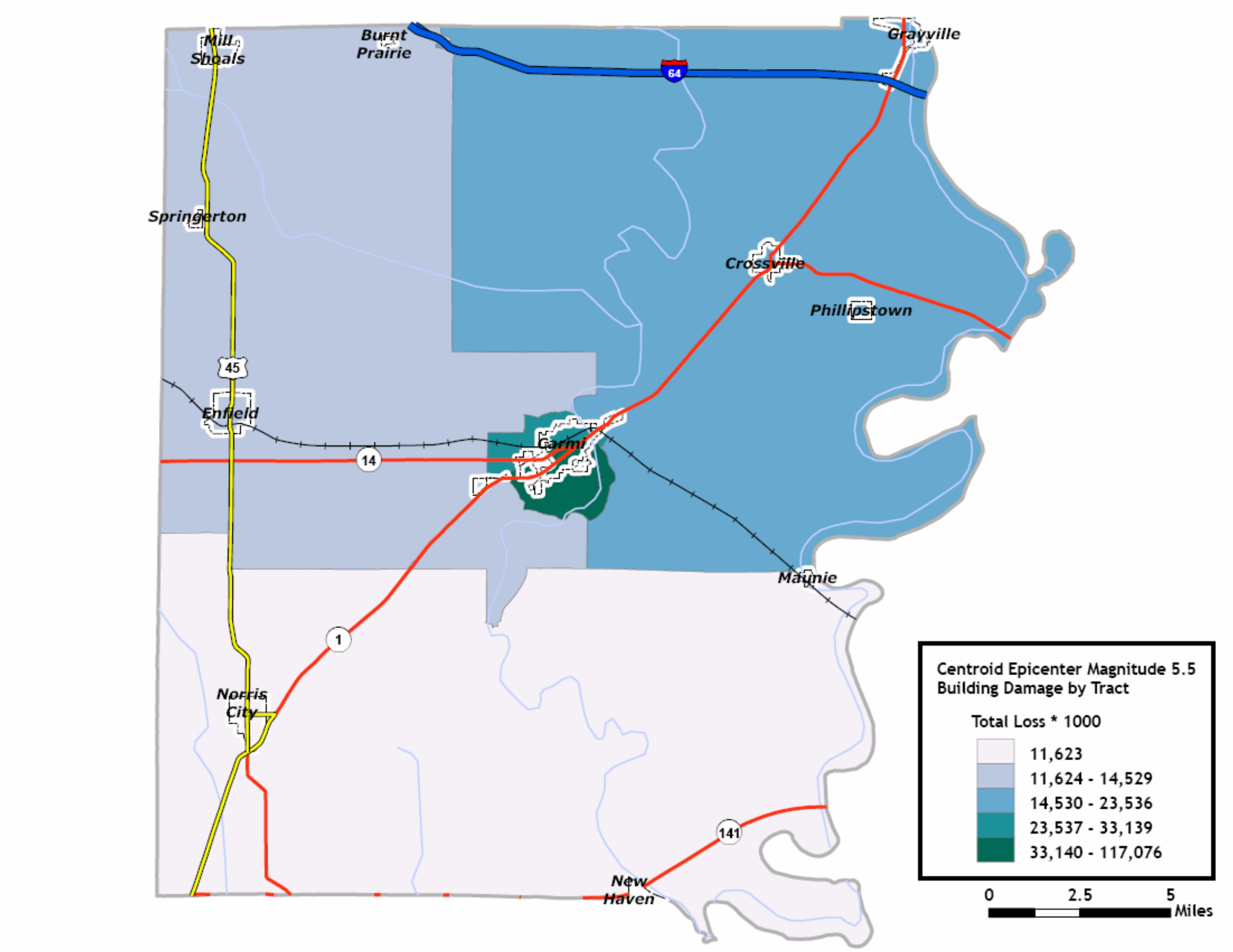
Table 4-25: White County 5.5M Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	4	0.12	2	0.10	2	0.16	1	0.24	1	0.09
Commercial	36	1.02	18	1.04	17	1.60	7	2.41	11	2.01
Education	3	0.07	1	0.07	1	0.11	0	0.16	1	0.13
Government	5	0.13	2	0.12	2	0.18	1	0.24	1	0.13
Industrial	14	0.40	5	0.31	6	0.51	2	0.77	2	0.34
Other Residential	549	15.74	303	17.31	307	28.23	72	24.38	63	11.78
Religion	6	0.16	3	0.16	2	0.22	1	0.34	1	0.23
Single Family	2,871	82.36	1,415	80.90	751	68.99	210	71.45	455	85.28
Total	3,486		1,749		1,088		294		534	

Table 4-26: White County 5.5M Scenario-Building Economic Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	1.33	5.39	0.15	0.60	7.46
	Capital-Related	0.00	0.55	4.46	0.11	0.15	5.27
	Rental	3.14	1.92	2.18	0.08	0.22	7.54
	Relocation	0.36	0.05	0.13	0.01	0.08	0.64
	Subtotal	**3.50**	**3.84**	**12.17**	**0.35**	**1.05**	**20.91**
Capital Stock Loses							
	Structural	16.52	3.96	4.89	1.28	2.67	29.33
	Non_Structural	57.98	18.04	18.17	5.67	8.16	108.01
	Content	17.44	4.52	9.92	4.12	4.56	40.56
	Inventory	0.00	0.00	0.29	0.69	0.11	1.09
	Subtotal	**91.94**	**26.52**	**33.27**	**11.76**	**15.50**	**178.99**
	Total	**95.44**	**30.37**	**45.44**	**12.11**	**16.55**	**199.90**

Figure 4-11: White County 5.5M Scenario-Building Economic Losses in Thousands of Dollars



White County 5.5M Scenario-Essential Facility

Before the earthquake, the region had 471 care beds available for use. On the day of the earthquake, the model estimates that only 22 care beds (5%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 46% of the beds will be back in service. By day 30, 69% will be operational. According to the HAZUS-MH analysis greater than 50% damage would be experienced at three care facilities, seven schools, one police station, and two fire stations.

Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

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

Analysis of Community Development Trends

Community development will occur outside of the low-lying areas in flood plains with a water table within five feet of grade which are susceptible to liquefaction. The only areas that could actually be categorized as growing would be the South side of Grayville and the South Side of Carmi both located along Highway 1.

4.4.4 Thunderstorm Hazard

Hazard Definition for Thunderstorm Hazard

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

- Hail of diameter 0.75 inches or higher,
- Frequent and dangerous lightning,
- Wind speeds equal to or greater than 58 mph.

Hail

Hail can be a product of a strong thunderstorm. Hail usually falls near the center of a storm, however strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in a broader distribution. Hail stones range from pea-sized to baseball-sized, but hail stones larger than softballs have been reported on rare occasion.

Lightning

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

Severe Winds (Straight-Line Winds)

Straight-line winds from thunderstorms are a fairly common occurrence across 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 for Thunderstorm Hazard

The NCDC database reported 38 hailstorms in White County since 1978, which have caused more than $750,000 in property damage. Hail in some form occurs nearly every year in the late spring and early summer months. The most recent significant occurrence was in April 2002 when 2.50-inch hail fell in the region. White County hailstorms are listed in Table 4-26; additional details for NCDC events are included in Appendix D.
Source: NCDC

Table 4-27: White County Hailstorms*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	8/17/1978	Hail	1.75 in.	0	0	0	0
White	6/1/1981	Hail	2.00 in.	0	0	0	0
White	1/7/1989	Hail	1.75 in.	0	0	0	0
White	3/14/1989	Hail	0.88 in.	0	0	0	0
White	4/3/1989	Hail	2.75 in.	0	0	0	0
White	4/3/1989	Hail	2.75 in.	0	0	0	0
White	4/3/1989	Hail	2.00 in.	0	0	0	0
White	9/7/1990	Hail	0.88 in.	0	0	0	0
White	5/17/1991	Hail	0.75 in.	0	0	0	0
White	5/17/1991	Hail	0.75 in.	0	0	0	0
White	7/2/1991	Hail	1.75 in.	0	0	0	0
Carmi	8/16/1993	Hail	1.00 in.	0	0	0	0
Enfield	5/16/1995	Hail	0.75 in.	0	0	1K	0
Enfield	8/15/1996	Hail	0.75 in.	0	0	0	0
Springerton	5/20/1998	Hail	1.75 in.	0	0	0	0
Carmi	5/20/1998	Hail	0.75 in.	0	0	0	0
Carmi	6/1/1999	Hail	0.75 in.	0	0	0	0
Enfield	8/18/2001	Hail	0.75 in.	0	0	0	0
Norris City	4/21/2002	Hail	1.00 in.	0	0	0	0
Carmi	4/24/2002	Hail	1.75 in.	0	0	750K	0
Norris City	4/24/2002	Hail	2.50 in.	0	0	0	0
Carmi	4/28/2002	Hail	1.00 in.	0	0	0	0
New Haven	5/1/2003	Hail	0.88 in.	0	0	0	0
Crossville	5/5/2003	Hail	0.75 in.	0	0	0	0
Burnt Prairie	7/21/2003	Hail	0.75 in.	0	0	0	0
Carmi	8/3/2003	Hail	1.00 in.	0	0	0	0
Norris City	5/23/2004	Hail	1.00 in.	0	0	0	0
Norris City	5/27/2004	Hail	0.88 in.	0	0	0	0
Carmi	7/6/2004	Hail	0.75 in.	0	0	0	0
Carmi	8/28/2004	Hail	1.00 in.	0	0	0	0
Norris City	4/12/2005	Hail	0.88 in.	0	0	0	0
Carmi	11/15/2005	Hail	1.25 in.	0	0	0	0
Mill Shoals	6/3/2006	Hail	0.75 in.	0	0	0	0
Carmi	6/3/2006	Hail	0.75 in.	0	0	0	0
Norris City	9/27/2006	Hail	1.25 in.	0	0	0	0
Burnt Prairie	4/3/2007	Hail	1.00 in.	0	0	0K	0K
New Haven	1/10/2008	Hail	0.88 in.	0	0	0K	0K
Grayville	1/10/2008	Hail	0.88 in.	0	0	0K	0K

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

The National Climatic Data Center (NCDC) database reported four occurrences of significant lightning strikes in White County since 1996, which have caused more 1996; these events resulted in more than $100,000 in property damage. For example, in June 2007, lightning struck a tree, sending parts of it crashing onto a mobile home. The mobile home received minor damage.

The White County lightning strikes are identified in Table 4-27. Additional details for NCDC events are included in Appendix D. Lightning occurs in White County every year. The following list only represents those events which were recorded by the NCDC.

Table 4-28: White County Lightning Strikes*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Enfield	2/27/1996	Lightning	N/A	0	0	80K	0
Carmi	7/7/1996	Lightning	N/A	0	0	20K	0
Crossville	5/23/2000	Lightning	N/A	0	0	5K	0
Grayville	6/8/2007	Lightning	N/A	0	0	4K	0K

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

The National Climatic Data Center (NCDC) database identified 79 wind storms reported since 1975. On multiple occasions in the past 35 years trees have been uprooted by severe winds in White County. Many of the displaced trees landed on homes and automobiles. In addition, several of these extreme wind events resulted in damage to multiple buildings unable to withstand the force produced by the wind speeds. These thunderstorms have been attributed with one death, six injuries, and nearly $3.0 million in property damage in White and adjacent counties.

An example of thunderstorm wind damage occurred on October 24, 2001. Damaging straight-line winds raked northern White County, downing trees and power lines, and destroying at least one pole barn. On County Road 800 East, a school bus was stopped when it was caught between fallen trees. A number of semi-tractor trailers and cars were blown off Interstate 64 approximately six miles west of Grayville. The driver of one of the semis was treated at a local hospital for minor injuries. A second person was injured on Interstate 64, but no details were available. South of Burnt Prairie, several hogs were killed when a silo blew over and crashed into a hog barn. Roofs were blown off several buildings at a fertilizer plant near Burnt Prairie. A number of residences around Centerville were damaged, mainly by downed trees and limbs. Trees and limbs were downed in Crossville and Grayville, including one that fell on a home in Crossville. Several power lines were downed in Carmi, and at least two poles were broken.

