Wabash County, Illinois Multi-Hazard Mitigation Plan

2017 Countywide MHMP

FEMA

IEMA
ILLINOIS EMERGENCY MANAGEMENT AGENCY

SEAL OF THE COUNTY OF WABASH, ILLINOIS
1824

GWRPC

SIU
Southern Illinois University
CARBONDALE

Multi-Hazard Mitigation Plan

Wabash County, Illinois

Adoption Date: -- _____ --

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The Wabash County Multi-Hazard Mitigation Plan would not have been possible without the feedback, input, and expertise provided by the County leadership, citizens, staff, federal and state agencies, and volunteers. We would like to give special thank you to the citizens not mentioned below who freely gave their time and input in hopes of building a stronger, more progressive County. Wabash County gratefully acknowledges the following people for the time, energy and resources given to create the Wabash County Multi-Hazard Mitigation Plan.

Wabash County Board

Robert Dean	County Board Chairman
Robie Thompson	
Tim Hocking	

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Section 1. Introduction

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

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

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

The Wabash County Emergency Management Agency, Southern Illinois University, and Greater Wabash Regional Planning Commission have joined efforts in developing the County's first mitigation plan. This plan incorporates state-of-the art hazard analyses, addresses changes in probability and impact of specific hazards, incorporates changes in land-use, population and demographic within the county. Detailed GIS and Hazus-MH Level 2 analyses were performed for the Risk Assessment and sound mitigation strategies were established for each jurisdiction. This document hereby serves as the Wabash County 2017 Multi-Hazard Mitigation Plan.

Section 2. Planning Process

2.1 Timeline

The MHMP process is broken into a series of six meetings. These meetings are organized by SIU and hosted by the Wabash County Emergency Management Agency (EMA). At these six meetings, various tasks are completed by SIU and the Wabash County Multi-Hazard Mitigation Planning Team:

Meeting 1: The purpose of Meeting 1 was to introduce the MHMP process, discuss scheduling and milestones, and organize resources. This meeting included a discussion of roles, responsibilities, decision-making processes, administrative procedures, and communication strategies. SIU gathered local resources that contribute to the detailed county risk assessment such as critical facilities in the county, as well as assessor's data and pertinent GIS data.

Meeting 2: SIU presented the county's historical hazards. Based on this information, the Planning Team identifies natural hazards to include in the plan, and ranks hazards by potential damages and occurrences. The Planning Team also provided SIU with disaster scenarios for the county risk assessment.

Meeting 3: SIU presented the draft risk assessment, derived from the Hazus-MH and GIS modeling of the identified disasters, to the Planning Team. The general public was also invited to this meeting through a series of newspaper articles and/or radio spots. At the end of the meeting, SIU encouraged the general public to ask questions and provide input to the planning process, fulfilling one of FEMA's requirements for public input.

Meeting 4: This meeting consisted of a "brainstorming session." The Planning Team provided local knowledge to identify and prioritize mitigation strategies and projects that can address the threats identified in the risk assessment. FEMA requires the plan to contain mitigation strategies specific to each hazard and for each incorporated area within the county.

Meeting 5: The Planning Team reviewed the draft plan, proposed revisions, and accepted the plan after SIU incorporates the necessary changes. Subsequently, SIU will forwarded the county MHMP to the mitigation staff at the Illinois Emergency Management Agency (IEMA) for review prior to submitting it to FEMA.

Meeting 6: This is not a formal meeting of the Planning Team, but rather the adoption of the approved plan. Once FEMA approves the plan, the plan is returned to the county for formal adoption by the appropriate commissions and town boards.

2.2 Jurisdiction Participation Information

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

Participating Jurisdictions

Wabash County	**Mount Carmel**	**Wabash General Hospital**
Allendale	**Mount Carmel Area Economic Alliance**	**Allendale CCSD #17**
Bellmont	**Mount Carmel Public Utility Co.**	**Wabash CUSD #348**
Keensburg	**Dersch Energy, Inc.**	**Wabash Valley College**

2.3 Planning Team Information

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

Wabash County Planning Team Members

Jurisdiction	Name	Title
Wabash County	Gerald Brooks	EMA Coordinator
	Robert Dean	County Board Chairman
	Kyle Smith	9-1-1 Coordinator
	J. Derek Morgan	Wabash County Sheriff
Allendale	Tim Grounds	Village President
Keensburg	Shawn Perry	Village President
Bellmont	Shawn Berg	Public Works
Mount Carmel	Bill Hudson	Mayor
	Rudy Witsman	City Clerk/Administrator
	Aaron Brown	Firefighter
	John Lockhart	Chief of Police
Wabash General Hospital	Tamara Gould	VP of Clinical Services/Chief Nursing Officer
Allendale CCSD #17	Bob Bowser	Superintendent
Wabash CUSD #384	Steve Holt	Principal
	Sheila Odom	Principal
University of Illinois Extension	Courtney Yost	Community & Economic Development
Wabash Valley College	Matt Flower	President
	Katie Hinderliter	Administration Assistant
Mt. Carmel Public Utility Co.	Margaret Felts	President
	Eric Bramlet	Attorney
Dersch Energy	Tom Dersch	President
Mount Carmel Area Economic Alliance	Ben Ross	Executive Director

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

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

The first MHMP meeting was held in Mount Carmel, Illinois on November 20th, 2014. Representatives from SIU explained the rationale behind the MHMP process and answered questions from the participants. SIU representatives also provided an overview of GIS/Hazus-MH, described the timeline and the process of mitigation planning.

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

Planning Meetings

MEETING 1	Nov 20th, 2014
MEEING 2	March 23rd, 2015
MEETING 3	Oct 21st, 2015
MEETING 4	March 10th, 2016 April 12th, 2016
MEETING 5	*Dec 19th, 2016*

2.4 Public Involvement

The Wabash County EMA solicited public input throughout the planning process a public meeting was held on March 23, 2015 to review the county's risk assessment. The public was encouraged to recommend mitigation strategies. Appendix A contains the minutes from the public meeting. Appendix B contains press releases and/or articles sent to local newspapers throughout the MHMP development process.

2.5 Neighboring Community Involvement

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

Neighboring Community Participation

Person Participating	Neighboring Jurisdiction	Title/Organization
Ken Pryor	Crawford County	EMA Coordinator
Debbie Judge	Edwards County	EMA Coordinator
Jess Angle	Lawrence County	EMA Coordinator
Jeff Jake	Wayne County	EMA Coordinator
Jim Totten	White County	EMA Coordinator

2.6 Review of Technical Documents

The Wabash County Planning Team identified technical documents from key agencies to assist in the planning process. These documents includes land use plans, comprehensive plans, emergency response plans, municipal ordinances, and building codes. The following technical data, reports, and studies were utilized:

- Federal Emergency Management Agency
  - *Developing the Mitigation Plan (April 2003)*
  - *Mitigation Ideas (January 2003)*
  - *Local Mitigation Planning Handbook*
  - *Flood Insurance Study (Dec 2011)*
- United State Census Bureau
  - *County Profile Information*
  - *2010 Census Data*
  - *American Community Survey (2009-2013)*
- United States Department of Transportation
  - *PHMSA Hazardous Materials Incident Data*
- United States Geological Survey
  - *Earthquake Data*
- United States Army Corps of Engineers
  - *National Inventory of Dams*
  - *National Levee Database*
- NOAA National Climatic Data Center
  - *Climate Data*
- NOAA / National Water Service Storm Prediction Center
  - *Severe Weather Data*
- Illinois Emergency Management Agency
  - *2013 Illinois Natural Hazard Mitigation Plan*
  - *Hazardous Materials Incident Reports*
- Illinois Environmental Protection Agency
  - *2014 303d Listed Waters and Watershed Maps*
- Illinois State Water Survey
  - *Climate Data*
- Illinois Department of Natural Resources
  - *Repetitive Loss Data*
  - *Dam and Levee Data*
- Illinois State Geological Survey
  - *Panno, et al, 1997,* Karst Regions of Illinois
  - *Bauer, 2008,* Planned Coal Mine Subsidence in Illinois: A Public Information Booklet
- Geologic Sources
  - *Illinois Coal Association*
  - *White, 1988,* Geomorphology and hydrology of karst terrains*, Journal of Quaternary Science*
- Wabash County
  - *2013 Assessment Records*
  - *2013 Countywide GIS Parcel Database*

2.7 Adoption by Local Government

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

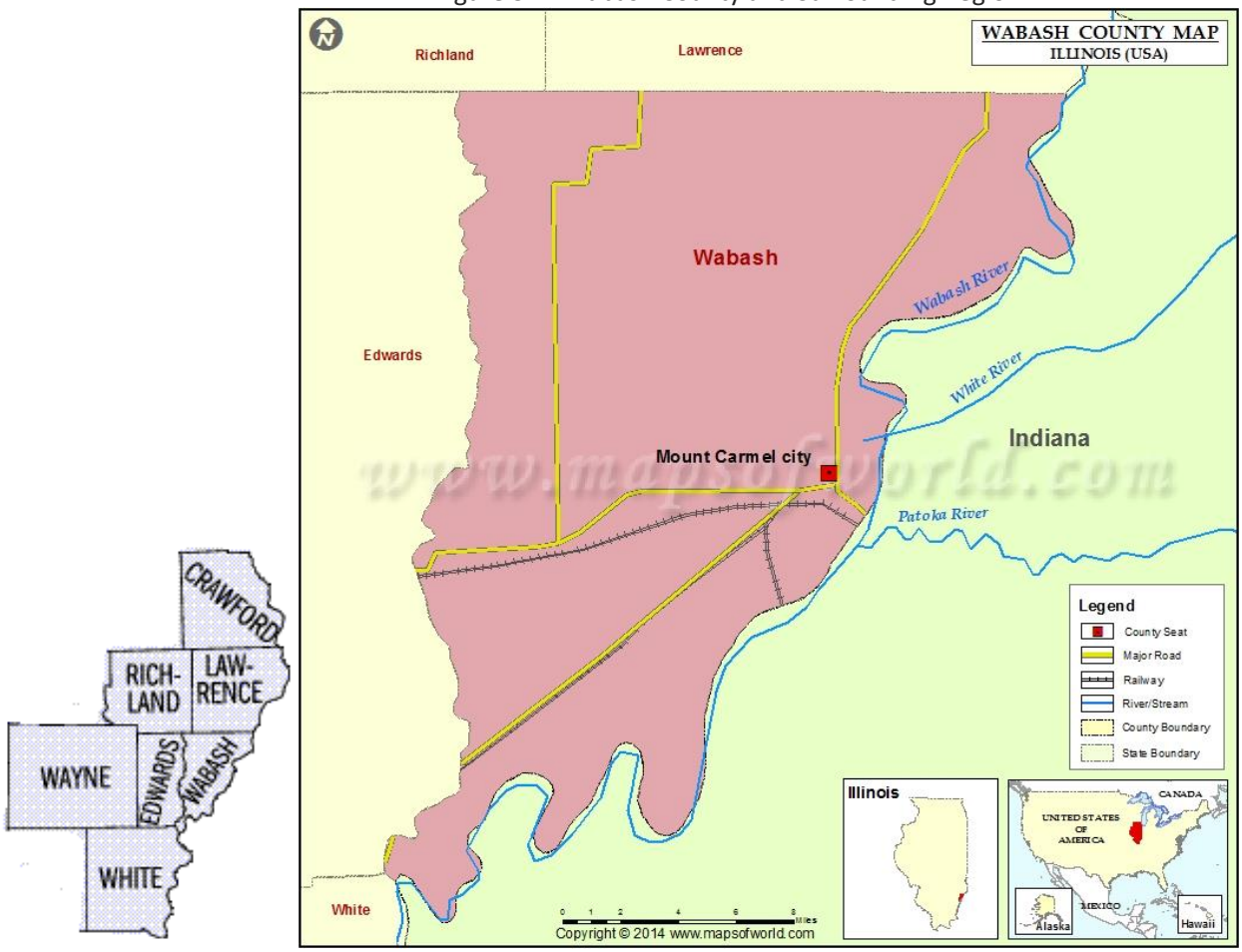
Section 3. County Profile

3.1 County Background

Wabash County is a county located in the U.S. state of Illinois. It is a small, rural area in Southeastern Illinois and is part of the seven county district that makes up the Greater Wabash region. Its county seat is Mount Carmel. Figure 3.1 shows Wabash County and the surrounding region. Wabash County was formed in 1824 out of Edwards County, to avert an armed confrontation between the militias of Albion and Mt. Carmel after the county seat was moved from a town near the current city of Mount Carmel to Albion. The County is named for the Wabash River, which forms its eastern and southern borders.

The Greater Wabash Region is located within a three to four hour commute to major metropolitan cities including Chicago, Illinois, Cincinnati, Ohio, Memphis, Tennessee, St. Louis, Missouri, and Louisville, Kentucky. Evansville, Indiana is located only 40 miles from Mt. Carmel.