As shown in Table 4-28, wind storms have historically occurred year round with the greatest frequency and damage in April through August. The following table includes available top wind speeds for White County.

Table 4-29: White County Wind Storms*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	4/23/2001	Gradient Wind	N/A	0	0	0	0
White	3/19/1996	High Wind	50 kts.	0	0	5K	0
White	10/22/1996	High Wind	0 kts.	0	0	28K	0K
White	10/29/1996	High Wind	52 kts.	0	0	0	0
White	4/6/1997	High Wind	54 kts.	0	0	1.6M	0
White	4/30/1997	High Wind	52 kts.	0	0	20K	0
White	5/7/1997	High Wind	60 kts.	0	0	0	0
White	9/29/1997	High Wind	52 kts.	0	1	15K	0
White	11/9/1998	High Wind	57 kts.	0	0	0	0
White	2/25/2001	High Wind	50 kts.	0	0	0	0
White	6/12/2001	High Wind	69 kts.	0	0	0	0
White	3/9/2002	High Wind	49 kts.	0	0	0	0
White	2/11/2003	High Wind	64 kts.	0	0	0	0
White	11/12/2003	High Wind	54 kts.	0	0	100K	0
White	12/12/2004	High Wind	54 kts.	0	0	6K	0
White	11/11/1995	High Winds	0 kts.	0	0	0	0
White	10/25/2001	Strong Wind	N/A	0	2	0	0
White	11/29/2001	Strong Wind	N/A	0	1	10K	0
White	1/8/2006	Strong Wind	N/A	0	0	19K	0
White	1/19/2006	Strong Wind	N/A	0	0	19K	0
White	12/1/2006	Strong Wind	N/A	0	0	1K	0K
White	2/24/2007	Strong Wind	N/A	0	0	1K	0K
White	4/11/2007	Strong Wind	N/A	0	0	1K	0K
White	12/2/2007	Strong Wind	N/A	0	0	1K	0K
Carmi	6/8/2007	Tstorm Wind	N/A	0	0	50K	0K
Carmi	6/14/2007	Tstorm Wind	N/A	0	0	100K	0K
Grayville	1/29/2008	Tstorm Wind	N/A	0	0	100K	0K
Carmi	4/15/1994	Tstorm Winds	N/A	0	0	1K	0
White	7/19/1994	Tstorm Winds	N/A	0	0	50K	5K
Carmi	5/17/1995	Tstorm Winds	N/A	0	0	10K	0
Norris City	5/18/1995	Tstorm Winds	N/A	0	0	5K	0
White	4/18/1975	Tstorm Winds	0 kts.	0	0	0	0
White	7/1/1978	Tstorm Winds	0 kts.	0	0	0	0
White	7/20/1981	Tstorm Winds	0 kts.	0	0	0	0
White	5/30/1982	Tstorm Winds	52 kts.	0	0	0	0
White	6/8/1982	Tstorm Winds	0 kts.	0	0	0	0
White	6/18/1984	Tstorm Winds	0 kts.	0	0	0	0
White	6/18/1984	Tstorm Winds	0 kts.	0	0	0	0
White	8/3/1987	Tstorm Winds	0 kts.	0	0	0	0
White	8/3/1987	Tstorm Winds	0 kts.	0	0	0	0
White	5/9/1990	Tstorm Winds	0 kts.	0	0	0	0
White	5/16/1990	Tstorm Winds	0 kts.	1	0	0	0
White	9/7/1990	Tstorm Winds	0 kts.	0	0	0	0
White	6/1/1991	Tstorm Winds	0 kts.	0	0	0	0
White	6/15/1991	Tstorm Winds	0 kts.	0	0	0	0
White	6/15/1991	Tstorm Winds	0 kts.	0	0	0	0
White	11/30/1991	Tstorm Winds	0 kts.	0	0	0	0
Carmi	3/24/1996	Tstorm Winds	0 kts.	0	0	10K	0
Enfield	6/19/1996	Tstorm Winds	0 kts.	0	0	20K	0
Carmi	3/28/1997	Tstorm Winds	52 kts.	0	0	0	0
Epworth	6/13/1997	Tstorm Winds	60 kts.	0	0	30K	0
Norris City	7/19/1997	Tstorm Winds	52 kts.	0	0	4K	0
Carmi	5/20/1998	Tstorm Winds	50 kts.	0	0	3K	0
New Haven	5/5/1999	Tstorm Winds	0 kts.	0	0	40K	0
Norris City	5/17/1999	Tstorm Winds	0 kts.	0	0	20K	0
Carmi	6/4/1999	Tstorm Winds	52 kts.	0	0	10K	0
Carmi	7/11/2000	Tstorm Winds	0 kts.	0	0	50K	0
Carmi	9/20/2000	Tstorm Winds	52 kts.	0	0	5K	0
Carmi	9/20/2000	Tstorm Winds	50 kts.	0	0	3K	0
Centerville	10/24/2001	Tstorm Winds	61 kts.	0	2	200K	0
Centerville	3/29/2002	Tstorm Winds	50 kts.	0	0	3K	0
Norris City	4/21/2002	Tstorm Winds	50 kts.	0	0	3K	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Carmi	5/28/2003	Tstorm Winds	52 kts.	0	0	0	0
Carmi	4/30/2004	Tstorm Winds	50 kts.	0	0	0	0
Crossville	5/26/2004	Tstorm Winds	52 kts.	0	0	15K	0
White	5/27/2004	Tstorm Winds	55 kts.	0	0	25K	0
Enfield	5/30/2004	Tstorm Winds	50 kts.	0	0	0	0
Grayville	7/5/2004	Tstorm Winds	64 kts.	0	0	30K	0
Grayville	7/6/2004	Tstorm Winds	52 kts.	0	0	10K	0
Carmi	8/28/2004	Tstorm Winds	55 kts.	0	0	150K	0
Carmi	1/13/2005	Tstorm Winds	50 kts.	0	0	3K	0
Grayville	4/22/2005	Tstorm Winds	52 kts.	0	0	20K	0
Carmi	11/15/2005	Tstorm Winds	52 kts.	0	0	25K	0
White	4/2/2006	Tstorm Winds	61 kts.	0	0	100K	0
Grayville	4/7/2006	Tstorm Winds	59 kts.	0	0	0	0
White	7/21/2006	Tstorm Winds	52 kts.	0	0	40K	0
Crossville	5/23/2000	Tstorm Winds/Hail	0 kts.	0	0	0	0
White	4/20/2000	Wind	N/A	0	0	0	0
White	3/9/2002	Wind	N/A	0	0	3K	0

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

Geographic Location for 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 historical thunderstorms listed above varies both in terms of the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

Calculated Risk Priority Index for Thunderstorm Hazard

Based on historical information, the probability of future high wind damage is highly likely. High winds with widely varying magnitudes are expected to happen. According to the RPI, thunderstorms and high wind damage ranked as the number four hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
4	x	**1**	=	**4**

Vulnerability Analysis for Thunderstorm Hazard

Severe thunderstorm events are located in Table 4-32 to 4-34. Severe thunderstorms are an evenly distributed threat across the entire jurisdiction; therefore, the entire county's population and all buildings are susceptible to severe thunderstorms and can expect the same impacts within the affected area. This plan will therefore consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in White County are discussed in types and numbers in Table 4-7. In addition, even though the exact areas affected are not known, a discussion of the potential impacts for buildings and infrastructure during a severe thunderstorm are also included.

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, debris (trees or limbs) causing damage, roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of function of the facility (i.e.. damaged police station will no longer be able to serve the community). Table 4-6 lists the types and numbers of all of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

A table of the building exposure in terms of types and numbers of buildings for the entire county is provided in Table 4-7. The buildings within the county can all expect the same impacts, similar to those discussed for critical facilities. These impacts include structural failure, debris (trees or limbs) causing damage, roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (i.e. damaged home will no longer be habitable causing residence to seek shelter).

Infrastructure

During a severe thunderstorm, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since the county’s entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a severe thunderstorm. The impacts to these items include broken, failed or impassable roadways; broken or failed utility lines (i.e. loss of power or gas to community); or railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

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

Analysis of Community Development Trends

Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures need to be built with more sturdy construction, and those structures already in place need to be hardened to lessen the potential impacts of severe weather. Community warning sirens to provide warning of approaching storms are also vital to preventing the loss of property and ensuring the safety of

White County residents. White County is a very slow growing county. The only areas of potential development are in the City of Grayville and the City of Carmi located on Highway 1. The City of Grayville has an industrial park that is being expanded and the City of Carmi recently has had so commercial development on the south side of the town along Highway 1.

4.4.5 Drought Hazard

Hazard Definition for Drought Hazard

Drought is a normal climatic phenomenon that occurs across the state of Illinois and within White County. The meteorological condition which creates a drought is below-normal rainfall. However excessive heat can lead to increased evaporation which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low-rainfall areas. Drought refers to abnormally low amounts of precipitation over an extended period of time (usually a growing season or more). The severity of a drought depends on its location, duration, and geographical extent, as well as on the water supply, and usage demands made by human activities, and vegetation or agricultural operations.

Drought brings several different problems that must be addressed. The quality and quantity of crops, livestock, and other agricultural activities will be affected during prolonged drought. Drought can adversely impact forested areas including the potential for destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Previous Occurrences for Drought Hazard

The National Climatic Data Center (NCDC) database reported 35 drought/heat wave events in White County since 1997. Heat wave events have been attributed with seven deaths and 82 injuries since 1997 in White and adjacent counties. For example, in August 2006, the heat index peaked between 105°F and 113°F across southern Illinois on August 1. Hourly measurements of the heat index peaked as high as 113°F at Harrisburg and Fairfield, 110°F at Mount Vernon, 108°F at Marion, 107°F at Carbondale, and 105°F at Cairo. Heat indices were a little lower in most areas the next day, but still peaked at or above 105°F in the Wabash Valley and near Cairo. The highest heat indices on August 2 were 110°F at Fairfield, 108°F at Harrisburg, and 105°F at Cairo and Mount Vernon.

NCDC records of droughts/heat waves are identified in Table 4-29. Additional details for NCDC events are included in Appendix D.

Table 4-30: White County Drought / Heat Wave Events*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	7/2/1997	Excessive Heat	N/A	1	0	0	0
White	7/25/1997	Excessive Heat	N/A	0	0	0	0
White	7/25/1997	Excessive Heat	N/A	0	12	0	0
White	2/1/1998	Abnormal Warmth	N/A	0	0	0	0
White	6/22/1998	Excessive Heat	N/A	1	0	0	0
White	9/1/1998	Drought	N/A	0	0	0	0
White	12/1/1998	Unusual Warmth	N/A	0	0	0	0
White	7/18/1999	Excessive Heat	N/A	4	0	0	0
White	7/19/1999	Excessive	N/A	1	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
		Heat					
White	8/1/1999	Drought	N/A	0	0	0	0
White	9/1/1999	Drought	N/A	0	0	0	0
White	10/1/1999	Drought	N/A	0	0	0	0
White	11/1/1999	Drought	N/A	0	0	0	0
White	12/1/1999	Drought	N/A	0	0	0	0
White	7/7/2001	Excessive Heat	N/A	0	0	0	0
White	8/1/2002	Drought	N/A	0	0	0	0
White	8/3/2002	Excessive Heat	N/A	0	8	0	0
White	9/1/2002	Drought	N/A	0	0	0	53.0M
White	6/1/2005	Drought	N/A	0	0	0	0
White	6/15/2005	Drought	N/A	0	0	0	0
White	7/1/2005	Drought	N/A	0	0	0	180.1M
White	7/1/2005	Drought	N/A	0	0	0	0
White	7/21/2005	Excessive Heat	N/A	0	62	0	0
White	8/1/2005	Drought	N/A	0	0	0	48.5M
White	8/1/2005	Drought	N/A	0	0	0	0
White	8/19/2005	Excessive Heat	N/A	0	0	0	0
White	9/1/2005	Drought	N/A	0	0	0	0
White	10/1/2005	Drought	N/A	0	0	0	0
White	11/1/2005	Drought	N/A	0	0	0	0
White	12/1/2005	Drought	N/A	0	0	0	0
White	1/1/2006	Drought	N/A	0	0	0	0
White	2/1/2006	Drought	N/A	0	0	0	0
White	3/1/2006	Drought	N/A	0	0	0	0
White	7/31/2006	Heat	N/A	0	0	0	0
White	8/1/2006	Heat	N/A	0	0	0	0

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

Geographic Location for Drought Hazard

Droughts, as shown in the above table, are regional in nature. Most of the NCDC data is calculated regionally or in some cases statewide.