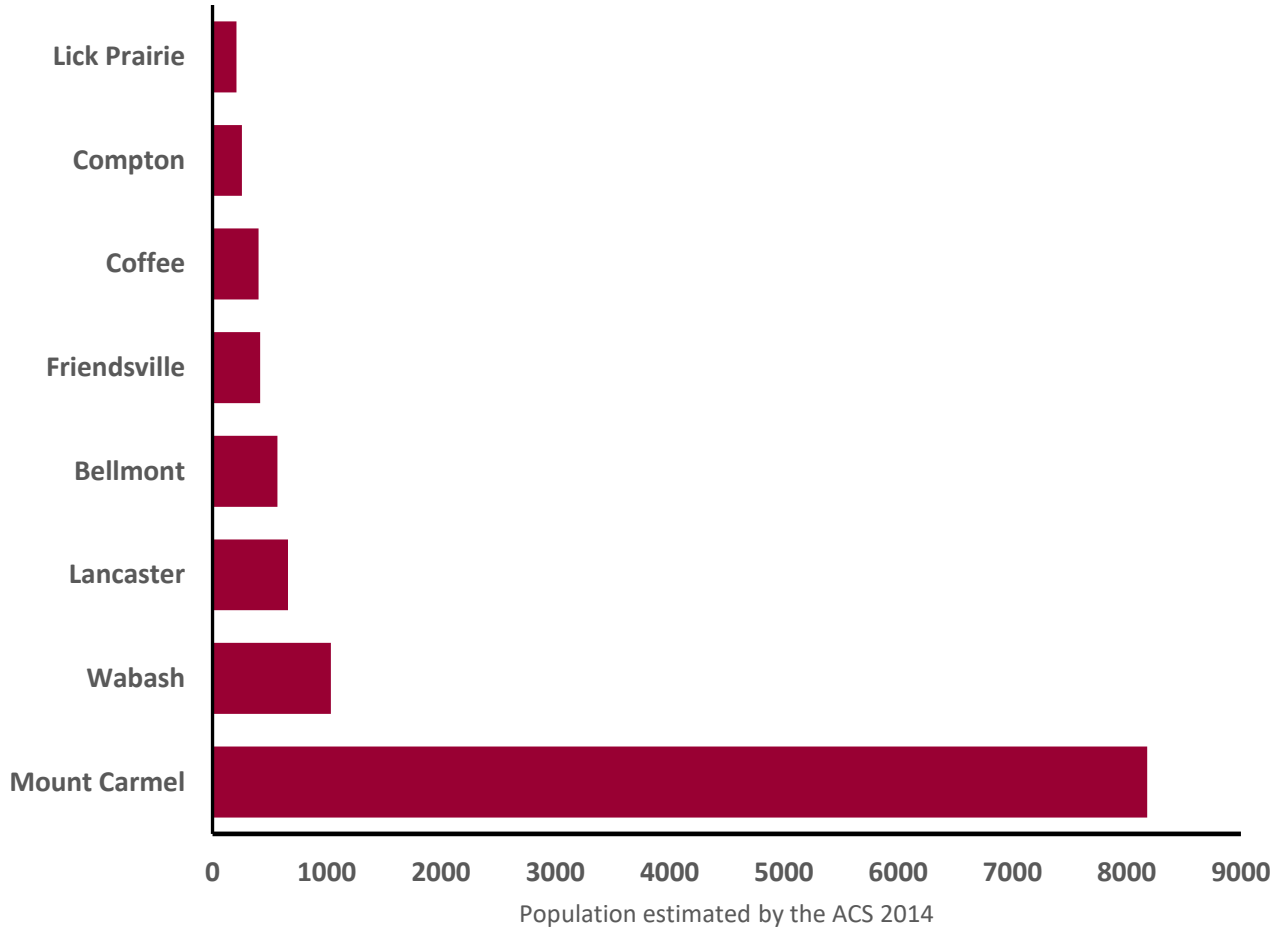
Figure 3-1. Wabash County and Surrounding Region



3.2 Demographics

According to the 2010 U.S. Census, Wabash County's population is 11,947. As of 2015, Wabash County's population estimate is 11,542, a decrease of 3.4% from 2010. According to the Wabash County/Mount Carmel Economic Development Plan 2013, the decrease in population can be attributed to a "brain drain" of young adults, a steadily decline of natural –resource industries, and retail leaving the county. The population is spread through eight precincts: Bellmont, Coffee, Compton, Friendsville, Lancaster, Lick Prairie, Mount Carmel, and Wabash (Allendale). Figure 3-2 displays the breakdown of population by township from 2010-2014 American Community Survey 5- Year Estimates.

Figure 3-2. Wabash County 2014 Population by Precinct



3.3 Economy and Industry

According to the State of Illinois Opportunity Returns, Wabash County is considered to be in the Economic Development Region of Southern Illinois. Its county seat, Mount Carmel, is a state-designated Enterprise Zone, encouraging companies to build or expand in order to create jobs and boost the economy.

The Illinois State Geological Survey has estimated that there is over eight billion tons of coal beneath the Greater Wabash region. Wabash Mine is one of the two coal operations located in Wabash County in the Illinois Basin just east of Keensburg. It has approximately 250 salaried and hourly employees. In 2007, Foundation Coal Holdings, Inc. announced plans to close the Wabash Mine, meaning a loss of over 200 jobs in the county.

Wabash County jobs have decreased by 0.43 percent due to loss of industrial jobs. The Illinois Department of Employment Security reported that in 2010 Wabash County had an unemployment rate high of 12.4% compared to 12.2% for the state of Illinois. Unemployment levels have continued to increase since 2007 and have been historically higher than the U.S. unemployment rate. Table 3.1 lists top employers and the approximate number of employees in Wabash County.

Table 3-1. Wabash County's Major Employers

Employer	Industry	Number of Employees
Wabash Mine	Mining	250
Mt. Carmel Schools	Education	250
Wabash Valley College	Education	230
Wabash County Hospital	Health Care	200
Pacific Press and Shear	Metal Forming Equipment	65
Friendsville Mine	Strip Mining	55
Cooling Systems Technology	Radiator Parts	53
Wabash Asphalt	Asphalt	30

2011 Comprehensive Economic Development Strategy

Illinois Department of Employment Security reported for 2007 that 89.1% of the workforce in Wabash County was employed in the private sector. The breakdown is included in Table 3-2. Manufacturing represents the largest sector, employing approximately 61.5% of the workforce and generating approximately 77.5% of the earnings.

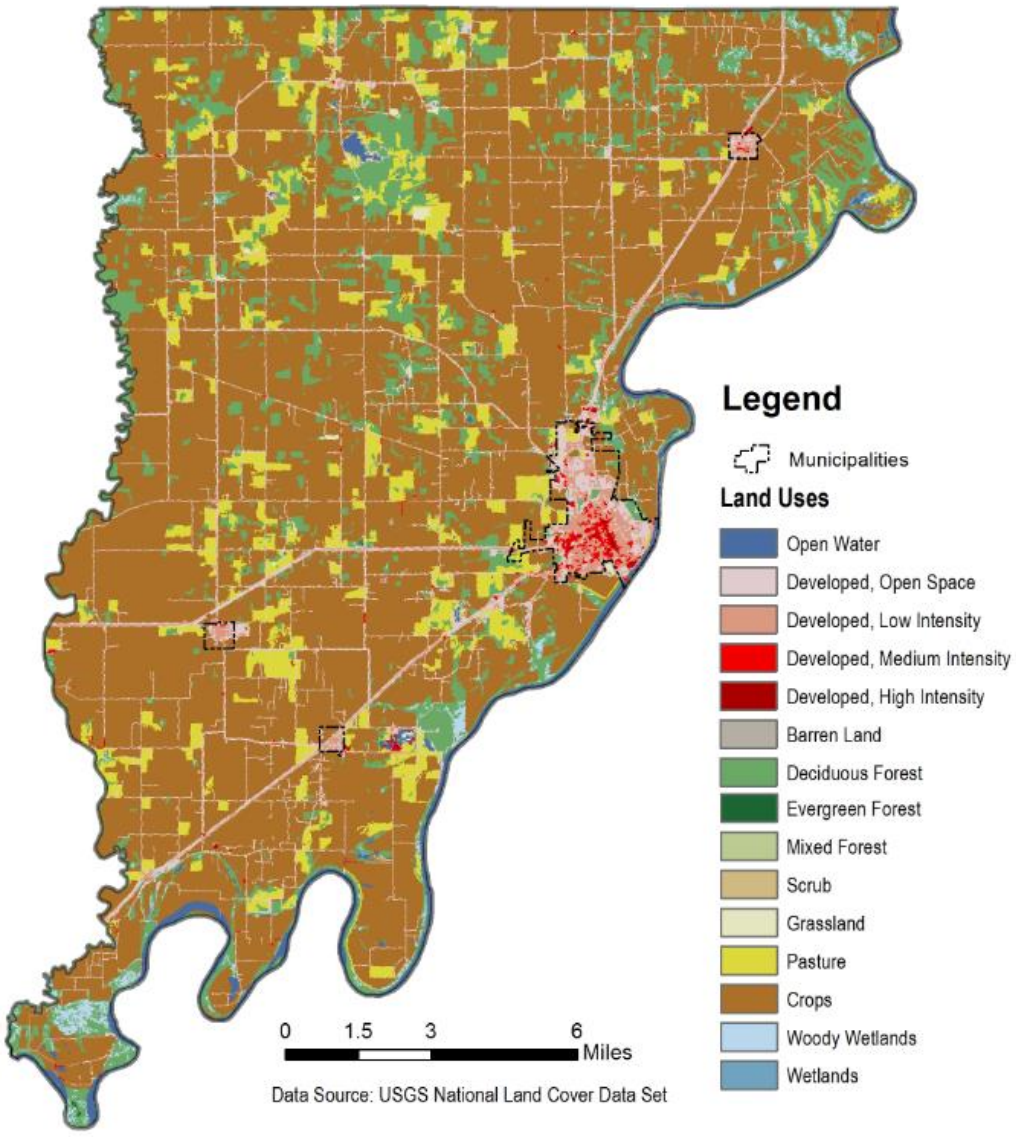
Table 3-2: Industrial Employment by Sector

Industrial Sector	**% of County Workforce (2007)**
Agriculture, forestry, fishing, hunting, and mining	1.9%
Construction	2.4%
Manufacturing	61.5%
Wholesale trade	4.9%
Retail trade	8.2%
Transportation, warehousing and utilities	1.3%
Information	6%
Finance, insurance, real estate, and rental/leasing	2.3%
Waste management services	0.002%
Educational, health, and social services	4%
Arts, entertainment, recreation, accommodation and food services	1.8%
Other services(except public administration)	1.4%
Public administration	3.5%

3.4 Land Use and Development Trends

Most of the Greater Wabash Region territory is characterized by a highly rural composition that is primarily dedicated to agricultural purposes. Corn is the mayor crop followed by soybeans, wheat and winter wheat. While the amount of agricultural use remains high, some farmland is gradually being converted to other uses such as industrial and residential land uses. Industrial parks are one of the biggest opportunities for growth within Wabash County. The opportunity for the advancement of technology and communication services offers the potential for industrial, commercial, and business development. If reopened, Wabash Mines has the potential to create jobs within the Greater Wabash Region. Figure 3.3 depicts Wabash County's land use map.

Figure 3-3. Land Use in Wabash County



Illinois Department of Agriculture 2011

3.5 Climate

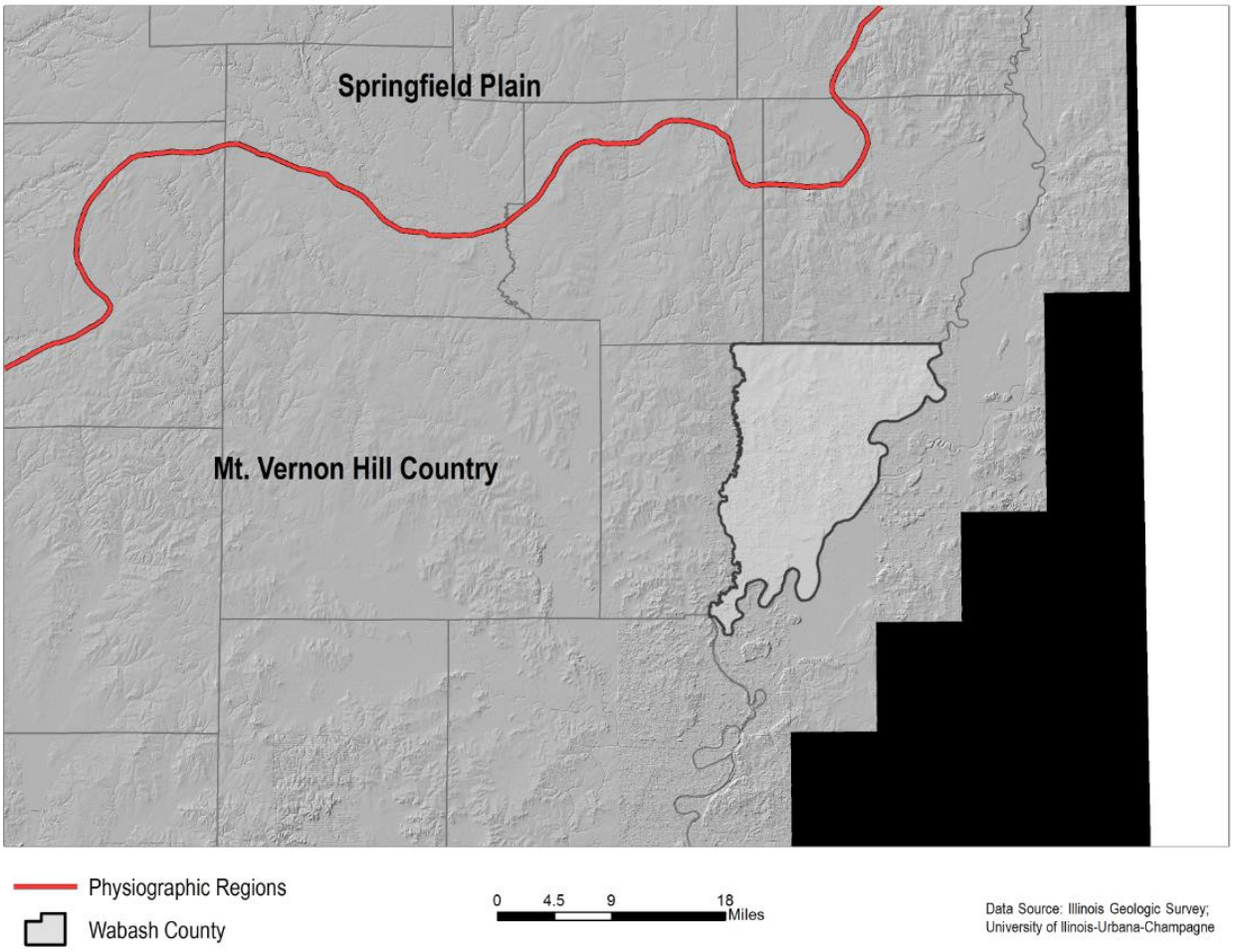
The Greater Wabash Region has four distinct seasons and a moderate climate, with average monthly temperatures ranging from 32 F to 90 F. The summers are usually typified by hot, humid weather with highs reaching the upper 90's, and moderate cold winters with night-time lows averaging in the teens. The average precipitation totals approximately 43 inches of rain and 14 inches of snow.