Hazard Extent for Drought Hazard

The extent of droughts varies in terms of geographical extent, temperature, duration, and the range of precipitation.

Calculated Risk Priority Index for Drought Hazard

Based on historical information, future droughts in White County are possible. Droughts of varying magnitudes are expected. According to the RPI, droughts ranked as the number eight greatest hazard posed to White County.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
2	x	1	=	2

Vulnerability Analysis for Drought Hazard

Heat wave and drought events are listed in Tables 4-35. Drought impacts are an evenly distributed threat across the entire jurisdiction; therefore, the entire county is vulnerable to drought and can expect the same impacts within the affected area. The entire population and buildings have been identified as at risk. The building exposure is included in Table 4-7. In addition, even though the exact areas affected are not known, a discussion of the potential impacts during a drought is also included.

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 damage. 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. Table 4-6 lists the types and numbers of all of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

A table of the building exposure in terms of types and numbers of buildings for the entire county is listed in Table 4-7. The buildings within the county can all expect the same impacts similar 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 infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with fire that could result from the hot, dry conditions. If such a fire event were to occur, any number of these items could become damaged. The impacts to these items may include broken, failed or impassable roadways; broken or failed utility lines (i.e. loss of power or gas to community); or railway failure from broken or impassable railways. Bridges could fail or become impassable.

Vulnerability to Future Assets/Infrastructure for Drought Hazard

Future development will remain vulnerable to these events. Some urban and rural areas are more susceptible than others. Excessive demands of the populated area place a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of heat and drought, and dry conditions can lead to the ignition of wildfires that could threaten residential, commercial, and recreational areas.

Analysis of Community Development Trends

Because the droughts are regional in nature future development will be impacted across the county. White County is not a growing county. The population has decreased over the years and is not expected to rise in the near future.

4.4.6 Winter Storm Hazard

Hazard Definition for Winter Storm Hazard

Severe winter weather consists of various forms of precipitation and strong 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, and death.

Ice (glazing) and Sleet Storms

Ice or sleet, even in small quantities, can result in hazardous driving conditions and can cause property damage. Sleet involves frozen raindrops that bounce when they hit the ground or other objects. 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.

The most damaging winter storms in southern Illinois have been ice storms. Ice storms occur when moisture-laden gulf air converges with the northern jet stream causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain coating power and communication lines and trees with heavy ice. The winds will then cause the overburdened limbs and cables to snap; leaving large sectors of the population without power, heat, or communication. In the past few decades, including the winter of 2007–08, numerous ice storm events have occurred in southern Illinois.

Snow Storms

Significant snow storms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snow storm with winds of 35 miles per hour or greater and/or visibility of less than ¼ mile for three or more hours. Blizzards are the most dramatic and perilous of all winter storm events. Most snow within a blizzard is in the form of fine, powdery particles, which are wind-blown in such great quantities that visibility is reduced to only a few feet. Blizzards have the potential to result in property damage.

Illinois has repeatedly been struck by blizzards, although they are less common in the southern part of the state. Blizzard conditions can cause power outages, loss of communication, and make transportation impossible. The blowing of snow can reduce visibility to less than ¼ mile, resulting in disorientation that can make even travel by foot dangerous.

Severe Cold

Severe cold is characterized by the ambient air temperature that may drop to around 0°F or below. These extreme temperatures can increase the likelihood of frostbite and hyperthermia. High winds during severe cold events can enhance the air temperatures affects. Fast winds during cold weather events can lower the Wind Chill Factor (how cold the air feels on your skin) which can lower the time it takes for frostbite and hypothermia to affect a person's body.

Previous Occurrences for Winter Storm Hazard

The National Climatic Data Center (NCDC) database identified 156 winter storm and extreme cold events for White County since 1993. Winter storms and extreme cold events have been attributed with two deaths, 10 injuries, and more than $800,000 in property damage in White and surrounding counties. The most recent event occurred on February 28, 2008. An upper -level disturbance moving from the northern Rockies to the northern Great Lakes on February 28, 2008 spread an area of light snow across the region. Widespread snow accumulations of one to three inches were noted across eastern Iowa, northwest and western Illinois and extreme northeast Missouri. Temperatures were in the 20s and southeast winds were sustained 15 to 20 mph with gusts to near 30 mph. The combination of fluffy snow and gusty winds caused considerable blowing and drifting.

The NCDC winter storms are listed in Table 4-30. Additional details for NCDC events are included in Appendix D.

Table 4-31: Winter Storm Events*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	2/15/1993	Heavy Snow	N/A	0	0	50K	0
White	3/8/1994	Heavy Snow	N/A	0	0	500K	0
Northern Illinois	12/6/1994	Winter Storm	N/A	0	0	10	0
White	1/18/1995	Heavy Snow	N/A	0	0	0	0
White	11/10/1995	Snow/sleet/freezing Rain	N/A	0	0	0	0
White	11/27/1995	Snow/sleet/freezing Rain	N/A	0	0	0	0
White	12/8/1995	Snow	N/A	0	0	0	0
White	12/9/1995	Cold Wave	N/A	0	0	0	0
White	1/18/1996	Winter Storm	N/A	0	0	0	0
White	1/26/1996	Winter Storm	N/A	0	0	0	0
White	1/30/1996	Extreme Cold	N/A	0	0	0	0
White	2/1/1996	Extreme Cold	N/A	0	0	0	0
White	2/2/1996	Extreme Cold	N/A	0	0	0	0
White	3/19/1996	Winter Storm	N/A	0	0	0	0
White	11/14/1996	Winter Storm	N/A	0	0	0	0
White	12/16/1996	Winter Storm	N/A	0	0	0	0
White	12/27/1996	Winter Storm	N/A	0	0	0	0
White	1/8/1997	Winter Storm	N/A	0	0	0	0
White	1/9/1997	Winter Storm	N/A	0	0	0	0
White	1/10/1997	Extreme Wind chill	N/A	0	1	0	0
White	1/10/1997	Extreme Wind chill	N/A	1	0	0	0
White	1/15/1997	Ice Storm	N/A	0	0	0	0
White	1/15/1997	Winter Storm	N/A	0	0	0	0
White	1/17/1997	Extreme Wind chill	N/A	0	0	0	0
White	1/24/1997	Winter Storm	N/A	0	0	0	0
White	2/3/1997	Winter Storm	N/A	0	0	0	0
White	4/10/1997	Heavy Snow	N/A	0	0	0	0
White	4/18/1997	Frost	N/A	0	0	0	0
White	11/14/1997	Winter Storm	N/A	0	0	0	0
White	12/8/1997	Snow	N/A	0	0	0	0
White	12/24/1997	Heavy Snow	N/A	0	0	0	0
White	12/30/1997	Snow	N/A	0	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	1/8/1998	Winter Storm	N/A	0	0	0	0
White	1/20/1998	Winter Storm	N/A	0	0	0	0
White	2/4/1998	Heavy Snow	N/A	0	0	0	0
White	12/21/1998	Freezing Rain	N/A	0	0	0	0
White	12/30/1998	Snow	N/A	0	0	0	0
White	12/30/1998	Winter Storm	N/A	0	0	0	0
White	1/1/1999	Ice Storm	N/A	0	0	150K	0
White	1/1/1999	Winter Storm	N/A	0	0	0	0
White	1/8/1999	Ice Storm	N/A	0	0	0	0
White	3/5/1999	Winter Storm	N/A	0	0	0	0
White	3/8/1999	Winter Storm	N/A	0	0	0	0
White	3/14/1999	Heavy Snow	N/A	0	0	0	0
White	12/16/1999	Winter Storm	N/A	0	0	0	0
White	12/19/1999	Winter Storm	N/A	0	0	0	0
White	12/23/1999	Winter Storm	N/A	0	0	0	0
White	1/3/2000	Winter Storm	N/A	0	0	0	0
White	1/17/2000	Freezing Rain	N/A	0	0	0	0
White	1/17/2000	Winter Storm	N/A	0	0	0	0
White	1/19/2000	Winter Storm	N/A	0	0	0	0
White	1/22/2000	Snow	N/A	0	0	0	0
White	1/29/2000	Winter Storm	N/A	0	0	0	0
White	2/17/2000	Winter Storm	N/A	0	0	0	0
White	4/9/2000	Frost	N/A	0	0	0	0
White	10/9/2000	Frost	N/A	0	0	0	0
White	12/1/2000	Record Cold	N/A	0	0	0	0
White	12/1/2000	Record Snow	N/A	0	0	0	0
White	12/1/2000	Snow	N/A	0	0	0	0
White	12/2/2000	Snow	N/A	0	0	0	0
White	12/7/2000	Snow/freezing Rain	N/A	0	0	0	0
White	12/10/2000	Winter Storm	N/A	0	0	0	0
White	12/12/2000	Extreme Cold	N/A	0	0	0	0
White	12/13/2000	Winter Storm	N/A	0	0	0	0
White	12/15/2000	Freezing Rain	N/A	0	0	0	0
White	12/15/2000	Ice Storm	N/A	0	0	0	0
White	12/16/2000	Extreme Wind chill	N/A	0	0	0	0
White	12/16/2000	Snow	N/A	0	0	0	0
White	12/18/2000	Snow/blowing Snow	N/A	0	0	0	0
White	12/20/2000	Snow	N/A	0	0	0	0
White	12/21/2000	Extreme Wind chill	N/A	0	0	0	0
White	12/23/2000	Extreme Wind chill	N/A	0	0	0	0
White	12/28/2000	Snow	N/A	0	0	0	0
White	1/1/2001	Extreme Cold	N/A	0	0	0	0
White	1/13/2001	Snow/freezing Rain	N/A	0	0	0	0
White	1/26/2001	Freezing Rain	N/A	0	0	0	0
White	1/26/2001	Snow/blowing Snow	N/A	0	0	0	0
White	1/28/2001	Ice Storm	N/A	0	0	0	0
White	2/14/2001	Freezing Rain	N/A	0	0	0	0
White	2/21/2001	Winter Storm	N/A	0	0	0	0
White	2/23/2001	Freezing Rain	N/A	0	0	0	0
White	3/15/2001	Snow	N/A	0	0	0	0
White	4/14/2001	Snowmelt Flooding	N/A	0	0	0	0
White	4/18/2001	Frost	N/A	0	0	0	0
White	1/30/2002	Winter Storm	N/A	0	0	0	0
White	3/1/2002	Winter Storm	N/A	0	0	0	0
White	12/4/2002	Winter Storm	N/A	0	0	0	0
White	12/23/2002	Winter Storm	N/A	0	0	0	0
White	1/22/2003	Winter Weather/mix	N/A	0	0	0	0
White	1/23/2003	Extreme Cold/wind Chill	N/A	0	0	0	0
White	1/28/2003	Winter Storm	N/A	0	0	0	0
White	2/14/2003	Winter Storm	N/A	0	0	0	0
White	2/16/2003	Winter Storm	N/A	0	0	0	0
White	2/23/2003	Heavy Snow	N/A	0	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	3/4/2003	Winter Storm	N/A	0	0	0	0
White	5/3/2003	Frost/freeze	N/A	0	0	0	0
Maunie	7/2/2003	Funnel Cloud	N/A	0	0	0	0
White	10/3/2003	Frost/freeze	N/A	0	0	0	0
White	11/28/2003	Winter Weather/mix	N/A	0	0	0	0
White	12/13/2003	Winter Weather/mix	N/A	0	0	0	0
White	1/25/2004	Ice Storm	N/A	0	0	0	0
White	1/27/2004	Winter Weather/mix	N/A	0	0	0	0
White	1/29/2004	Winter Weather/mix	N/A	0	0	0	0
White	12/22/2004	Winter Storm	N/A	1	1	100K	0
White	12/23/2004	Extreme Cold/wind Chill	N/A	1	0	0	0
White	1/5/2005	Heavy Snow	N/A	0	0	30K	0
White	5/3/2005	Frost/freeze	N/A	0	0	0	26.4M
White	5/4/2005	Frost/freeze	N/A	0	0	0	0
White	10/28/2005	Frost/freeze	N/A	0	0	0	0
White	12/8/2005	Winter Storm	N/A	0	0	0	0
White	12/8/2005	Winter Weather/mix	N/A	0	0	0	0
White	1/13/2006	Winter Weather/mix	N/A	0	0	0	0
White	2/8/2006	Winter Weather/mix	N/A	0	0	0	0
White	2/11/2006	Winter Weather/mix	N/A	0	0	0	0
White	2/15/2006	Winter Weather	N/A	0	0	10K	0
White	2/18/2006	Winter Weather/mix	N/A	0	0	0	0
White	4/26/2006	Frost/freeze	N/A	0	0	0	0
White	12/1/2006	Winter Storm	N/A	0	0	0K	0K
White	1/13/2007	Winter Weather	N/A	0	0	0K	0K
White	1/21/2007	Winter Weather	N/A	0	0	0K	0K
White	1/21/2007	Winter Weather	N/A	0	0	0K	0K
White	2/1/2007	Winter Weather	N/A	0	0	0K	0K
White	2/2/2007	Extreme Cold/wind Chill	N/A	0	0	0K	0K
White	2/6/2007	Winter Weather	N/A	0	0	0K	0K
White	2/11/2007	Winter Weather	N/A	0	0	0K	0K
White	2/13/2007	Winter Storm	N/A	0	0	0K	0K
White	2/13/2007	Winter Weather	N/A	0	0	0K	0K
White	2/16/2007	Winter Weather	N/A	0	0	0K	0K
White	2/24/2007	Ice Storm	N/A	0	0	0K	0K
White	3/1/2007	Winter Weather	N/A	0	0	0K	0K
White	4/3/2007	Frost/freeze	N/A	0	0	0K	0K
White	4/10/2007	Frost/freeze	N/A	0	0	0K	0K
White	12/1/2007	Ice Storm	N/A	0	0	0K	0K
White	12/1/2007	Winter Storm	N/A	0	0	0K	0K
White	12/4/2007	Winter Weather	N/A	0	0	0K	0K
White	12/6/2007	Winter Weather	N/A	0	0	0K	0K
White	12/11/2007	Ice Storm	N/A	0	0	0K	0K
White	12/15/2007	Winter Weather	N/A	0	0	0K	0K
White	12/15/2007	Winter Weather	N/A	0	0	0K	0K
White	12/22/2007	Winter Weather	N/A	0	0	0K	0K
White	12/28/2007	Heavy Snow	N/A	0	0	0K	0K
White	12/28/2007	Winter Weather	N/A	0	0	0K	0K
White	12/31/2007	Winter Weather	N/A	0	0	0K	0K
White	1/21/2008	Winter Weather	N/A	0	0	0K	0K
White	1/24/2008	Extreme Cold/wind Chill	N/A	0	0	0K	0K
White	1/29/2008	Winter Weather	N/A	0	0	0K	0K
White	1/31/2008	Winter Weather	N/A	0	0	0K	0K
White	2/1/2008	Winter Storm	N/A	0	0	0K	0K
White	2/1/2008	Winter Weather	N/A	0	0	0K	0K
White	2/3/2008	Winter Weather	N/A	0	0	0K	0K
White	2/5/2008	Winter Storm	N/A	0	0	0K	0K