The Region's relatively mild climate poses no significant hindrance to economic development efforts. This factor could, in fact, allow for a much more diverse agricultural sector of the local economy. The growing season lasts about 190 to 200 total days. The average regional climate in the area is as follows: Summer- 90 degree Fahrenheit, Winter- 32 degree Fahrenheit. The area receives approximately 40 inches of rainfall and 14 inches of snow annually.

3.6 Topography

Wabash County is located in the Mount Vernon Hill Country physiographic sub-division of the Till Plains Section. Figure 3-4 depicts the terrain within Wabash County. The Mount Vernon Hill Country is characterized by low rolling hills and broad alluvial valleys along the major streams. The relief in this region is not pronounced. Upland prairies are flat to moderately hilly, and the valleys are shallow. The land surface is primarily controlled by bedrock, which has been only slightly modified by glacial drift deposits. While the southern boundary of the Mount Vernon Hill Country lies within a few miles of the limits of glaciations, moraine ridges are essentially absent in the area. Elevation in the county varies from slightly more than 550 feet above sea level to approximately 360 feet above sea level.

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



3.7 Major Lakes, Rivers, and Watersheds

The Wabash River is one of the mayor watersheds in Wabash County, IL. A 503-mile-long river in the Midwestern United States that flows southwest from near the Indiana border in northwest Ohio, across northern and central Indiana to southern Illinois, where it forms the Illinois-Indiana border before draining into the Ohio River, of which it is the largest northern tributary.

The Wabash River flows down the eastern boundaries of Crawford, Lawrence, Wabash, and White Counties. The Wabash River and its local tributaries drain the vast majority of all seven counties making it the most important water resource in the Greater Wabash Region and most susceptible to flooding. Wabash County has only one substantial lake, Mesa Lake.

Figure 3-5. Major drainage basins in Wabash County

Section 4. Risk Assessment

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

4.1 Hazard Identification

4.1.1 Existing Plans

The Planning Team identified technical documents from key agencies to assist in the identification of potential hazards. Several other documents were used to profile historical hazards and guide the Planning Team during the hazard ranking exercise. Section 2.6 contains a complete list of the technical documents utilized to develop this plan.

4.1.2 National Hazard Records

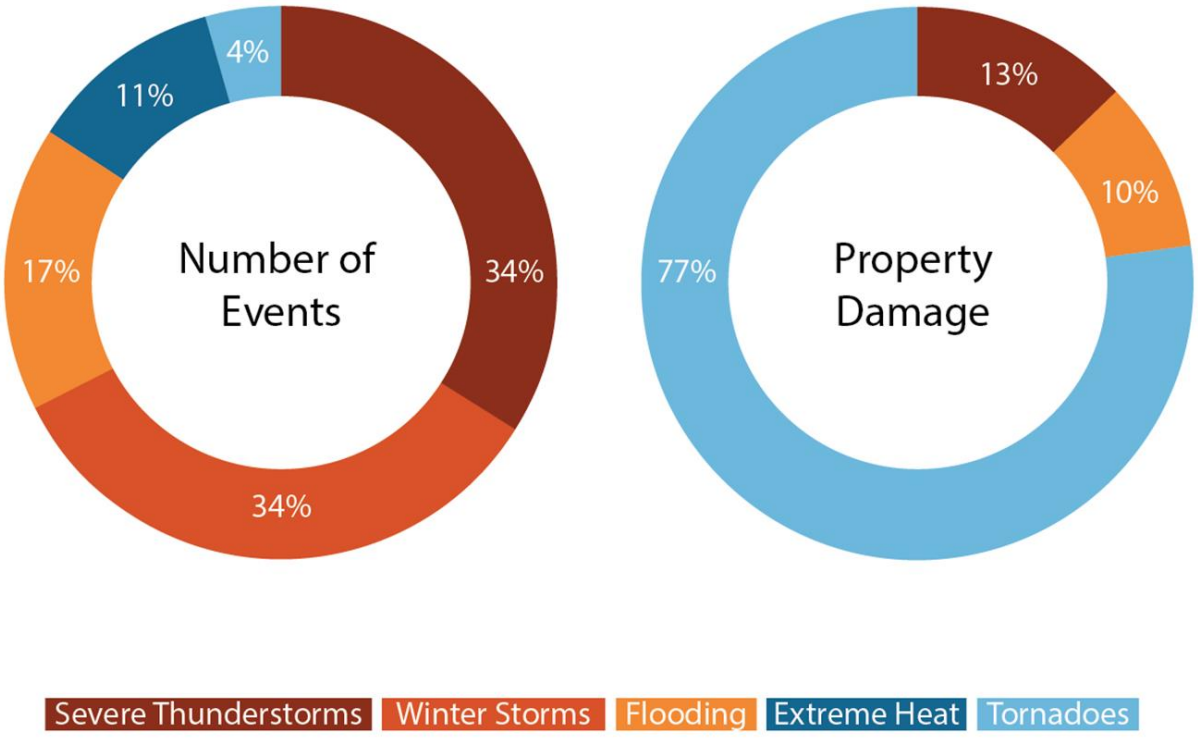
To assist the Planning Team, historical storm event data from the National Climatic Data Center (NCDC) was complied. NCDC records are estimates of damages reported to the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature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

The NCDC database included 465 reported meteorological events in Wabash County from 1950-2014 (the most updated information as of the date of this plan). The following hazard-profile sections each include a summary table of events related to each hazard type. Table 4-1 summarizes the meteorological hazards reported for Wabash County. Figure 4-1 summarize the relative frequency of NCDC reported meteorological hazards and the percent of total damage associated with each hazard for Wabash County. Full details of individual hazard events are on the NCDC website. In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail was mapped using SPC-recorded latitudes and longitudes. Appendix D includes a map of these events.

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

Hazards	Time Period		Number of Events	Property Damage	Deaths	Injuries
	Start	End				
Flooding	1996	2014	77	$1,028,000	0	0
Severe Thunderstorms	1973	2014	158	$1,453,000	0	4
Tornadoes	1958	2014	20	$8,259,000	0	51
Winter Storms	1996	2014	157	$50,000	0	0
Extreme Heat	1997	2013	53	$0	0	3

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



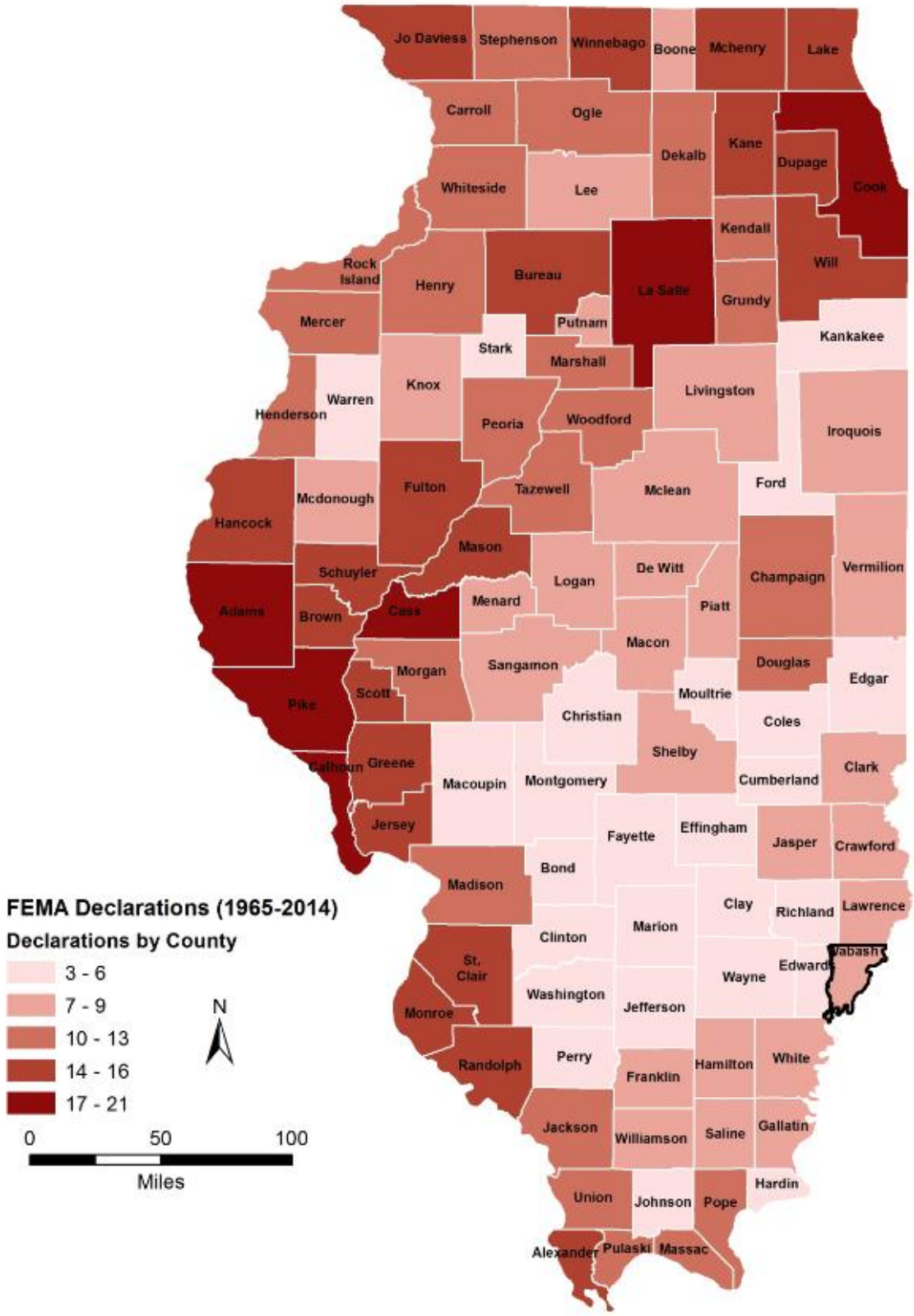
4.1.3 FEMA Disaster Information

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

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

Declaration Number	Date of Declaration	Description
819	01/13/1989	Severe Storms and Tornadoes
871	6/22/1990	Severe Storms, Tornadoes and Flooding
1112	5/6/1996	Severe Storms and Flooding
1416	5/21/2002	Severe Storms, Tornadoes and Flooding
3199	2/1/2005	Record/Near Record Snow
3230	9/7/2005	Hurricane Katrina Evacuation
1991	6/7/2011	Severe Storms and Flooding
4157	11/26/2013	Severe Storms, Straight-line Winds, and Tornadoes

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



4.1.4 Hazard Ranking Methodology

Based on Planning Team input, national datasets, and existing plans, the Wabash County Planning Team developed and ranked a list of hazards. These hazards ranked the highest based on the Risk Priority Index discussed in Section 4.1.5. It should be noted that Wildfire has been omitted from the plan and was not a natural hazard identified by Wabash County or participating jurisdictions during the risk assessment process.

Wabash County Hazard List

TORNADOES

DAM/ LEVEE FAILURE

EARTHQUAKES

SEVERE THUNDERSTORMS

HAZARDOUS MATERIALS RELEASE

FLOODING

WINTER STORMS

GROUND FAILURE

DROUGHT/ EXTREME HEAT

4.1.5 Risk Priority Index

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

Table 4-3. Hazard Probability Ranking

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

Table 4-4. Hazard Severity Ranking

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

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

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

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Tornadoes	4	4	16	1
Dam/Levee Failure	2	8	16	2
Earthquakes	2	6	12	3
Severe Thunderstorms	4	2	8	4
Hazardous Materials Release	3	3	9	5
Flooding	4	2	8	6
Winter Storms	4	2	8	7
Ground Failure	1	2	2	8
Drought/ Extreme Heat	2	1	2	9

4.1.6 Jurisdictional Hazard Ranking

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

Table 4-6. Hazard Ranking by Jurisdiction

Jurisdiction	Tornadoes	Dam/Levee Failure	Earthquakes	Severe Storms	HAZMAT	Flooding	Winter Storms	Ground Failure	Heat / Drought
Wabash County	1	2	3	4	5	6	7	8	9
Allendale	1	-	4	3	5	-	2	-	-
Bellmont	1	-	-	2	-	-	3	-	-
Keensburg	1	1	3	5	4	5	7	8	-
Mount Carmel	1	2	3	4	5	6	7	8	-
Allendale CCSD 17	1	-	2	3	-	5	4	-	6

Jurisdiction	Tornadoes	Dam/Levee Failure	Earthquakes	Severe Storms	HAZMAT	Flooding	Winter Storms	Ground Failure	Heat / Drought
Wabash CUSD 348	1	-	2	-	3	-	-	-	-
Wabash Valley College	1	2	3	4	5	6	7	8	-
Mt. Carmel Public Utility Co.	2	1	3	4	6	7	5	8	-
Wabash General Hospital	1	6	3	2	-	5	4	-	7
Dersch Energies, Inc.	1	2	3	4	5	6	7	8	-

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Processes and Sources for Identifying Assets

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

Essential Facilities List

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

Table 4-7. Wabash County's Essential Facilities

Facility	Number of Facilities
EOC	1
Fire Stations	5
Police Stations	1
Medical Care	1
Schools	7

Facility Replacement Costs

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

Table 4-8. Wabash County's Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure
Residential	4,661	$313,425,900
Agriculture	307	$11,573,745
Commercial	571	$3,731,859,165
Industrial	52	$199,314,675
Total:	**5,591**	**$4,256,173,485**

Future Development

Wabash County is expected to see a modest increase in population due to the expansion of existing distribution centers, light industry, and the creation of new opportunities in the service industry such as retail stores, restaurants, and hotels. Most of this expansion is expected to take place within the city limits of Mount Carmel within close proximity to transportation corridors such as State Routes 1 and 15 (see section 3.4 Land Use and Development Trends).

4.3 Risk Analysis

4.3.1 GIS and Hazus-MH

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

Updates to the default Hazus-MH data include:

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

The following assumptions were made during analysis:

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

Depending upon the analysis options and the quality of data the user inputs, Hazus-MH generates a combination of site-specific and aggregated loss estimates. Hazus-MH is not intended as a substitute for detailed engineering studies; it is intended to serve as a planning aid for communities interested in

assessing their risk to flood-, earthquake-, and hurricane-related hazards. This plan does not fully document the processes and procedures completed in its development, but this documentation is available upon request. Table 4-9 indicates the analysis type (i.e. GIS, Hazus-MH, or historical records) used for each hazard assessment.

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

Hazard	Risk Assessment Tool(s)
Tornadoes	GIS-based
Levee Failure	Historical Records
Earthquakes	Hazus-MH
Severe Thunderstorm	Historical Records
Hazmat Release	GIS-based
Flooding	Hazus-MH
Winter Storms	Historical Records
Ground Failure	GIS-Based

4.3.2 Tornado Hazard

Hazard Definition

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

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

Tornadoes are classified according to the Enhanced Fujita tornado intensity scale. The Enhanced Fujita scale ranges from intensity EF0, with effective wind speeds of 40 to 70 miles per hour, to EF5 tornadoes, with effective wind speeds of over 260 miles per hour. Table 4-10 outlines the Enhanced Fujita intensity scale.

Table 4-10. Enhanced Fujita Tornado Rating

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

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

Previous Occurrences of Tornadoes

There have been several occurrences of tornadoes in Wabash County during recent decades. The National Climatic Data Center (NCDC) database reported twenty tornadoes/funnel clouds in Wabash County since 1950. Table 4-11 identifies NCDC-recorded tornadoes that caused damage, death, or injury in Wabash County. Additional details of individual hazard events are on the NCDC website.

The most damaging tornado event occurred in January 7th, 1989 when a strong F4 tornado touched down in Wabash County near Allendale. Fifty people were injured and the grade school was destroyed. Damage to Allendale was approximately $27.5 million.

Table 4-11. NCDC-Recorded Tornadoes That Caused Damage, Death, or Injury in Wabash County

Location or County*	Date	Scale	Deaths	Injuries	Property Damage
Wabash County	7/11/1958	F2	0	0	$25,000
Wabash County	4/19/1963	F2	0	0	$250,000
Wabash County	5/6/1971	F1	0	0	$25,000
Allendale	1/7/1989	F4	0	50	$27,500,000
Wabash County	6/2/1990	F4	0	0	$2,500,000
Mount Carmel	8/16/1993	F1	0	0	$50,000
Mount Carmel	5/18/1995	F1	0	0	$50,000
Allendale	5/3/1998	F0	0	0	$20,000
Patton	6/12/1998	F0	0	0	$2,000
Wabash County	10/26/2010	EF0	0	0	$12,000
Wabash County	4/19/2011	EF1	0	0	$2,100,000
Wabash County	11/17/2013	EF2	0	1	$250,000
		Total:	**0**	**51**	**$32,784,000**

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

Geographic Location for Tornado Hazard

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

Hazard Extent for Tornado Hazard

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

Risk Identification for Tornado Hazard

Based on historical information, the probability of future tornadoes in Wabash County is likely. The County should expect tornadoes with varying magnitudes to occur in the future. Although historical information equates a 31% chance of occurrence in any given year for a tornado event in Wabash County, input from the Planning Team suggests tornadoes in this area of great magnitude and severity of damage and loss is a highly likely event. According to the Risk Priority Index (RPI) and County input, tornadoes are ranked as the number one hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	4	=	16

Vulnerability Analysis for Tornado Hazard

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

Critical Facilities

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

Building Inventory

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

Infrastructure

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

or gas to community), and railway failure from broken or impassable rail lines. Bridges could fail or become impassable, causing risk to motorists.

GIS-based Tornado Analysis

One tornado scenario was conducted for Wabash County through Mount Carmel. The following analysis quantifies the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure damaged.

GIS-overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used a hypothetical path based upon the F4 tornado event that runs for 4 miles through Mount Carmel. Table 4-12 depicts tornado damage curves and path widths utilized for the modeled scenarios. The damage curve is based on conceptual wind speeds, path winds, and path lengths from the Enhanced-Fujita Scale guidelines.

Table 4-12. Tornado Path Widths and Damage Curves

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

Degrees of damage depend on proximity to the path centerline within a given tornado path. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. To model the EF4 tornado, a tornado path was created in GIS with buffers added (damage zones) around the tornado paths. Table 4-13 and Figure 4-3 illustrate the zone analysis. Figure 4-4 depicts the selected hypothetical tornado paths.

Table 4-13. EF4 Tornado Zones and Damage Curves

Zone	Buffer (feet)	EF4 Damage Curve
1	0-150	100%
2	150-300	80%
3	300-600	50%
4	600-900	10%

Figure 4-3. EF4 Tornado Analysis (Damage Curves) Using GIS Buffers

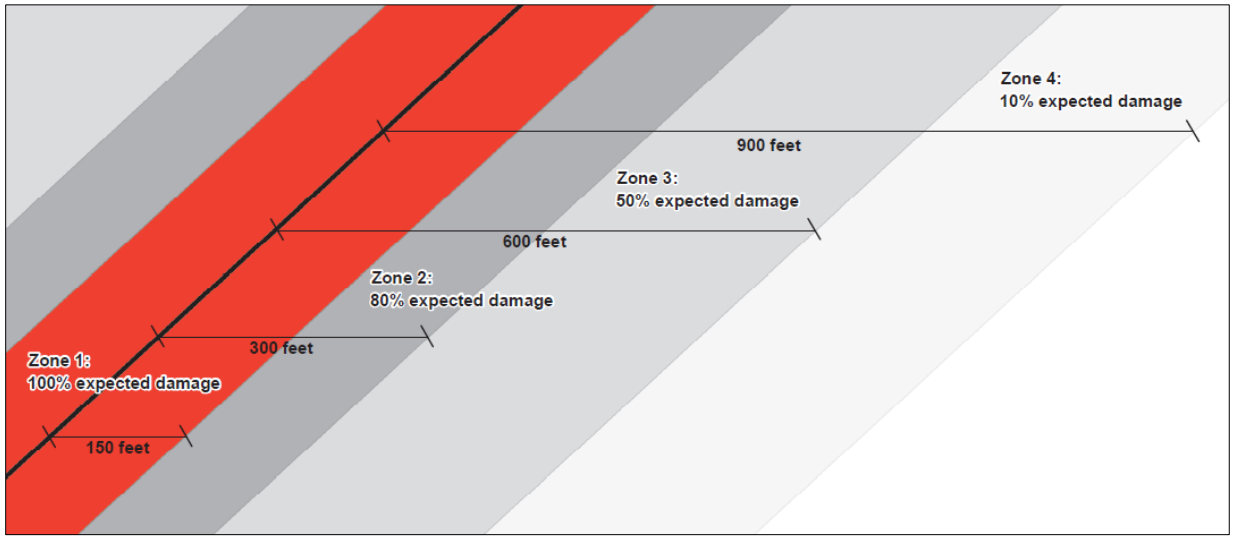
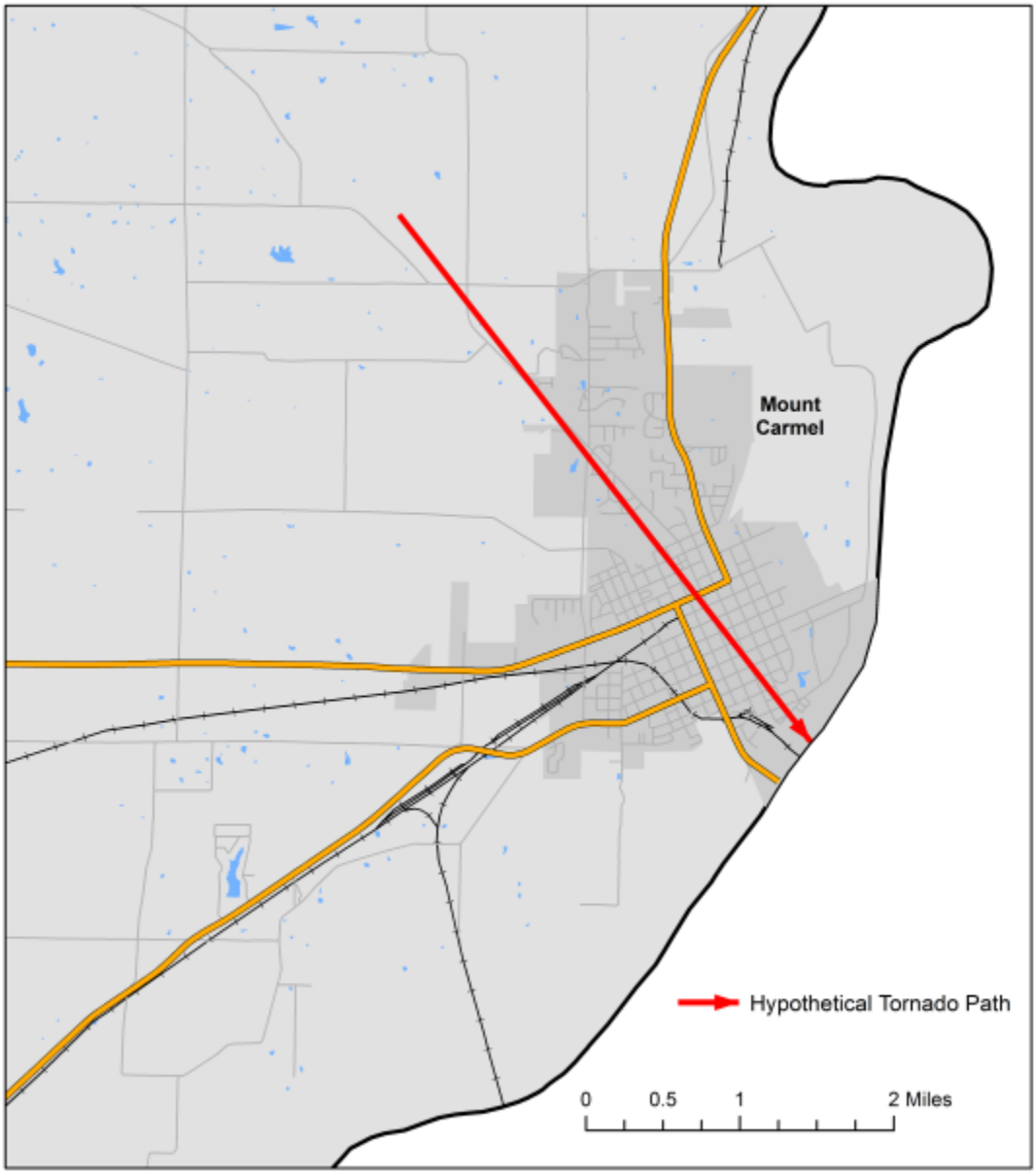


Figure 4-4. Modeled Tornado Track for Wabash County



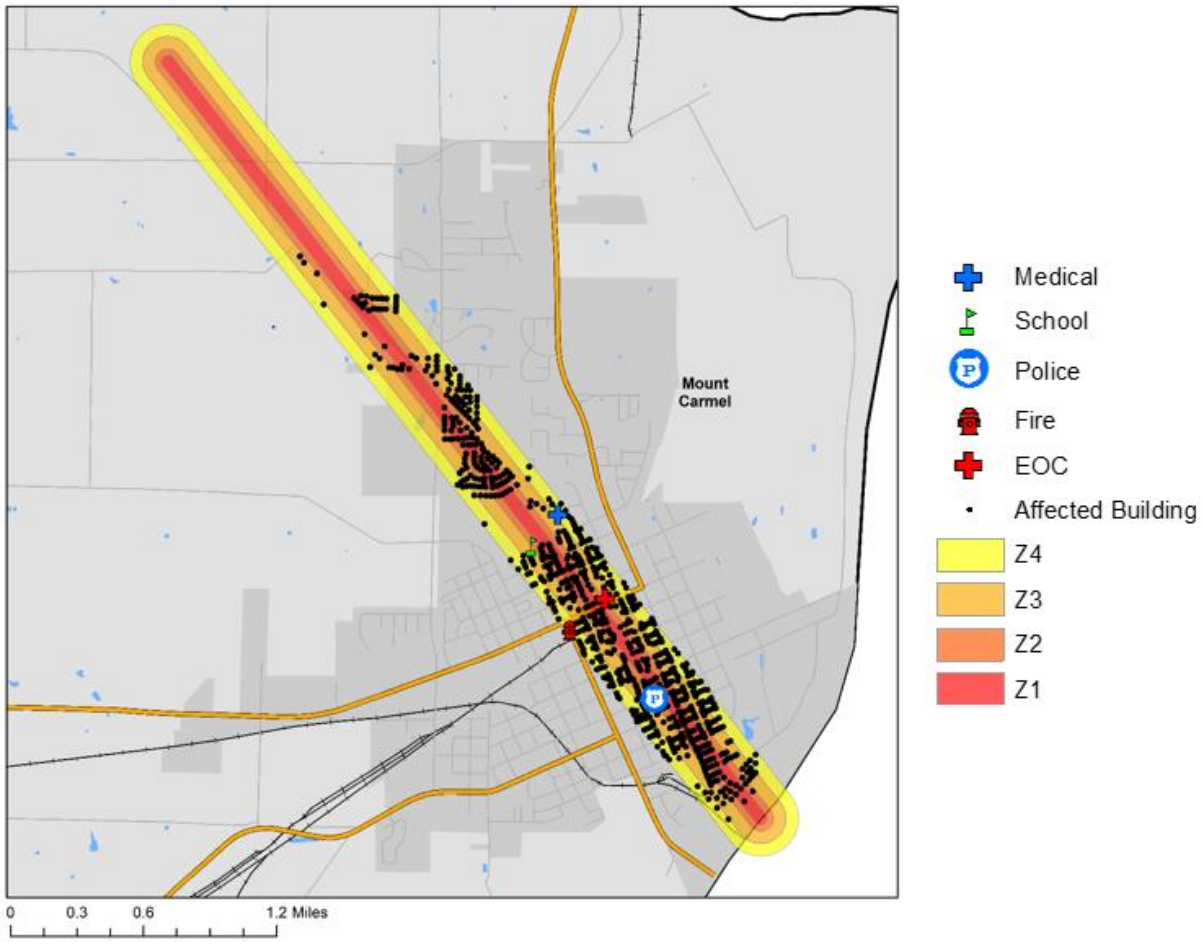
Modeled Impacts of the EF4 Tornado

The GIS analysis estimates that the modeled EF4 tornado would damage 952 buildings. The estimated building losses are $1.1 billion. The building losses are an estimate of building replacement costs multiplied by the damage percent. Table 4-14 and Figure 4-5 show the results of the EF4 tornado analysis.