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
White	2/11/2008	Winter Storm	N/A	0	0	0K	0K
White	2/11/2008	Winter Weather	N/A	0	0	0K	0K
White	2/25/2008	Winter Storm	N/A	0	0	0K	0K
White	2/25/2008	Winter Weather	N/A	0	0	0K	0K
White	2/28/2008	Winter Weather	N/A	0	0	0K	0K

Source: NCDC

*White County's data of historical events may more extensive and more recent than the recorded NCDC events. The county data may include more events and greater economic losses from property or crop damages.

Geographic Location for Winter Storm Hazard

Severe winter storms, as shown in the above table, are regional in nature. Most of the NCDC data is calculated regionally or in some cases statewide.

Hazard Extent for Winter Storm Hazard

The extent of the historical winter storms listed above varies in terms of storm extent, temperature, and ice or snowfall. Severe winter storms, as shown in the above table, affect the entire jurisdiction equally.

Calculated Risk Priority Index for Winter Storm Hazard

Based on historical information, the probability of future winter storms is likely. Winter storms of varying magnitudes are expected to happen. According to the RPI, winter storms ranked as the number seven highest hazard posed to White County.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	1	=	3

Vulnerability Analysis for Winter Storm Hazard

Winter storm impacts are an evenly-distributed threat across the entire jurisdiction; therefore the entire county is vulnerable to winter storms and can expect the same impacts within the affected area. The building exposure for White County is included in Table 4-7.

Winter storm events are listed in Table 4-36. This plan will therefore consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in White County are discussed in types and numbers below. In addition, even though the exact areas affected are not known, a discussion of the potential impacts for buildings and infrastructure during a winter storm are also included.

Critical Facilities

All critical facilities are vulnerable to a winter storm. A critical facility will encounter many of the same impacts as any other buildings within the jurisdiction. These impacts include loss of gas or electricity from broken or damaged utility lines, roads and railways damaged or impassable, broken water pipes, and roof collapse from heavy snow. Table 4-6 lists the types and numbers of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-7 lists the building exposure in terms of types and numbers of buildings for the entire county. The impacts to the building stock within the county are similar to the damages expected to the critical facilities, including loss of gas of electricity from broken or damaged utility lines, roads and railways damaged or impassable, broken water pipes, and roof collapse from heavy snow.

Infrastructure

During a winter storm, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. Since the county's entire infrastructure is equally vulnerable it is important to emphasize that any number of these items could become damaged during a winter storm. Potential impacts include broken gas and/or electricity lines, or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

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

Analysis of Community Development Trends

Because the winter storm events are regional in nature future development will be impacted across the county. White County is not a growing county and does not expect a population increase in the future. There are not many new homes being built and not in any type of "subdivision" pattern.

4.4.7 Hazardous Materials Storage and Transport Hazard

Hazard Definition for Hazardous Materials Storage and Transport Hazard

Explosions result from the ignition of volatile materials such as petroleum products, natural gas and other flammable gases; hazardous materials/chemicals, and dust; and explosive devices. 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 for Hazardous Materials Storage and Transport Hazard

White County has not experienced a significant or large-scale hazardous material incident at a fixed site or transportation route that has resulted in multiple deaths or serious injuries <verify>.

Geographic Location for Hazardous Materials Storage and Transport Hazard

The hazardous material hazards are countywide and are primarily associated with the transport of materials via highway or rail.

Hazard Extent for Hazardous Materials Storage and Transport 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.

Calculated Risk Priority Index for Hazardous Materials Storage and Transport Hazard

The possibility of a hazardous materials accident is possible, based on input from the planning team. According to the RPI, Hazardous Materials Storage and Transport ranked as the number three greatest hazard facing White County.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
2	x	3	=	6

Vulnerability Analysis for Hazardous Materials Storage and Transport Hazard

Hazardous material impacts are an evenly distributed threat across the entire jurisdiction; therefore the entire county is vulnerable to a release associated with hazardous materials storage or transport and can expect the same impacts within the affected area. The building exposure for White County, as determined from the HAZUS-MH building inventory, is included in Table 4-7. This plan will therefore consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in White County are discussed below. In addition, even though the exact areas affected are not known, a discussion of the potential impacts for buildings and infrastructure is also included.

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 buildings within the jurisdiction. These impacts include structural failure due to fire or explosion and loss of function of the facility (i.e. damaged police station will no longer be able to serve the community). Table 4-6 lists the types and numbers of all essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-7 lists the building exposure in terms of type and number 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 due to fire or explosion or debris and loss of function of the building (i.e. a damaged home will no longer be habitable causing residence to seek shelter).

Infrastructure

During a hazardous materials release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since a full inventory of infrastructure is not available for this plan, it is important to emphasize that any number of these items could become damaged in the event of a hazardous material release. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (i.e. loss of power or gas to community); and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

In terms of number and types of buildings and infrastructure, typical scenarios are described as follows to gauge the anticipated impacts of hazardous materials events in the county.

Analysis

The U.S. EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for a Phosgene release at the I-64 and US 45 near Mill Shoals.

Phosgene is used as a chemical intermediate; in the past, it was used as a chemical warfare agent. Phosgene is extremely toxic by acute (short-term) inhalation exposure. Severe respiratory effects, including pulmonary edema, pulmonary emphysema, and death have been reported in humans. Severe ocular irritation and dermal burns may result following eye or skin exposure. Chronic (long-term) inhalation exposure to phosgene has been shown to result in some tolerance to the acute effects noted in humans, but may also cause irreversible pulmonary changes of emphysema and fibrosis. Limited human studies indicate no increase in the incidence of cancer among workers chronically exposed to phosgene.