Table 4-14. Estimated Building Loss by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$12,790,800	$9,526,986	$12,064,399	$2,162,210
Agriculture	$0	$0	$23,790	$96
Commercial	$497,560,980	$267,234,456	$199,591,515	$66,079,614
Industrial	$0	$0	$0	$0
Total:	**$510,351,780**	**$276,761,442**	**$211,679,704**	**$68,241,920**

Figure 4-5. Building Inventory Affected by the EF4 Tornado



Essential Facilities Damage

There are eight essential facility located within 900 feet of the F4 tornado path. The affected facilities are identified in Table 4-15, and their geographic locations are shown in Figure 4-6.

Table 4-15. Essential Facilities Affected by the EF4 Tornado

Essential Facility	Facility Name
Medical	Wabash General Hospital
EOC	Wabash County Civil Defense
Fire Station	Mount Carmel Fire Dept.
Police Station	Wabash County Sheriff
School	North Intermediate Center of Education
	Mount Carmel High School
	St. Mary's Catholic School
	Wabash Valley College

Vulnerability to Future Assets/Infrastructure for Tornado Hazard

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

Suggestions for Community Development Trends

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

4.3.3 Dam and Levee Failure

Hazard Definition for Dam and Levee Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, creating the potential for failure. The same potential exists for levees when they serve their purpose, which is to confine flood waters within the channel area of a river and exclude that water from land or communities land-ward of the levee. Dams and levees can fail due to either: 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a 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 levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. 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 can fail due to structural deficiencies. 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 levee failure may require substantial commitment of time, personnel, and resources. Since levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Previous Occurrences of Dam and Levee Failure

According to Wabash County historical records, there are no records or local knowledge of certified levee failure in the county. Neighboring Lawrence County has had levee failures in the past, but topography of Wabash County's border with Indiana favors flooding on the Indiana side of the Wabash River. Note in Figure 4-7 the large swaths of red on the east side of the river that are affected by levee failure compared to the smaller sections on the Illinois side of the river. Further protection of Wabash County comes from the fact that the levees and topography of the Indiana side are generally lower in elevation, resulting in the flooding of Gibson County, Indiana relieving the rising waters.

Geographic Location of Levees in Wabash County

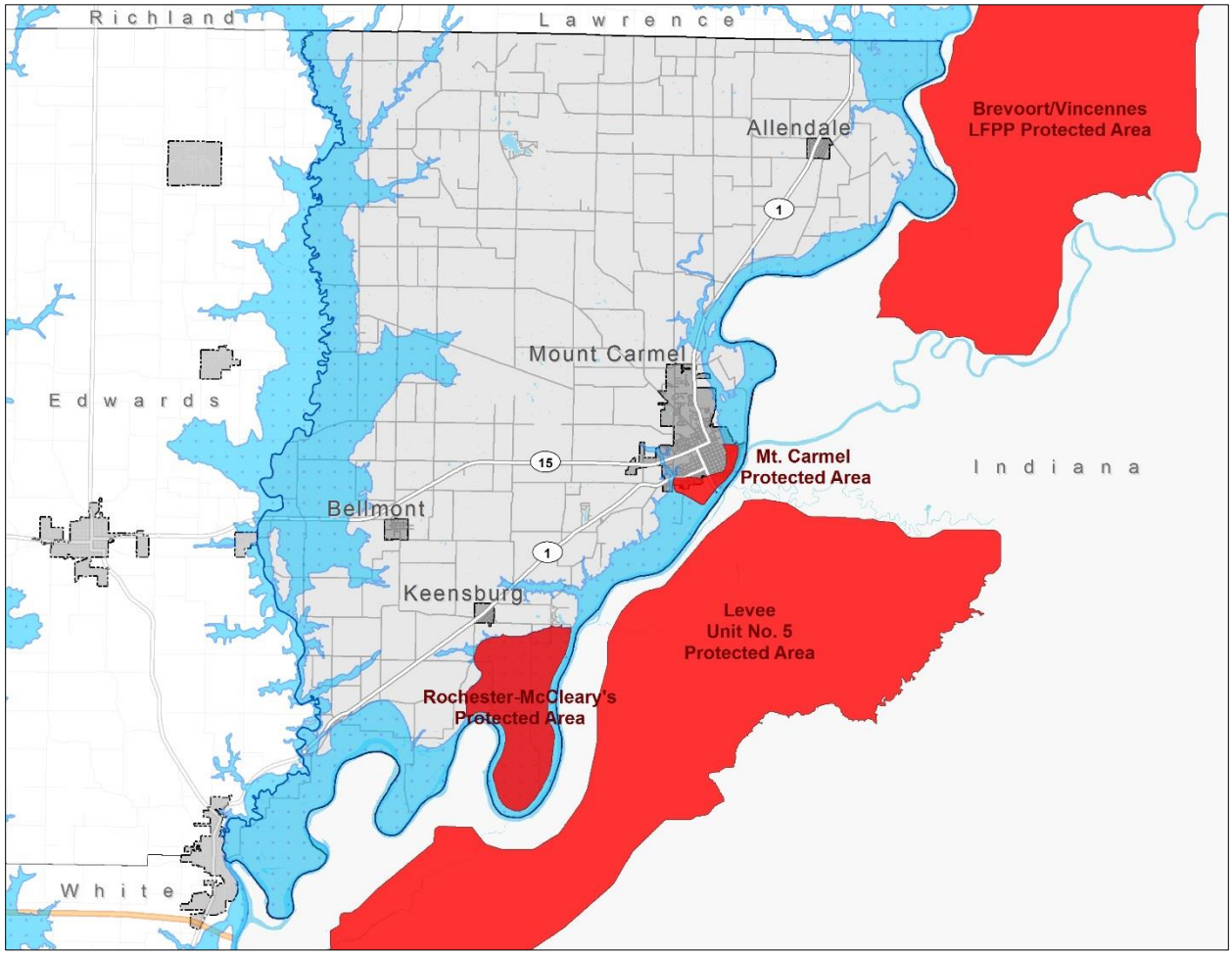
A review of the US Army Corps of Engineers National Levee Database and IDNR records revealed two levee systems within Wabash County and two levee systems within close proximity to Wabash County in the State of Indiana. Table 4-16a list of the levees located in Wabash County and their respective U.S. Army Corps of Engineers (USACE) levee system inspection rating. The approximate location of the levee systems are shown in Figure 4-7.

Table 4-16a. Wabash County Levee Inventory

Levee System	Levees District	Length (miles)	Protection Levee	USACE Levee System Inspection Rating*
Mount Carmel Levee System	Mount Carmel Levee	3.03	100-year	Minimally Acceptable
Rochester-McCleary's Bluff Levee System	Rochester-McCleary's Bluff Levee Segment	8.94	15-year	Minimally Acceptable
Levee Unit No. 5 System	Levee Unit No. 5	41.73	15-year	Minimally Acceptable
Brevoort /Vincennes Levee System	Brevoort Levee	37	15-year	Minimally Acceptable
	Vincennes Levee	1.77	100-year	

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

Figure 4-7. Approximate Location of the Levee Systems within Wabash County



The U.S. Army Corps of Engineers maintains the National Inventory of Dams (NID) which identified three dams in Wabash County. According to NID records, zero of the dams in Wabash County are classified as high hazard and zero dams have Emergency Action Plans (EAP). Table 4-16b lists the dams located in Wabash County and their respective classification level.

Table 4-16b. Wabash County Dam Inventory

Dam Name	Stream/River	Hazard Rating	EAP
Fish Lake Dam	Trib. Jordan Creek	Significant	No
Mesa Lake Dam	Trib. Jordan Creek	Significant	No
Wabash Valley Club Conservation Lake Dam	Sugar Creek	Low	No

Hazard Extent for Dam and Levee Failure

The USACE performs both routine and periodic inspections of levee systems. The final inspection rating is based on a levee inspection checklist, which includes 125 specific items dealing with the operation and maintenance of levee embankments, floodwalls, interior draining, pump stations, and channels. Each levee segments receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. If a levee system comprises one or more levee segments (if there are different levee sponsors for different parts of the levee) then the overall levee system rating is the lowest of the segment

ratings. A levee sponsor must maintain the levee to at least the Minimally Acceptable standard to remain eligible for federal rehabilitation assistance through the USACE Rehabilitation and Inspection Program (PL 84-99).

According to USACE records, the four levee systems in or within close proximity to Wabash County have a minimally acceptable rating. According to this rating, one or more inspection items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable inspection items would not prevent the segment/system from performing as intended during the next flood event.

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

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

Risk Identification for Dam and Levee Failure

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

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	8	=	16

Vulnerability Analysis for Dam and Levee Failure

An Emergency Action Plan (EAP) is required to assess the effect of dam failure on these communities. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the 1% annual probability flood.

Because all floodplains are susceptible to flooding in Wabash County; therefore, the population and all buildings located within the floodplain are vulnerable to dam and levee failure. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable. Failure of dams and levees in the planning area would result in those floodplains adjacent to or downstream of the river to

have the greatest impact. For example, if Mesa Lake Dam (located outside the Village of Lancaster) were to fail there would be an impact to those downstream on Jordan Lake and in Lancaster especially if it were to fail during a significant flood event where the 100 or 500 year floodplain is already inundated.

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

Critical Facilities

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

Building Inventory

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

Infrastructure

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

Hazus-MH Flood Analysis

See Section 4.3.7 Flooding Hazard for the results of the Hazus-MH Flood Analysis.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

Flooding as a result of dam and levee failure may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable. Table 4-8 includes the building exposure for Wabash County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Wabash County and Appendix F displays a large format map of the locations of all critical facilities within the county.

Suggestions for Community Development Trends

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

4.3.4 Earthquake Hazard

Hazard Definition

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

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

Earthquakes are usually measured by two criteria: intensity and magnitude (M). Earthquake intensity qualitatively measures the strength of shaking produced by an earthquake at a certain location and is determined from effects on people, structures, and the natural environment. Earthquake magnitude quantitatively measures the energy released at the earthquake's subsurface source in the crust, or epicenter. Table 4-17 provides a comparison of magnitude and intensity, and Table 4-18 provides qualitative descriptions of intensity, for a sense of what a given magnitude might feel like.