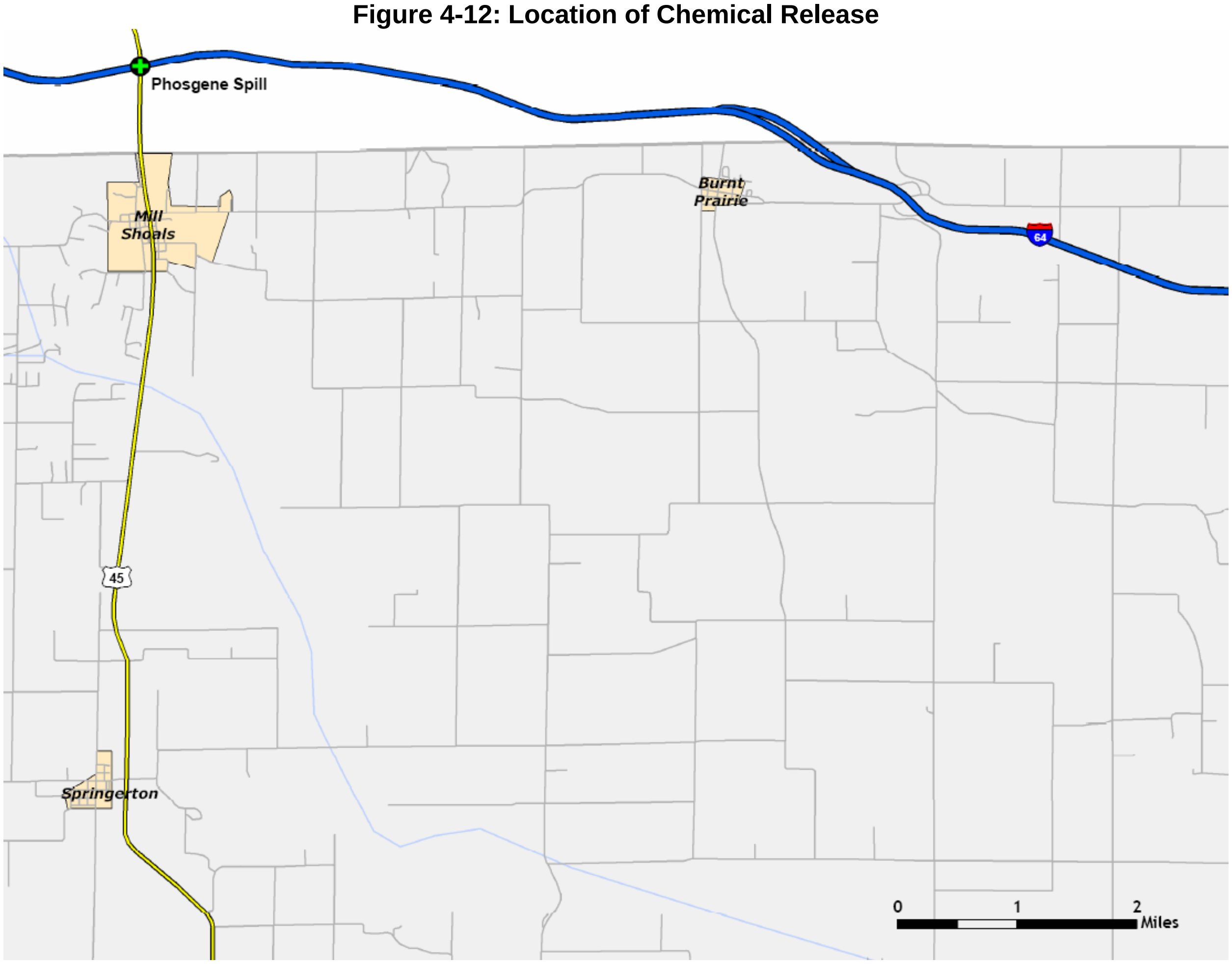
Source: CAMEO

ALOHA is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. Phosgene is a common chemical used in industrial operations and can be found in either liquid or gas form. Rail and truck tankers commonly haul Phosgene to and from facilities.

For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the west were assumed. The target area was chosen due to its proximity to Mill Shoals.

The geographic area covered in this analysis is depicted in Figure 4-12.

Figure 4-12: Location of Chemical Release



The ALOHA atmospheric modeling parameters, depicted in Figure 4-13, were based upon a northwesterly wind speed of five mph. The temperature was 68°F with 75% humidity and partly cloudy skies.

The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to eight feet and the length set to 33 feet (12,048 gallons). At the time of its release, it was estimated that the tank was 100% full. The Phosgene 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.

Figure 4-13: ALOHA Plume Modeling Parameters

```
SITE DATA:
  Location: MILL SHOALS, ILLINOIS
  Building Air Exchanges Per Hour: 0.30 (sheltered single storied)
  Time: September 16, 2008  1300 hours CDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: PHOSGENE                Molecular Weight: 98.92 g/mol
  AEGL-2(60 min): 0.3 ppm   AEGL-3(60 min): 0.75 ppm
  IDLH: 2 ppm
  Ambient Boiling Point: 45.1° 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: 5 miles/hour from NW at 10 meters
  Ground Roughness: open country         Cloud Cover: 5 tenths
  Air Temperature: 68° F                 Stability Class: B
  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: 68° F
  Chemical Mass in Tank: 71.2 tons       Tank is 100% full
  Circular Opening Diameter: 2.5 inches
  Opening is 1 feet from tank bottom
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 3,780 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 140,386 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:
  Model Run: Heavy Gas
  Red   : greater than 6 miles --- (0.75 ppm = AEGL-3(60 min))
  Orange: greater than 6 miles --- (0.3 ppm = AEGL-2(60 min))
```

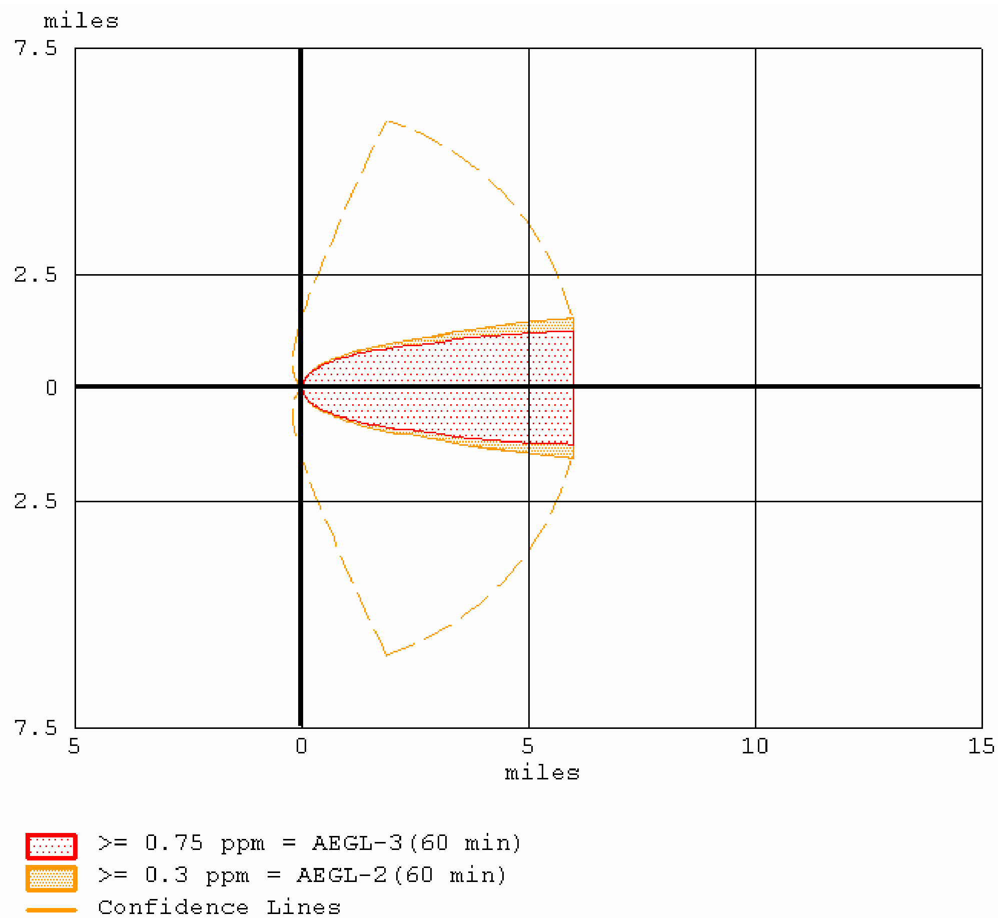
Acute Exposure Guideline Levels (AEGLs) are intended to describe the health effects on humans due to once-in-a-lifetime or rare exposure to airborne chemicals. The National Advisory Committee for AEGLs is developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills or other catastrophic exposures.

- AEGL 1: Above this airborne concentration of a substance, 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: Above this airborne concentration of a substance, 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: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

According to the ALOHA parameters, approximately 3,780 pounds of material would be released per minute. The image in Figures 4-14 depicts the plume footprint generated by ALOHA.

Figure 4-14: Plume Footprint Generated by ALOHA



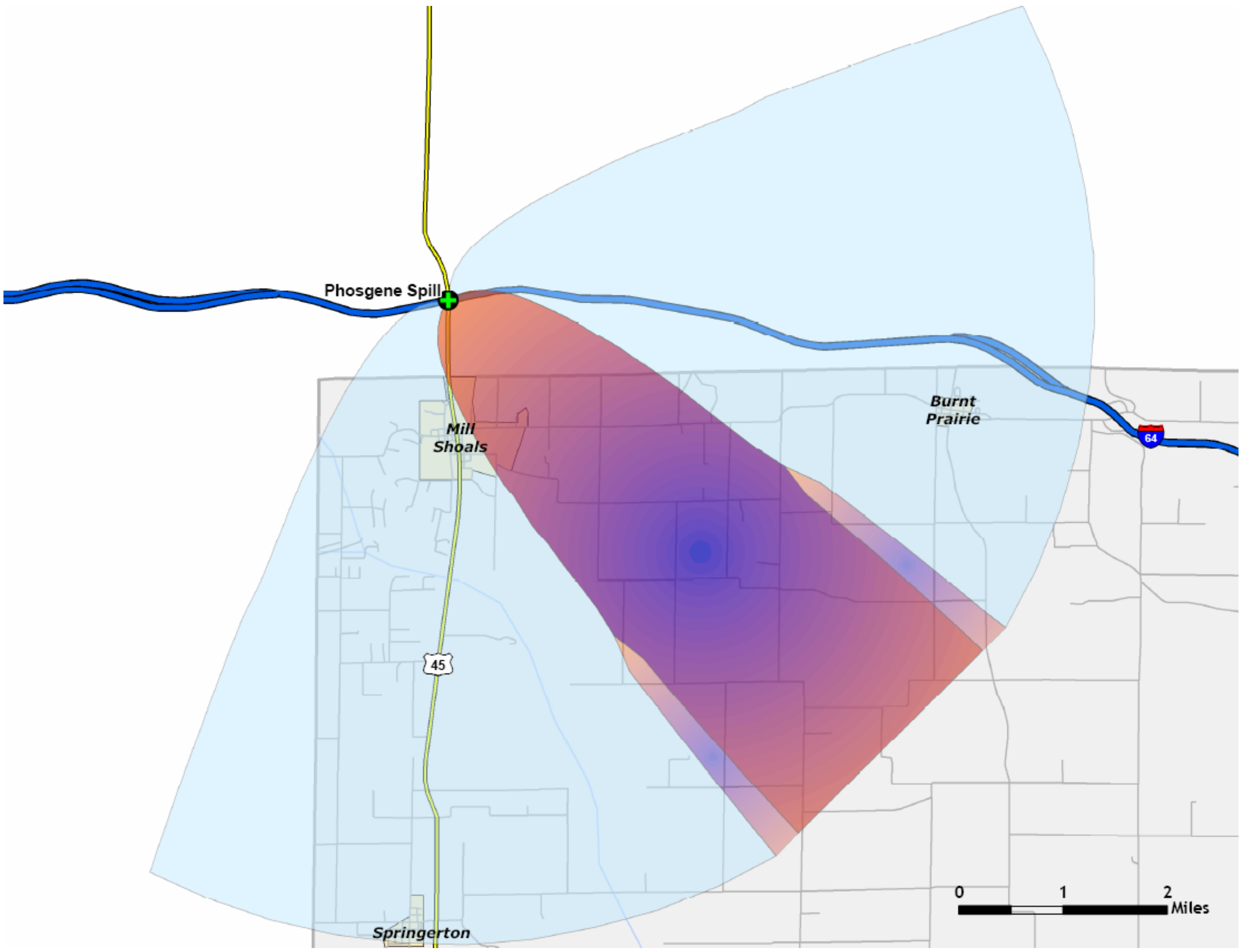
As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). For the purpose of clarification, this report will designate each level of concentration as a specific zone. The zones are as follows:

- **Zone 1** (AEGL-3): The red buffer (> 0.75 ppm) extends more than six miles from the point of release after one hour.

- **Zone 2** (AEGL-2): The orange buffer (> 0.3 ppm) also extends more than six miles from the point of release after one hour.
- **Zone 3** (Confidence Lines): The dashed lines depict 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.

Figure 4-15 depicts the ALOHA plume footprint as overlaid in ArcGIS.

Figure 4-15: ALOHA Plume Footprint Overlaid in ArcGIS



Results

The White County GBS aggregate layer was added to ArcMap and overlaid with the plume footprint. The GBS aggregate layer was then intersected with each of the three footprint areas to determine the amount of a certain census block within each footprint. Finally, building exposure in each census block was calculated based upon the area of the block inside the plume footprint. By summing the GBS exposure within all AEGL zones (> 0.75 ppm, > 0.3 ppm, and < 0.3 ppm), the GIS overlay analysis predicts a total building exposure of $40.2 million.

Building Damage

The results of the analysis against the GBS points are depicted in Tables 4-1 through 4-34. Table 4-31 summarizes the results of the chemical spill by combining all AEGL zones: Zone 1 (> 0.75 ppm,), Zone 2 (> 0.3 ppm), and Zone 3 (< 0.3 ppm).

Table 4-32: Estimated Exposure for all Zones (all ppm)

Occupancy	Exposure (thousands)
Residential	$34,672
Commercial	$2,820
Industrial	$484
Agriculture	$2,154
Religious	$0
Government	$119
Education	$0
Total	**$40,251**

Tables 4-32 and 4-33 summarize the results of the chemical spill for each zone separately.

Table 4-33: Estimated Exposure for Zone 1 (> 0.75 ppm)

Occupancy	Exposure (thousands)
Residential	$9,680
Commercial	$962
Industrial	$58
Agriculture	$1,226
Religious	$0
Government	$0
Education	$0
Total	**$11,926**

Table 4-34: Estimated Exposure for Zone 2 (> 0.3 ppm)

Occupancy	Exposure (thousands)
Residential	$175
Commercial	$0
Industrial	$0
Agriculture	$33
Religious	$0
Government	$0
Education	$0
Total	**$208**

Zone 3 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. Table 4-34 summarizes the results of the chemical spill for Zone 4.

Table 4-35: Estimated Exposure for Zone 3 (< 0.3 ppm)

Occupancy	Exposure (thousands)
Residential	$24,817
Commercial	$1,858
Industrial	$426
Agriculture	$895
Religious	$0
Government	$119
Education	$0
Total	**$28,117**

Essential Facilities Damage

There are no essential facilities within the limits of the chemical spill plume.

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

Much new development in White County is in close proximity to transportation corridors, such as along State Route 1 and US 45. These areas are particularly vulnerable to chemical releases because of transportation of hazardous materials.

Analysis of Community Development Trends

Because of the concentration of new development in proximity to the transportation network, future development is likely to be vulnerable. The major transportation routes and the industries located in White County pose a threat of dangerous chemicals and hazardous materials release.

4.4.8 Ground Failure

Subsidence

Subsidence, sinking of the land surface, in Illinois is usually associated with either underground mining or collapse of soil into crevice in underling soluble bedrock. Areas at risk for subsidence can be determined from detailed mapping of geologic conditions or detailed mine maps. Data sources were compiled from the Illinois Geologic Survey and Illinois Department of Natural Resources to assess the risk of subsidence in White County. This section provides an overview of the subsidence hazards in Illinois in general and a discussion of the potential subsidence risk for White County.

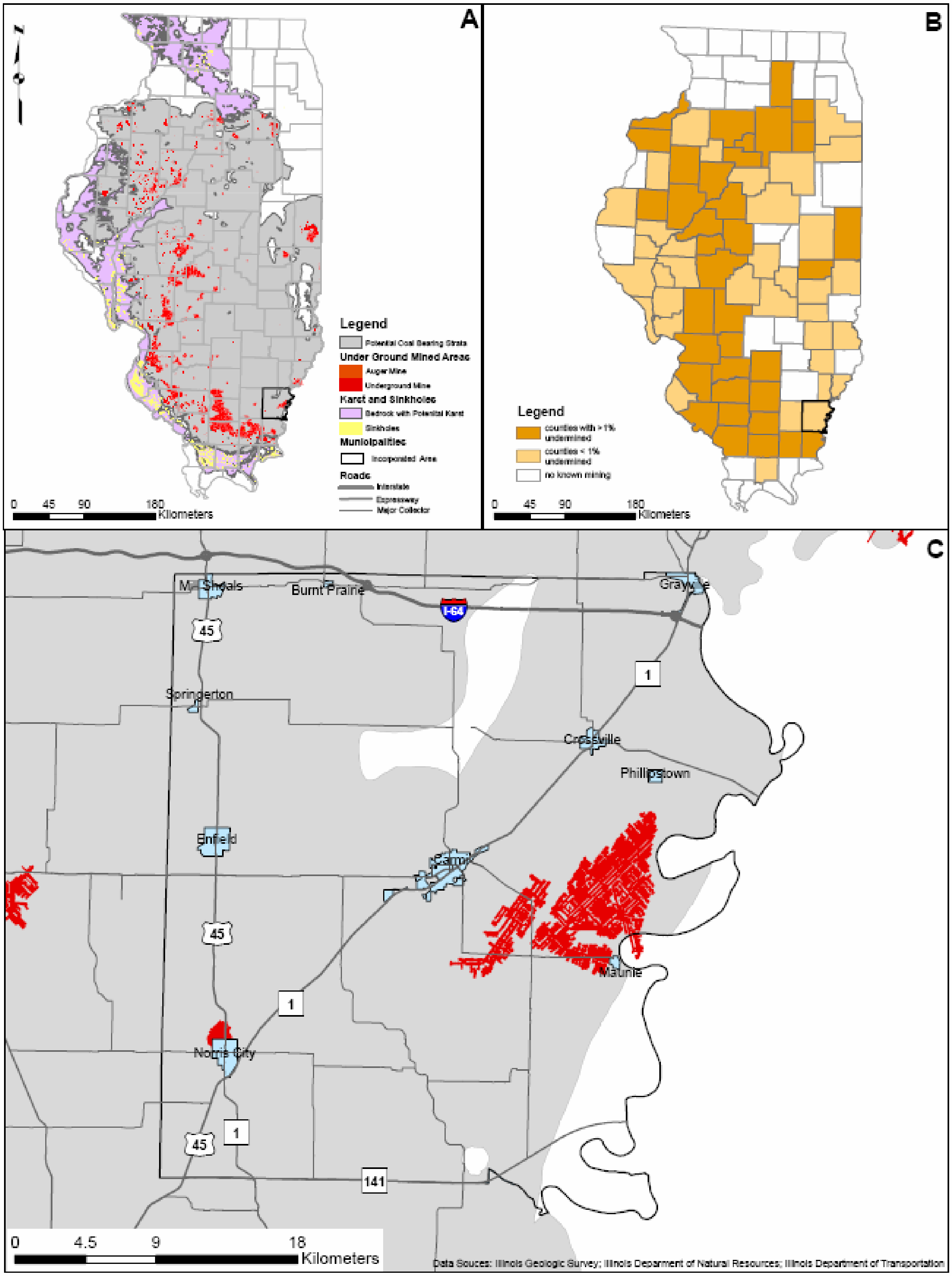
Underground Mining and Subsidence

Underground mines have been used extensively in Illinois to extract coal, lead, zinc, fluorites, shale, clay stones, limestone, and dolomite. When mining first began in Illinois, land over mined areas was sparsely populated. If the ground subsided, homes or other structures were seldom damaged. As towns and cities expanded over mined-out areas, subsidence damage to structures became increasingly more common. The most common underground mines in Illinois are coal mines. A recent study in Illinois has found that about 333,100 housing units were located over or adjacent to 839,000 acres mined for coal (Bauer, 2008).

Illinois has abundant coal resources. All or parts of 86 of 102 counties in the state have coal-bearing strata. As of 2007, about 1,050,400 acres (2.8% of the state) have been mined. Of that total, 836,655 acres are underground mines (Bauer, 2008). Illinois ranks first among all U.S. states for reserves of bituminous coal (Illinois Coal Association, 1992).

Figure 4-16a shows the statewide distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines. Figure 4-16b shows the counties which are 0, < 1%, and >1% undermined; Fig 4-16c shows the countywide distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines.

Figures 4-16a, 4-16b, and 4-16c: Maps of Statewide and Countywide Areas with Subsidence Hazard Potential



Mining Methods

There are two fundamental underground mining methods used in Illinois: high-extraction methods, such as long-wall and low-extraction room, and pillar mining. High-extraction methods remove almost all of the coal in localized areas. For modern mining practices, subsidence associated with high-extraction methods in planned and regulated by state and federal authorities. The subsurface subsides above the mine within several days or weeks after the coal has been removed. Subsidence of the over-burden above the mined-out area can continue up to seven years after subsurface removal, depending on the local geologic conditions (Bauer, 2008). The initial ground movements associated with this mining, which tend to be the largest, diminish rapidly after a few months. After subsidence has decreased to a level that no longer causes damage to structures, the land may be suitable for development. The maximum amount of subsidence is proportional to the amount of material extract and the depth between the mining and the surface. In general, over the centerline of the mine panel, subsidence can be 60% to 70% of the extract material (e.g., 10 feet of material extracted would cause a maximum subsidence of six to seven feet; Bauer, 2006).

For low-extraction techniques such a room-and-pillar mining, miners create openings (rooms) as they work. Enough of the coal layer is left behind in the pillars to support the ground surface. In Illinois this system of mining extracts 40% to 55% of the coal resources in modern mines and up to 75% is some older mines. Based on current state regulations, room-and-pillar mines in operation after 1983 that do not include planned subsidence must show that they have a stable design. Although these permitting requirements have improved overall mine stability, there are no guarantees that subsidence will not occur above a room-and-pillar mine in the future. In general, if coal or other mined resources has been removed from an area, subsidence of the overlying material is always a possibility (Bauer, 2006).

Types of Mine Subsidence

In Illinois, subsidence of the land surface related to underground mining undertakes two forms: pit subsidence or trough (sag) subsidence. Pit subsidence structures are generally six to eight feet deep and range from two to 40 feet in diameter. Pit subsidence mostly occurs over shallow mines that are <100 feet deep and where the overlying bedrock is <50 feet thick and composed of weak rock materials such as shale. The pit is produced when the mine roof collapses and the roof fall void works its way to the surface. These structures form rapidly. If the bedrock is only a few feet thick and the surface material are unconsolidated (loose), these material may fall into adjacent mine voids, producing a surface hole deeper than the height of the collapse mine void. Pit subsidence can cause damage to a structure if it develops under the corner a building or support post of a foundation or other critical location. Subsidence pits should be filled to ensure that people or animals don’t fall into these structures (Bauer, 2006).

Trough (or “sag”) subsidence forms a gentle depression over a broad area. Some trough subsidence may be as large as a whole mine panel (i.e. several hundred feet long and a few hundred feet wide). Several acres of land may be affected by a single trough event or feature. As discussed above, the maximum vertical settlement is 60% to 70% of the height of material removed (e.g., two to six feet). Significant troughs may develop suddenly (in a few hours or days) or gradually over a period of years. Troughs originate over places in mines where pillar have collapsed, producing downward movement at the ground surface. These failures can develop over mines of any depth. Trough subsidence produce an orderly pattern of tensile features (tension cracks) surrounding a central area of possible compression features. The type and extent of damage to surface structures relate to their orientation and position within a trough. In the tension zone, the downward-bending movements that develop in the ground may damage buildings, roads, sewer and water pipes, and other utilities. The downward bending of the ground surface causes the soil to crack, forming the tension cracks that pull structures apart. In the relatively smaller compression zone, roads may buckle and foundation walls may be pushed inward. Buildings damaged by compressional forces typically need their foundations rebuilt. They may also need to be leveled due to differential settling (Bauer, 2006).

Mine Subsidence Insurance

The Mine Subsidence Insurance of 1979 created subsidence insurance as part of an Illinois homeowner's policy. Homeowners in any of the Illinois counties undermined by approximately 1% or more automatically have mine subsidence insurance as a part of their policy, unless coverage is waived in writing. Mine subsidence insurance is especially important for homes located near or over mines that operated before the 1977 Surface Mine Control and Reclamation Act. The companies that operated these mines may no longer be in business (Bauer, 2006).