Table 4-17. Comparison of Earthquake Magnitude and Intensity

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

Table 4-18. Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

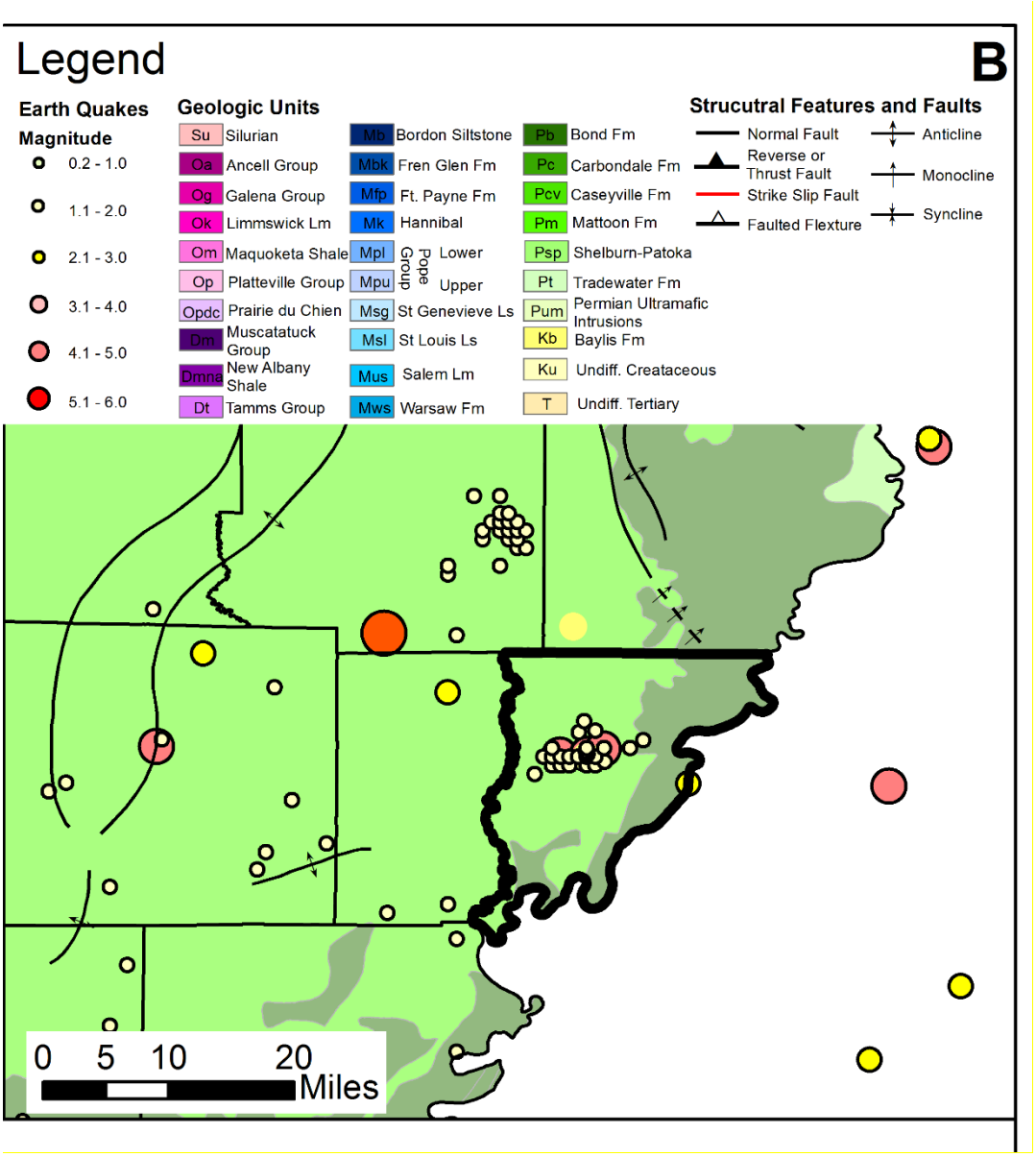
Mercalli Intensity	Description
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Previous Occurrences for Earthquakes

Historically, the most significant seismic activity in Illinois is associated with New Madrid Seismic Zone. The New Madrid Seismic Zone produced three large earthquakes in the central U.S. with magnitudes estimated between 7.0 and 7.7 on December 16, 1811, January 23, 1812, and February 7, 1812. These earthquakes caused violent ground cracking and volcano-like eruptions of sediment (sand blows) over an area >10,500 km^2, and uplifted a 50 km by 23 km zone (the Lake County uplift). The shaking was felt over a total area of over 10 million km^2 (the largest felt area of any historic earthquake). The United States Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimate the probability of a repeat of the 1811-1812 type earthquakes (M7.5-8.0) is 7%-10% over the next 50 years (USGS Fact Sheet 2006-3125).

Earthquakes measured in Illinois typically vary in magnitude from microseismic events of M=1-3 to larger events up to M=5.4. Figure 4-8 depicts the following: (A) location of notable earthquakes in Illinois region; (B) generalized geologic bedrock map with earthquake epicenters and geologic structures; (C) geologic and earthquake epicenter map of Wabash County. The most recent earthquake larger than M3 in Illinois—as of the date of this report—was a M3.4 event in May 2015, approximately 9 km north of Fairfield, Illinois in Wayne County. The last earthquake in Illinois to cause minor damage occurred on April 18, 2008 near Mt. Carmel, IL and measured 5.2 in magnitude. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years and are historically concentrated in southern Illinois.

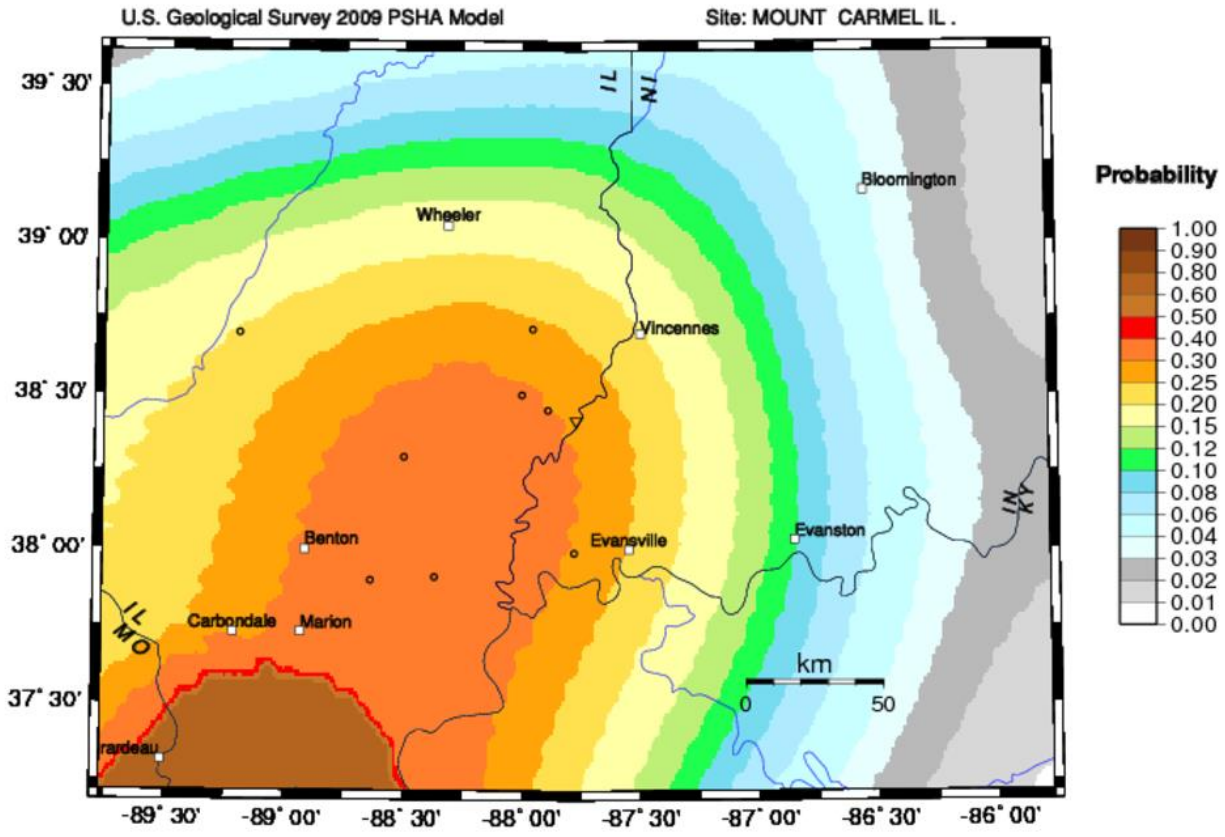
Figure 4-8. Notable Earthquakes in Illinois with Geologic and Earthquake Epicenters in Wabash County



Geographic Location for Earthquake Hazard

Wabash County is situated in a region susceptible to earthquakes. Since 1974, the epicenters of twenty-one earthquakes (M1.6-M5.4) have been recorded in Wabash County (see Figure 4-8(C)). Some of this local seismic activity has been focused along the Wabash Valley Fault System, which is one most significant zones of seismic activity in Illinois. The Wabash Valley Fault System extends nearly the entire length of southern Illinois and has the potential to generate an earthquake of sufficient strength to cause damage between St. Louis, MO and Indianapolis, IN. While large earthquakes (>M7.0) experienced during the New Madrid Events of 1811 and 1812 are unlikely in Wabash County, moderate earthquakes (≤ 6.0M) in, or in the vicinity of, Wabash County are probable. The USGS estimates the probability of a moderate M5.5 earthquake occurring in Wabash County within the next 500-years at approximately 30-40% (see Figure 4-9).

Figure 4-9. Probability of M5.5 Earthquake occurring in Wabash County within the next 500 years



Hazard Extent for Earthquake Hazard

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

Risk Identification for Earthquake Hazard

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

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	6	=	12

Vulnerability Analysis for Earthquake Hazard

Earthquakes could impact the entire county equally; therefore, the entire county's population and all buildings are vulnerable to an earthquake. To accommodate this risk, this plan considers all buildings

located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Wabash County.

Critical Facilities

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

Building Inventory

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

Infrastructure

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

Hazus-MH Earthquake Analyses

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

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

The earthquake hazard modeling scenarios performed:

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

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

Results for M5.5 Earthquake Scenario

The results of the M5.5 probabilistic earthquake scenario are depicted in Tables 4-19, 4-20, and Figure 4-10. Hazus-MH estimates that approximately 457 buildings will be at least moderately damaged. This is over 8.0% of the total number of buildings in the Wabash County. It is estimated that 10 buildings would be damaged beyond repair.

The total building related losses are approximately $32.24 million dollars. It is estimated that 15% of the losses are related to the business interruption of the region. By far, the largest loss is sustained by the residential occupancies which make up over 62% of the total loss.

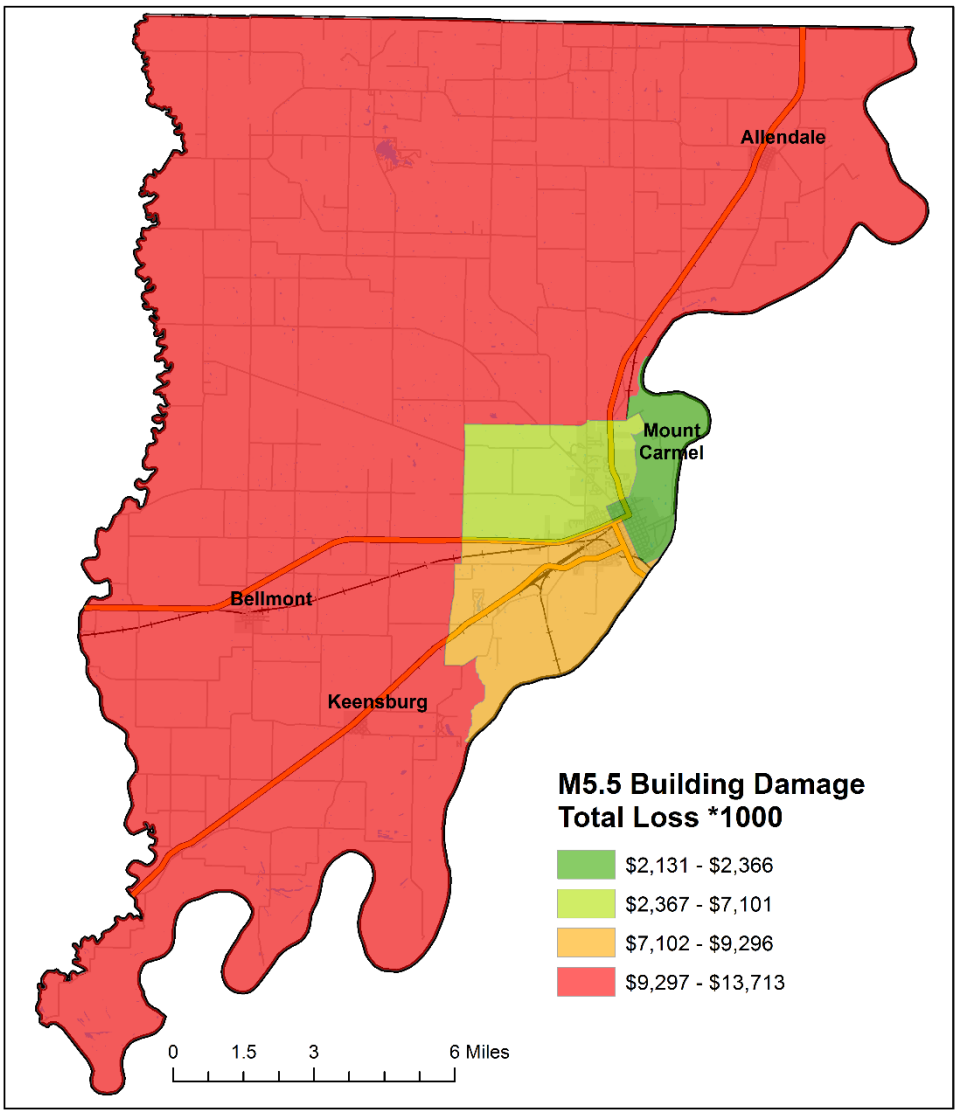
Table 4-19. M5.5 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	27	0.59	8	1.00	6	1.68	2	2.50	0	1.88
Commercial	248	5.46	48	6.31	28	7.60	8	9.69	1	8.31
Educational	12	0.27	2	0.28	1	0.35	0	0.39	0	0.48
Government	15	0.33	3	0.36	2	0.48	0	0.49	0	0.62
Industrial	59	1.30	14	1.82	11	2.88	3	4.08	0	2.75
Other Residential	454	9.99	149	19.46	135	36.72	23	29.74	2	18.91
Religion	47	1.03	8	1.05	5	1.29	1	1.69	0	1.70
Single Family	3,682	81.03	533	69.72	181	48.98	40	51.42	7	65.34
Total:	**4,544**		**765**		**369**		**77**		**10**	

Table 4-20. M5.5 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.03	0.76	0.04	0.11	0.95
	Capital-Related	0.00	0.01	0.62	0.03	0.02	0.69
	Rental	0.31	0.11	0.39	0.01	0.03	0.86
	Relocation	1.14	0.30	0.65	0.07	0.28	2.45
	Subtotal:	**$1.45**	**$0.45**	**$2.42**	**$0.15**	**$0.44**	**$4.95**
Capital Stock Losses	Structural	2.74	0.46	1.04	0.29	0.58	5.12
	Non-Structural	9.53	1.53	2.55	0.78	1.09	15.48
	Content	3.47	0.36	1.51	0.54	0.68	6.55
	Inventory	0.00	0.00	0.04	0.09	0.02	0.15
	Subtotal:	**$15.74**	**$2.35**	**$5.14**	**$1.70**	**$2.37**	**$27.30**
	Total:	**$17.19**	**$2.80**	**$7.56**	**$1.85**	**$2.81**	**$32.25**

Figure 4-10. Wabash County M5.5 Earthquake Building Economic Losses



Results for M7.7 New Madrid Earthquake

The results of the M7.7 New Madrid earthquake scenario are depicted in Tables 4-21, 4-22, and Figure 4-11. Hazus-MH estimates that approximately 34 buildings will be at least moderately damaged. This is over 1.0% of the buildings in the county. It is estimated that 4 buildings would be damaged beyond repair.