Mine Subsidence in White County

A small but, significant area (~4.0%) of White County has been undermined. The largest area of the county undermined occurs between Carmi and Maunie. A small area along US 45 north of Norris City has also been undermined.

Subsidence Related to Karst Features

Subsidence can also occur on land located over soluble bedrock. The land over such bedrock often has topography characteristic of past subsidence events. This topography is termed "karst." Karst terrain has unique landforms and hydrology found only in these areas. Bedrock in a karst areas are typically limestone, dolomite, or gypsum. In Illinois, limestone and dolomite (carbonate rocks) are the principle karst rock types; 9% of Illinois has carbonate rock types close enough to the ground surface to have a well developed karst terrain. The area in Illinois in which the karst terrain is most developed is the southern and southwestern part of the state (Panno, et al., 1997). The karst feature most associated with subsidence is the sinkhole)

Sinkhole Formation

A sinkhole is an area of ground that has no natural external surface drainage—when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface. Sinkholes can vary from a few feet to hundreds of acres and from less than one to more than 100 feet deep. Typically, sinkholes form slowly, so that little change is seen during a lifetime, but they also can form suddenly when a collapse occurs. Such a collapse can have a dramatic effect if it occurs in a populated setting.

Sinkholes form where rainwater moves through the soil and encounters soluble bedrock. The bedrock begins to dissolve along horizontal and vertical cracks and joints in the rock. Eventually, these cracks become large enough to start transporting small soil particles. As these small particles of soil are carried off, the surface of the soil above the conduit slump down gradually, and a small depression forms on the ground surface. This depression acts like a funnel and gathers more water, which makes the conduit still larger and washes more soil into the conduit.

Sinkhole Collapse

Sudden collapse of a sinkhole occurs where the soil close to the ground surface does not initially slump down, but instead forms a bridge. Beneath that surface cover, a void forms where the soil keeps washing into the conduit. These voids are essentially shallow caves. Over time, the void enlarges enough that the weight of the overlying bridge can no longer be supported. The surface layer then suddenly collapses into the void, forming a sinkhole.

The process of forming a conduit and a soil bridge usually takes years to decades to form. However this natural process can be aggravated and expedited by human activates. Since the process of forming a sinkhole depends on water to carry soil particle down into the karst bedrock, anything that increases the amount of water flowing into the subsurface can accelerate sinkhole formation process. Parking lots, streets, altered drainage from construction, and roof drainage are a few of the things that can increase runoff.

Collapses are more frequent after intense rainstorms. However, drought and altering of the water table can also contribute to sinkhole collapse. Areas where the water table fluctuates or has suddenly been lowered are more susceptible to sinkhole collapse.

It is also possible for construction activity to induce the collapse of near-surface voids or caves. In areas of karst bedrock, it is imperative that a proper geotechnical assessment be completed prior to construction of any significant structures. Solutions to foundation problems in karst terrain generally are expensive (White, 1988).

Sinkhole Subsidence or Collapse Potential for White County

Nearly all of White County is underlain by insoluble bedrock, and therefore subsidence from this mechanism should not be a concern.

Hazard Extent for Subsidence

The extent of subsidence hazard in White County is a function of where current development is located relative to 1) areas of past and present underground mining, and 2) areas of soluble bedrock.

Vulnerability Analysis for Ground Failure

The existing buildings and infrastructure of White County are discussed in types and numbers below. In addition, a discussion of the potential impacts for buildings and infrastructure as a result of ground failure is also included.

Critical Facilities

Any critical facility built above highly soluble bedrock could be vulnerable to land subsidence. A critical facility will encounter the same impacts as any other building within the affected area. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases, the failure of building foundations can cause cracking of critical structural elements. Table 4-6 lists the types and numbers of all of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-7 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within this area can anticipate impacts similar to those discussed above for critical facilities, ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases, the failure of building foundations causes cracking of critical structural elements.

Infrastructure

In the area of White County affected by land the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with land collapsing directly beneath them in a way that undermines their structural integrity. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (i.e. loss of power or gas to community); and railway failure from broken or impassable railways. In addition bridges could fail or become impassable causing risk to traffic.

Vulnerability to Future Assets/Infrastructure for Ground Failure

New buildings and infrastructure placed on undermined land or on highly soluble bedrock will be vulnerable to ground failure.

Analysis of Community Development Trends

White County is currently not a growing County. Population has been decreasing over the years and a population increase is not expected in the future. New business could potentially locate in the Grayville Industrial Park which is just North of I-64 on the southside of Grayville along Highway 1. This area has not been undermined.

Section 5 - Mitigation Strategy

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. The goal of mitigation is to build disaster-resistant communities. Mitigation actions and projects should be based on a well constructed risk assessment; White County's is provided in Section 4 of this plan. Mitigation should be an ongoing process adapting over time to accommodate the community's needs.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of these capabilities to determine whether the activities can be improved in order to more effectively reduce the impact of future hazards. The following sections identify existing plans and mitigation capabilities within all of the communities listed in Section 2 of this plan.

5.1.1 National Flood Insurance Program (NFIP)

The county and all of its communities are members of the National Flood Insurance Program (NFIP). In 2006, approximately 482 households were located in White County Special Flood Hazard Area. Of that, 17 households owned flood insurance, covering $1,289,300.00 in value. The total premiums collected amounted to $7,482, which on average was $440.12 annually. From November 1995 to February 28, 2007, three claims were filed totaling $37,957.06. The average claim was $12,652.35.

The county and incorporated areas do not participate in the National Flood Insurance Program's (NFIP) 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 meeting the three goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote the awareness of flood insurance. Table 5-1 identifies each community and the date each participant joined the NFIP.

Table 5-1: Additional Information on Communities Participating in the NFIP

Community	Participation Date	FIRM Date	CRS Date	CRS Rating	Flood Plain Zoning Ordinance Adopted Last
Burnt Prairie	12/13/74	11/01/95	N/A	N/A	No ordinance
Carmi	04/05/74	01/02/81	N/A	N/A	April 2006
Crossville	03/29/74	12/18/84	N/A	N/A	November 1990 Scheduled for an update
Enfield			N/A	N/A	No ordinance
Grayville	05/31/74	08/24/84	N/A	N/A	June 1984
Maunie	01/09/74	4/3/1985	N/A	N/A	1974
Mill Shoals		7/2/1976	N/A	N/A	
Norris City			N/A	N/A	
Phillipstown			N/A	N/A	
Springerton			N/A	N/A	
White County	12/1/1978	4/3/1985	N/A	N/A	April 1985

The villages of Burnt Prairie, Enfield and Norris City have no identified flood hazard boundaries; therefore, the communities do not participate in the NFIP. The villages of Mill Shoals, Phillipstown, and Springerton do have identified flood boundaries but have previously chosen not to participate in the program due to lack of interest or perceived need. The County will continue to educate these jurisdictions on the benefits of the program, especially in light of recent flooding.

5.1.2 Storm Water Management Stream Maintenance Program/Ordinance

Carmi and Grayville, Illinois have a storm water sewer that connects to the sewer system for their storm water management. Norris City does not.

5.1.3 Zoning Management Ordinance

The City of Grayville has a land use plan that was done in the 1960's. The City of Carmi does not have a current up to date land use plan. Both the City of Grayville and the City of Carmi have a TIF district. The City of Norris City does not have a land use plan. The City of Carmi and the City of Grayville both have a building code ordinance and issue building permits.

The City of Grayville has adopted the standard BOCA codes. The City of Carmi has a building code ordinance and issues building permits. The City of Norris City has limited building codes.

The City of Carmi and The City of Grayville both have Floodplain Zoning Ordinances listed in the following chart.

Table 5-2 displays hazard-related ordinances and standards for White County's jurisdictions.

Table 5-2: Description of Zoning Plans/Ordinances

Community	Comp Plan	Zoning Ord	Subd Control Ord	Erosion Control	Storm Water Mgmt	Burning Ord.	Seismic Ord.	Bldg. Stndrds.
White County	11/01/94	5/20/96	9/01/06	1994	1994	1994	N/A	1994 Natl./State
City of Grayville		10/26/76 Revised 6/4/84						
City of Carmi		8/3/1987 Revised 4/24/06						

5.1.4 Erosion Management Program/ Policy

White County utilizes the Illinois Administrative Code Title 35 and the Illinois Environmental Protection Act, administered by the Illinois Environmental Protection Agency. This requires the submission of a stormwater pollution prevention plan (SWPPP) for projects involving more than one acre of land disturbance.

5.1.5 Fire Insurance Rating Programs/ Policy

The White County Zoning Ordinance outlines Inspection Assistance by Township and District Fire Departments as follows: The Chief of each Township Fire Department or District Fire Department, or his designated representative, shall assist the Building Commissioner in the inspection of fire suppression, detection, alarm systems and other provisions of the Illinois Fire Prevention Code and shall provide reports of such inspection to the Building Commissioner as requested. This provision of the Zoning Ordinance is applicable to the entire County.

Table 5-3: Listing of Fire Departments, Ratings, and Number of Firefighters

Fire Department	Fire Insurance Rating	Number of Firefighters
City of Carmi Fire Protection District	7	31
Little Wabash Fire Protection District	6	21
Village of Crossville Volunteer Fire Department	7	19
Enfield Volunteer Fire Protection	7	24
Fairfield Rural Fire Protection District	7	17
Norris City Volunteer Fire Department	7	22

5.1.6 Land Use Plan

White County has a Comprehensive Plan developed in 1994. The entire County operates under an Area Planning Commission for all land use decisions and actions.
The White County Local Emergency Planning Commission does put together an annual Plan addressing Hazardous Materials that travel through and are used in White County. This plan is adopted and updated annually by the LEPC Board with extensive input from the White County Emergency Management Advisory Council.

The White County Zoning Ordinance does prevent residential or business construction in the flood plain.

5.1.7 Building Codes

The Building Rules of the Illinois Fire Prevention and Building Safety Commission are incorporated into the White County Zoning Ordinance, as set out in Articles of Title 675 of the Illinois Administrative Code, and including later amendments as published in the Illinois Register or Indiana Administrative Code. These include Building, Fire and Building Safety Standards, Illinois Building Code Standards, Illinois Handicapped Accessibility Code; One and Two Family Dwelling Code, Illinois Residential Code; Plumbing Code; Electrical Code; Mechanical Code; Energy Conservation Code; Swimming Pool Code; and Fire Prevention Code.

Additionally, a copy of the Design Release for Class One Structures, issued by the State Building Commissioner and State Fire Marshall pursuant to IC 22-15-3-1, shall be provided to the White County Building Commissioner before issuance of a permit for construction covered by such Design Release.

White County also inspects work after a permit is issued through its Building Commissioner. The Chief of each Township Fire Department, or his designated representative, assists the Building Commissioner in the inspection of fire suppression, detection, alarm systems, and other provisions of the Illinois Fire Prevention Code, and provides reports of such inspection to the Building Commissioner as requested.

All of White County residents fall under this Area Planning Commission and Building Code Rules. There are no building codes specific to seismic control. White County does not require tie-downs for mobile homes at this time; however it was a discussion item in some of the Hazard Mitigation meetings during 2006/2007.

5.2 Mitigation goals

The Greater Wabash Regional Planning Commission is charged with a mission to improve and assist the seven counties within the district, including White County, Illinois. The goals and objectives of the Greater Wabash Regional Planning Commission are to support the goals of the White County Hazardous Mitigation team. The MHMP developed the following goals, with a great deal of public input, to ensure that community priorities would be harmonious with the plan.

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

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

(b) Objective: Equip public facilities and communities to guard against damage caused by hazards.

(c) Objective: Minimize the amount of infrastructure exposed to hazards.

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

(e) Objective: Improve emergency sheltering in White County.

Goal 2: Create new or revise existing plans/maps related to hazards affecting White County

(a) Objective: Support compliance with the NFIP for each jurisdiction in White County.

(b) Objective: Review and update existing community plans and ordinances to support hazard mitigation.

Goal 3: Develop long-term strategies to educate the public on the hazards affecting White County

(a) Objective: Raise public awareness on hazard mitigation.

(b) Objective: Improve education of emergency personnel and public officials.

5.3 Mitigation Actions/Projects

Upon completion of the risk assessment and development of the goals and objectives, the Planning Committee was provided with a list of the six mitigation measure categories from the *FEMA State and Local Mitigation Planning How to Guides*. The measures are listed as follows.

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.

- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.

- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

After Meeting #3, held September 23, 2008, MHMP members were presented with the task of individually listing potential mitigation activities using the FEMA evaluation criteria. The MHMP members brought their mitigation ideas to Meeting #4 which was held October 21, 2008. The evaluation criteria (STAPLE+E) involved the following categories and questions.

Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political:
- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal:
- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic:
- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be "tabled" for implementation until outside sources of funding are available?

Environmental:
- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

The development of the MHMP is the first step in a multi-step process to implement projects and policies to mitigate hazards in the county and the communities in the county.

5.3.1 Completed or Current Mitigation Actions/Projects

Since this is the first mitigation plan developed for White County, there are no deleted or deferred mitigation items. The following tables will refer to completed, ongoing, or future mitigation actions.

Table 5-4 presents the completed and ongoing mitigation actions and projects in the county.

Table 5-4: Completed Mitigation Actions

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Comments
Install weather sirens in schools, and hotels	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county	Tornado, Thunderstorms	City of Grayville	The City of Grayville was responsible for this project it was completed in the last two years.
Enforce tie-down policy for mobile homes	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards	Tornado, Thunderstorms	Carmi	The City of Carmi completed this in February 4, 2002- Ordinance #1319.

5.4 Implementation Strategy and Analysis of Mitigation Projects

Implementation of the Mitigation Plan is critical to the overall success of the Mitigation Planning Process. The first step is 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 important. 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.

In meeting number 4, the planning team prioritized mitigation actions based on a number of factors. A rating of High, Medium, or Low was assessed for each mitigation item and is listed next to each item in Table 5-6. The factors were the STAPLE+E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria listed in Table 5-5.

Table 5-5: STAPLE+E planning factors

S – Social	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 – Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	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 – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economic	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 – Environmental	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.

For each mitigation action related to infrastructure, new and existing infrastructure was considered. Additionally, the mitigation strategies address continued compliance with the NFIP. While an official cost benefit review was not conducted for any of the mitigation actions, the estimated costs were discussed. The overall benefits were considered when prioritizing mitigation items from High to Low. An official cost benefit review will be conducted prior to the implementations of any mitigation actions. Table 5-6 presents mitigation projects developed by the planning committee.

Table 5-6: Mitigation Strategies

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Develop a redundant water supply	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Improve emergency sheltering in White County	Drought, Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	High	The county, local government, and County EMA will oversee the implementation of this project. Funding has not been secured as of 2008. The project is forecasted to be complete within approximately one year.
Purchase backup generators	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Improve emergency sheltering in White County	Drought, Winter Storm, Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	High	The County EMA will oversee the implementation of this project. Local resources and additional grants will be used to procure the systems. If funding is available, is forecasted to be complete within approximately two years.
Institute Reverse 911	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county	All	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA will oversee the implementation of this project. Local resources and additional grants will be used to procure the systems. If funding is available, is forecasted to be complete within approximately three years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Purchase weather radios for critical facilities	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county	All	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the cost benefits of the system. Funding has not been secured as of 2008. If funding is available, is forecasted to be complete within approximately three years.
Improve coordination and planning with local businesses	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county	HAZMAT	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Low	The county, local government, and White County EMA will oversee the implementation of this project. Local resources will be used to identify the resources. The project is forecasted to be complete within approximately five years.
Develop LEPC	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county	HAZMAT	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the capabilities of the Hazmat Response Team. Community development grants are a possible funding source. Implementation, if funding is available, is forecasted to be complete within approximately three years.
Create domes for structural loads	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Retrofit critical facilities with structural design practices and equipment that will withstand natural disasters and offer weather-proofing	Winter Storm, Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA will oversee the implementation of this project. Funding has not been secured as of 2008, but the pre-disaster mitigation program is a possible funding source. Implementation, if funding is available, is forecasted to be complete within approximately three years.
Establish heating and cooling centers	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Improve emergency sheltering in White County	Drought, Winter Storm	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	High	The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the cost benefit of heating and cooling centers. Funding has not been secured as of 2008. Implementation is forecasted to be complete within approximately one year.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Harden emergency center and create safe rooms in critical facilities	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objection:** Retrofit critical facilities with structural design practices and equipment that will withstand natural disasters and offer weather-proofing	Tornado, Thunderstorm, Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	High	The county, local government, and White County EMA will oversee the implementation of this project. Local resources will be used to identify the required structures to be hardened. Funding has not been secured as of 2008, but the pre-disaster mitigation program and community development grants are a possible funding source. Implementation, if funding is available, is forecasted to be complete within approximately two years.
Purchase generators and establish water pumping stations for all fire stations	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by hazards	Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA will oversee the implementation of this project. Local resources and additional grants will be used to procure the systems. If funding is available, is forecasted to be complete within approximately three years.
Develop a levee and pump system to prevent Little Wabash flooding	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards	Flood	Carmi	Low	The County, Carmi, and the County EMA will oversee the implementation of this project. Local resources will be used to evaluate the severity of the study. Funding has not been secured. Implementation is forecasted to be complete within approximately five years.
Institute buy-out program for residences with high flooding potential	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by hazards	Flood	Mill Shoals	Low	The County, Mill Shoals, and the County EMA will oversee the implementation of this project. Local resources will be used to evaluate the severity of the study. Funding has not been secured. Implementation is forecasted to be complete within approximately five years.
Develop training for potential hazardous materials spills and improve hazmat response team capabilities	**Goal:** Develop long-term strategies to educate the public on the hazards affecting White County **Objective:** Improve education of emergency personnel and public officials	HAZMAT	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Low	The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the capabilities of the Hazmat Response Team. Funding has not been secured as of 2008, but the Pre-Disaster Mitigation program and Community development grants are a possible funding source. Implementation, if funding is available, is forecasted to be complete within approximately five years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Develop public outreach program to instruct public on what to do during potential hazards	**Goal:** Develop long-term strategies to educate the public on the hazards affecting White County **Objective:** Raise public awareness on hazard mitigation	All	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Low	The County EMA, schools, Red Cross, and other organizations have implemented various forms of this strategy. Local resources have been used to target and inform the resident population. Additional funding will be sought from the Pre-Disaster Mitigation program.
Establish emergency supply centers for the public	**Goal:** Develop long-term strategies to educate the public on the hazards affecting White County **Objective:** Raise public awareness on hazard mitigation	Earthquake	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	Medium	The County EMA, schools, Red Cross, and other organizations have implemented various forms of this strategy. Local resources have been used to target and inform the resident population. Additional funding will be sought from the Pre-Disaster Mitigation program.
Adopt the NFIP model floodplain ordinance	**Goal:** Create new or revise existing plans/maps related to hazards affecting White County **Objective:** Support compliance with the NFIP **Objective:** Review and update existing community plans and ordinances to support hazard mitigation	Flood	White County, Carmi, Phillipstown, Crossville, Enfield, Grayville, Norris City, Maunie, Springerton, Mill Shoals, Burnt Prairie	High	The County EMA will oversee the implementation of this project. Local resources will be used to evaluate the severity of the study. Funding has not been secured, but additional funding will be sought from the Pre-Disaster Mitigation program. Implementation is forecasted to be complete within approximately three years.

The White County Emergency Management will be the local champions for the mitigation actions. The county Commissioners and the City and Town councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified actions. The Greater Wabash Regional Planning Commission is qualified to provide technical grant writing services to assist the county in seeking resources to achieve the recommended mitigation action.

5.5 Multi-Jurisdictional Mitigation Strategy

As a part of the multi-hazard mitigation planning requirements at least one identifiable mitigation action item has been addressed for each hazard listed in the risk assessment and for each jurisdiction covered under this plan.

Each of the 11 incorporated communities within White 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. When a community was not able to provide representation at these sessions, it was contacted individually and afforded the opportunity to provide input about their specific jurisdiction and the county strategies in general. In White County, this occurred from the incorporated communities of Crossville and Maunie.

All potential strategies and goals that arose through this process are included in this plan. The county planning team used FEMA's evaluation criteria to gauge the priority of all items. A final draft of the disaster mitigation plan was presented to all members to allow for final edits and approval of the priorities.

Section 6 - Plan Maintenance

6.1 Monitoring, Evaluating, and Updating the Plan

Throughout the five year planning cycle, the Greater Wabash Regional Planning Commission will work with the White County EMA director to reconvene the MHMP planning committee to monitor, evaluate, and update the plan on an annual basis in November of each year. Additionally, a meeting will be held during November 2013 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 a declared disaster occurs 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.

The committee 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 committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified. 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 county Commissioners.

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 this updated data will be used for future risk assessments and vulnerability analyses.

6.2 Implementation through Existing Programs

The results of this plan will be incorporated into ongoing planning efforts. Many of the mitigation projects identified as part of this planning process are on-going. Where needed, modifications will be made to the county and community planning documents and ordinances as part of regular updates.

6.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the White County EMA Director and forwarded to the MHMP planning committee for discussion. Education efforts for hazard mitigation will be on-going through updates in the paper and annual public meetings.

Once adopted, a copy of this plan will be posted at Greater Wabash Regional Planning Commission, White County Sheriff's Department and all municipalities within the County.

Glossary of Terms

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

B

BFE – Base Flood Elevation

C

CAMEO – Computer-Aided Management of Emergency Operations
CEMA – County Emergency Management Agency
CEMP – Comprehensive Emergency Management Plan
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

E

EAP – Emergency Action Plan
ERPG – Emergency Response Planning Guidelines
EMA – Emergency Management Agency
EPA – Environmental Protection Agency

F

FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Maps
FIS – Flood Information Study

G

GIS – Geographic Information System

H

HAZUS-MH – **Ha**zards **US**A **M**ulti-**H**azard
HUC – Hydrologic Unit Code

I

IDNR – Illinois Department of Natural Resources
IEMA – Illinois Emergency Management Agency

M

MHMP – Multi-Hazard Mitigation Plan

N

NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NOAA – National Oceanic and Atmospheric Administration

P

PPM – Parts Per Million

R

RPI – Risk Priority Index

S

SPC – Storm Prediction Center
SWPPP – Stormwater Pollution Prevention Plan

U

USGS – United States Geological Survey

Appendix C

Adopting Resolutions

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, White County recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, White County participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the White County Commissioners hereby adopt the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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County Commissioner Chairman

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County Commissioner

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County Commissioner

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Attested by: County Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Carmi recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the City of Carmi participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of Carmi hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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City of Albion Mayor

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City Alderman

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City Alderman

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City Alderman

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City Alderman

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City Alderman

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Attested by: City Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Maunie recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Maunie participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Maunie hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Springerton recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Springerton participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Springerton hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Crossville recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Crossville participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Crossville hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Grayville recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the City of Grayville participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of Grayville hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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City Mayor

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City Council Member

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City Council Member

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City Council Member

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City Council Member

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Attested by: City Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Burnt Prairie recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Burnt Prairie participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Burnt Prairie hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Phillipstown recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Phillipstown participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Phillipstown hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Norris City recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Norris City participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Norris City hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Enfield recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Enfield participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Enfield hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk

Resolution #_____________

ADOPTING THE WHITE COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Mill Shoals recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Mill Shoals participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Mill Shoals hereby adopts the White County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the White County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____________ Day of _________________, 2009.

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Village President

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Village Council Member

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Village Council Member

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Village Council Member

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Village Council Member

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Attested by: Village Clerk