The total building related losses are approximately $8.46 million dollars. It is estimated that 7.0% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up over 61% of the total loss.

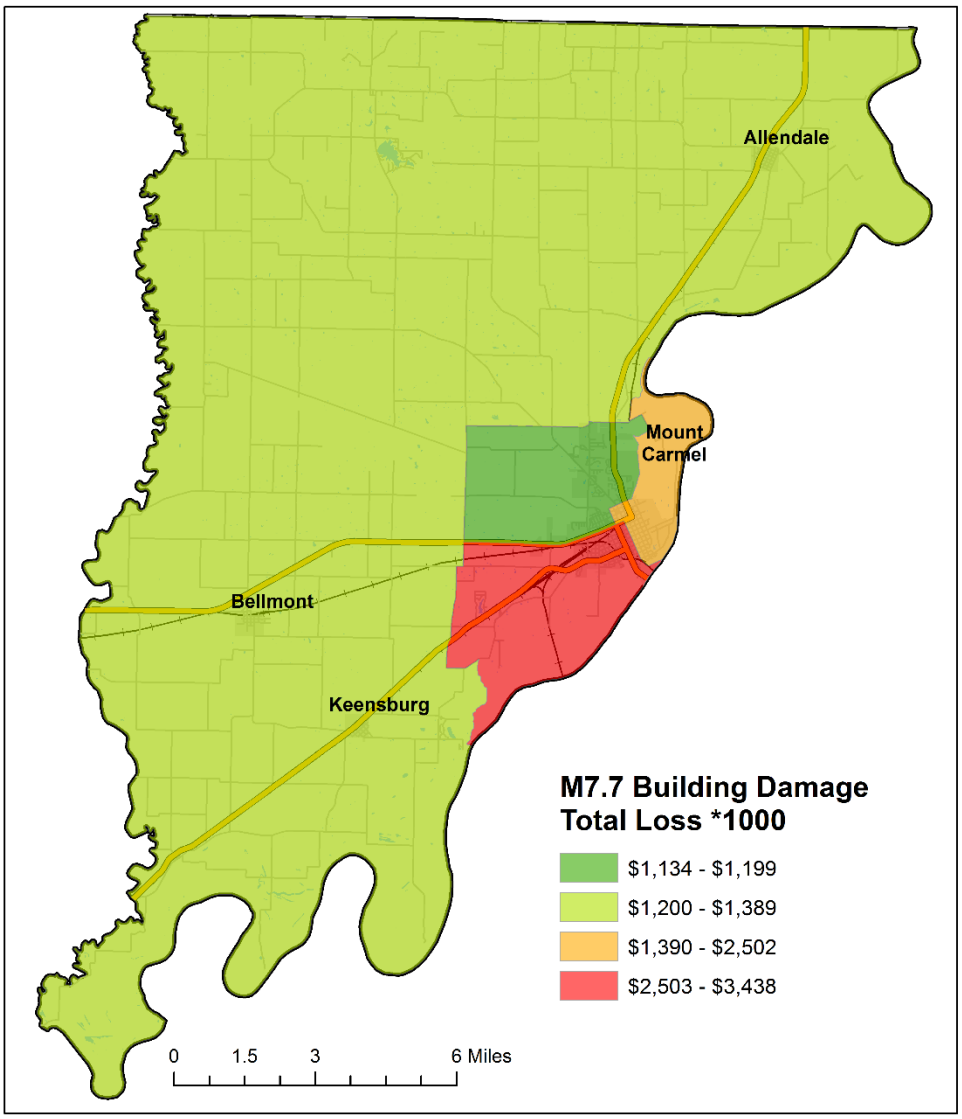
Table 4-21. New Madrid M7.7 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	42	0.74	1	0.99	0	0.97	0	0.32	0	0.31
Commercial	323	5.74	7	6.85	1	8.91	2	9.60	0	9.57
Educational	16	0.28	0	0.37	0	0.39	0	0.39	0	0.38
Government	19	0.34	0	0.44	0	0.48	0	0.46	0	0.46
Industrial	85	1.50	2	1.80	0	2.29	0	1.67	0	1.65
Other Residential	708	12.57	47	49.30	5	38.87	2	12.13	1	12.19
Religion	59	1.05	1	1.23	0	1.41	0	1.51	0	1.50
Single Family	4,383	77.78	37	39.01	6	46.68	13	73.93	3	73.93
Total:	**5,635**		**95**		**12**		**17**		**4**	

Table 4-22. New Madrid M7.7 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.00	0.08	0.00	0.01	0.10
	Capital-Related	0.00	0.00	0.07	0.00	0.00	0.07
	Rental	0.05	0.01	0.05	0.00	0.00	0.12
	Relocation	0.18	0.02	0.07	0.00	0.03	0.30
	Subtotal:	**$0.23**	**$0.03**	**$0.27**	**$0.00**	**$0.04**	**$0.59**
Capital Stock Losses	Structural	0.50	0.04	0.14	0.02	0.05	0.76
	Non-Structural	2.59	0.37	0.95	0.26	0.35	4.51
	Content	1.25	0.14	0.70	0.20	0.27	2.55
	Inventory	0.00	0.00	0.02	0.03	0.01	0.05
	Subtotal:	**$4.34**	**$0.55**	**$1.81**	**$0.51**	**$0.68**	**$7.87**
	Total:	**$4.57**	**$0.58**	**$2.08**	**$0.51**	**$0.72**	**$8.46**

Figure 4-11. New Madrid M7.7 Earthquake Building Economic Losses



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

The results of the Wabash Valley M7.1 earthquake scenario are depicted in Tables 4-23, 4-24, and Figure 4-12. Hazus-MH estimates that approximately 627 buildings will be at least moderately damaged. This is over11% of the buildings in the county. It is estimated that 75 buildings would be damaged beyond repair.

The building related losses are approximately $106.35 million dollars. It is estimated that 10% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up over 65% of the total loss.

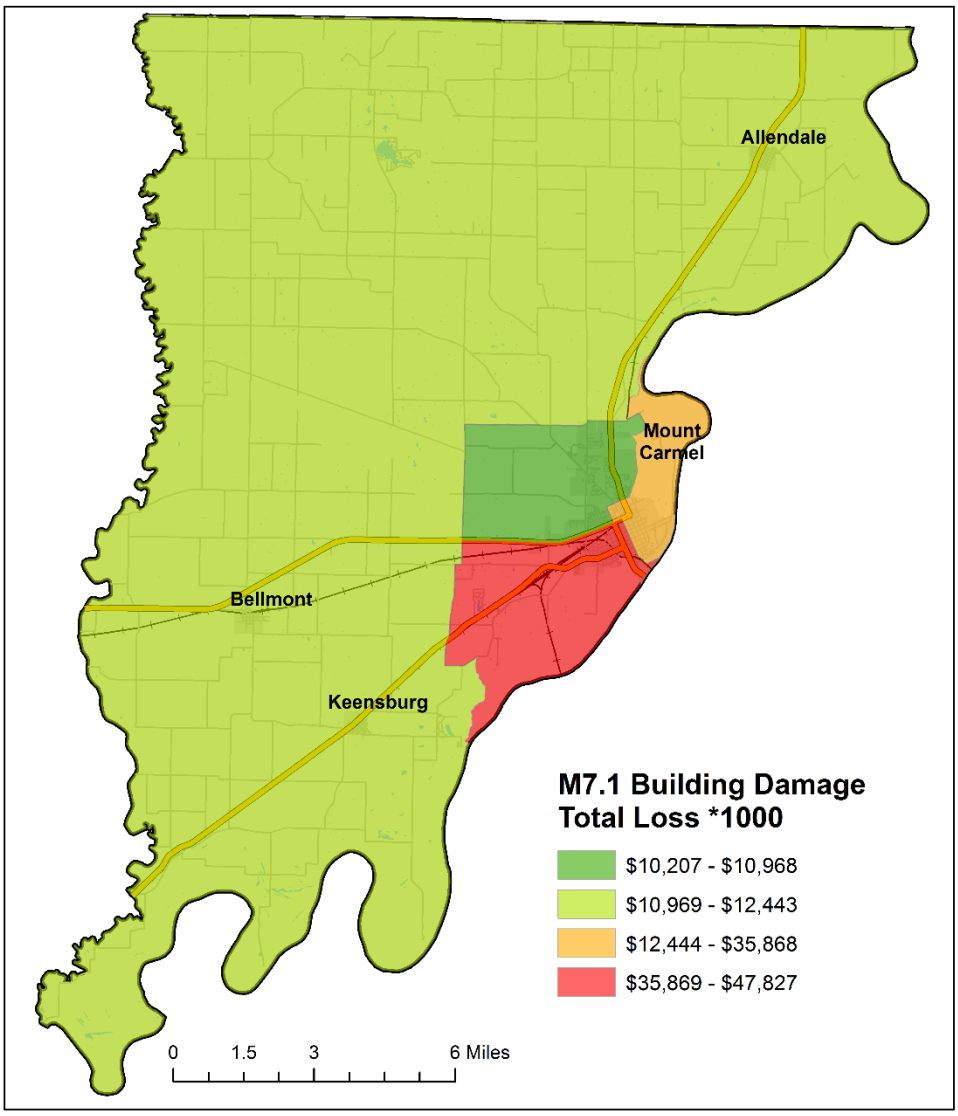
Table 4-23. Wabash Valley 7.1 Magnitude Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	30	0.70	8	1.06	3	1.24	1	0.4	0	0.31
Commercial	219	5.03	54	6.94	23	9.36	29	9.66	7	9.58
Educational	11	0.25	3	0.35	1	0.41	1	0.39	0	0.39
Government	14	0.32	3	0.39	1	0.45	1	0.46	0	0.46
Industrial	60	1.37	15	1.88	6	2.57	5	1.70	1	1.65
Other Residential	429	9.84	209	26.83	79	31.98	37	12.21	9	12.17
Religion	41	0.95	10	1.27	4	1.59	5	1.52	1	1.50
Single Family	3,556	81.54	477	61.28	129	52.40	225	73.72	55	73.94
Total:	**4,360**		**779**		**246**		**304**		**73**	

Table 4-24. Wabash 7.1 Magnitude Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.03	1.44	0.03	0.20	1.70
	Capital-Related	0.00	0.01	1.23	0.03	0.04	1.31
	Rental	0.97	0.23	0.83	0.01	0.07	2.11
	Relocation	3.32	0.36	1.22	0.06	0.58	5.54
	Subtotal:	**$4.29**	**$0.63**	**$4.72**	**$0.13**	**$0.89**	**$10.66**
Capital Stock Losses	Structural	8.79	0.64	2.39	0.33	0.91	13.05
	Non-Structural	34.68	4.05	10.21	2.14	3.85	54.93
	Content	14.28	1.44	7.01	1.73	2.75	27.21
	Inventory	0.00	0.00	0.19	0.26	0.05	0.50
	Subtotal:	**$57.75**	**$6.13**	**$19.80**	**$4.46**	**$7.56**	**$95.69**
	Total:	**$62.04**	**$6.76**	**$24.52**	**$4.59**	**$8.45**	**$106.35**

Figure 4-12. Wabash Valley M7.1 Scenario Building Economic Losses



Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

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

Suggestions for Community Development Trends

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

4.3.5 Thunderstorm Hazard

Hazard Definition

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

Hail 0.75 inches or greater in diameter

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

Frequent and dangerous lightning

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

Wind speeds greater than or equal to 58 miles per hour

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

Previous Occurrences of Thunderstorm Hazards

The National Climatic Data Center (NCDC) database reported 158 hailstorms, lightning events, and thunderstorm and wind storms in Wabash County since 1950. Table 4-25 identifies selected NCDC-recorded storms that caused major damage, death, or injury in Wabash County. Additional details of individual hazard events are on the NCDC website.

Table 4-25. Selected NCDC-Recorded Severe Thunderstorms that Caused Major Damage (over $20,000), Death, or Injury in Wabash County

Location or County*	Date	Deaths	Injuries	Property Damage
Mount Carmel	5/3/1996	0	0	$500,000
Mount Carmel	7/2/1996	0	0	$20,000
Wabash County	6/12/1998	0	0	$80,000
Lancaster	2/27/1999	0	0	$50,000
Wabash County	10/24/2001	0	1	$50,000
Wabash County	4/28/2002	0	1	$25,000
Wabash County	7/4/2004	0	1	$25,000
Keensburg	11/15/2005	0	0	$50,000
Mount Carmel	4/2/2006	0	0	$70,000
Mount Carmel	12/27/2008	0	0	$20,000
Wabash County	2/11/2009	0	0	$25,000
Mount Carmel	10/26/2010	0	0	$20,000
Wabash County	3/25/2010	0	0	$50,000
Allendale	4/19/2011	0	0	$50,000
Mount Carmel	7/12/2011	0	0	$20,000

Location or County*	Date	Deaths	Injuries	Property Damage
Allendale	10/12/2011	0	0	$50,000
Mount Carmel	1/12/2013	0	0	$20,000
	Total:	**0**	**3**	**$1,125,000**

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

Geographic Location of Thunderstorm Hazard

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

Hazard Extent for Thunderstorm Hazard

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

Risk Identification for Thunderstorm Hazard

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

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	2	=	8

Vulnerability Analysis for Thunderstorm Hazard

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

Critical Facilities

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

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect impacts similar to those discussed for critical facilities. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by

hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

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

Potential Dollar Losses from Thunderstorm Hazard

According to the NCDC, Wabash County has incurred approximately $1.5 million in damages relating to thunderstorms, including hail, lightning, and high winds since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained; however, based on average property damage in the past decade, SIU estimates that Wabash County incurs property damages of approximately $23,000 per year related to severe thunderstorms.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

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

Suggestions for Community Development Trends

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

4.3.6 Hazardous Material Storage and Transportation Hazard

Hazard Definition

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

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

emergency response. Emergency response may require fire, safety/law enforcement, search and rescue, and hazardous materials units.

Previous Occurrences of Hazardous Materials Storage and Transportation Hazard

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

The Illinois Emergency Management Agency maintains a comprehensive Hazardous Materials Incident Report Database for the State of Illinois. The database contains information on all Hazardous Materials Reports since 1987 but does not include an assessment of economic and property losses in terms of dollars of damage. The database reported 173 incidents in Wabash County as of June 2016. The most recent event occurred in June 2016 in Mount Carmel at IL Highway 15/ Crossroads: Empire Street & Oak Street. A leak or spill involving light crude (possibly) entered into the waterway of Great House Creek, approximately 1 mile from Wabash River.

Industries regulated by The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) are required to report incidents which meet or exceed established reporting criteria. The data for reported incidents are available on the PHMSA website via the U.S. Department of Transportation Hazmat Intelligence Portal. The database reported 11,264 incidents for the State of Illinois since 2008. As of January 2017, no incidents were reported for Wabash County.

Geographic Location of Hazardous Materials Storage and Transportation Hazard

Hazardous material hazards are countywide and are primarily associated with the transport of materials via highway, railroad, and/or river barge. Duke Energy Gibson Generating Plant in Gibson County Indiana has a large bulk storage of anhydrous ammonia at the plant just south of Mt. Carmel.

Hazard Extent of Hazardous Materials Storage and Transportation Hazard

The extent of the hazardous material hazard varies both in terms of the quantity of material being transported as well as the specific content of the container. In general, a greater risk lies with the transportation of materials compared to storage. The modeling will address the more likely hypothetical of failure in transport in the middle of a city rather than a leak at an isolated plant.

Risk Identification of Hazardous Materials Storage and Transportation Hazard

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

Risk Priority Index

Probability	x	Magnitude	=	RPI
3	x	3	=	9

Vulnerability Analysis for Hazardous Materials Storage and Transportation Hazard

The entire county is vulnerable to a hazardous material release and can expect impacts within the affected area. The main concern during a release or spill is the affected population. This plan will therefore consider all buildings located within the county as vulnerable. To accommodate this risk, this plan

considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Wabash County.

Critical Facilities

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

Building Inventory

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

Infrastructure

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

ALOHA Hazardous Chemical Release Analysis

The U.S. Environmental Protection Agency's ALOHA (Areal Locations of Hazardous Atmospheres) model was used to assess an (1) ammonia release at the railroad crossing along State Route 1 and (2) chlorine release close to the Wabash General Hospital. ALOHA is a computer program designed for response to chemical accidents, as well as emergency planning and training. The Wabash County planning team chose the scenarios because bulk chemicals are transported within a relatively densely populated area and within close proximity to essential facilities.

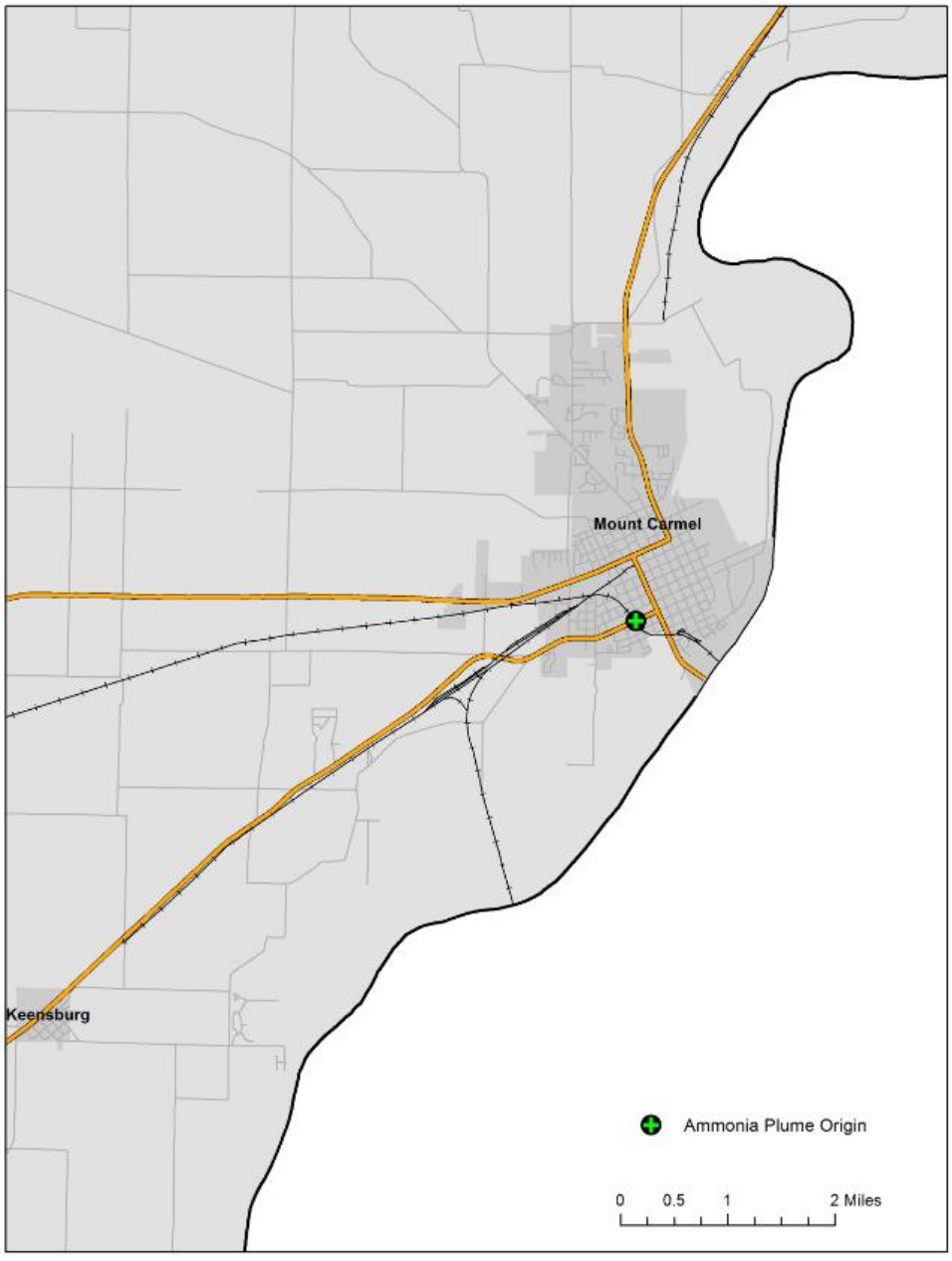
Ammonia is a clear colorless gas with a strong odor. Ammonia is shipped as a liquid under its own vapor pressure. The density of liquid ammonia is 6 lb./gal. Contact with the unconfined liquid can cause frostbite. Gas is generally regarded as nonflammable but does burn within certain vapor concentration limits and with strong ignition. Fire hazard increases in the presence of oil or other combustible materials. Although gas is lighter than air, vapors from a leak initially hug the ground. Prolonged exposure of containers to fire or heat may cause violent rupturing and rocketing. Long-term inhalation of low concentrations of the vapors or short-term inhalation of high concentrations have adverse health effects. Used as a fertilizer, as a refrigerant, and in the manufacture of other chemicals (NOAA Reactivity, 2007).

Chlorine is a greenish yellow gas with a pungent suffocating odor. It is toxic by inhalation and slightly soluble in water. Liquefies at -35°C and room pressure. Chlorine readily liquefied by pressure applied at room temperature. The density of chlorine as a liquid is 13.0 lb. / gal. Contact with unconfined liquid can cause frostbite by evaporative cooling. Chlorine does not burn but, like oxygen, but supports combustion. Long-term inhalation of low concentrations or short-term inhalation of high concentrations has ill effects.

Vapors are much heavier than air and tend to settle in low areas. Chlorine is commonly used to purify water, bleach wood pulp, and to make other chemicals. (NOAA Reactivity, 2007).

For the ammonia scenario, SIU assumed average atmospheric and climatic conditions for the spring season with a breeze from the south. For the chlorine scenario, SIU assumed average atmosphere and climatic conditions for the spring season with a breeze from the northeast. Figures 4-13 depicts the plume origins of the modeled hazardous chemical releases in Wabash County.

Figure 4-13. ALOHA Modeled Hazardous Chemical Plume Origins in Wabash County



ALOHA displays the estimated threat zones as Acute Exposure Guideline Levels (AEGL). The AEGLs are intended to describe the risk to humans resulting from once-in-a-lifetime, or rare exposure to airborne chemical (U.S. EPA AEGL Program). The National Advisory Committee for the Development of Acute

Exposure Guideline Levels for Hazardous Substances (AEGL Committee) is involved in developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills, or other catastrophic exposures. AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. The three AEGLs have been defined as follows:

> AEGL-1: the airborne concentration, expressed as parts per million or milligrams per cubic meter (ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
>
> AEGL-2: the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
>
> AEGL-3: the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

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

Analysis Parameters of the Ammonia Scenario

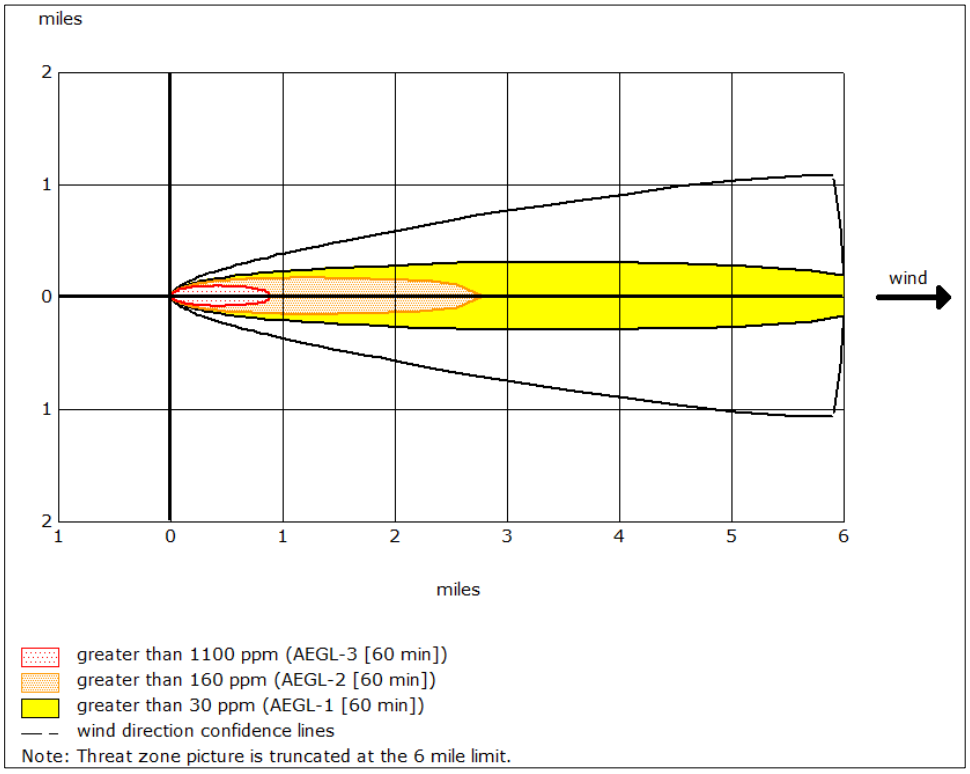
The ALOHA atmospheric modeling parameters for the ammonia release, depicted in Figure 4-14, were based upon a southerly speed of 10 miles per hour. The temperature was 48°F with 75% humidity and a cloud cover of five-tenths skies. SIU used average weather conditions reported by NOAA for wind direction, wind speed, and temperature to simulate spring conditions. The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to 8 feet and the length set to 33 feet (12,408 gallons). At the time of its release, it was estimated that the tank was 75% full. The ammonia 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 4-14 shows the plume modeling parameters in greater detail.

Figure 4-14. ALOHA Modeling Parameters for the Ammonia Release

```
SITE DATA:
  Location: MOUNT CARMEL, ILLINOIS
  Building Air Exchanges Per Hour: 0.98 (unsheltered single storied)
  Time: March 31, 2015  1410 hours CDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: AMMONIA                  Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100 ppm
  IDLH: 300 ppm      LEL: 150000 ppm      UEL: 280000 ppm
  Ambient Boiling Point: -28.7° 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: 10 miles/hour from 065° true at 10 feet
  Ground Roughness: open country          Cloud Cover: 5 tenths
  Air Temperature: 48° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 75%

SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Flammable chemical escaping from tank (not burning)
  Tank Diameter: 8 feet                   Tank Length: 33 feet
  Tank Volume: 12,408 gallons
  Tank contains liquid                    Internal Temperature: 48° F
  Chemical Mass in Tank: 24.3 tons        Tank is 75% full
  Circular Opening Diameter: 2.5 inches
  Opening is 12 inches from tank bottom
  Release Duration: 12 minutes
  Max Average Sustained Release Rate: 6,330 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 45,036 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).
```

Using the parameters in Figure 4-14, approximately 45,036 pounds of material would be released. The image in Figure 4-15 depicts the plume footprint generated by ALOHA. As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million.

Figure 4-15. ALOHA Generate Plume Footprint of the Ammonia Release



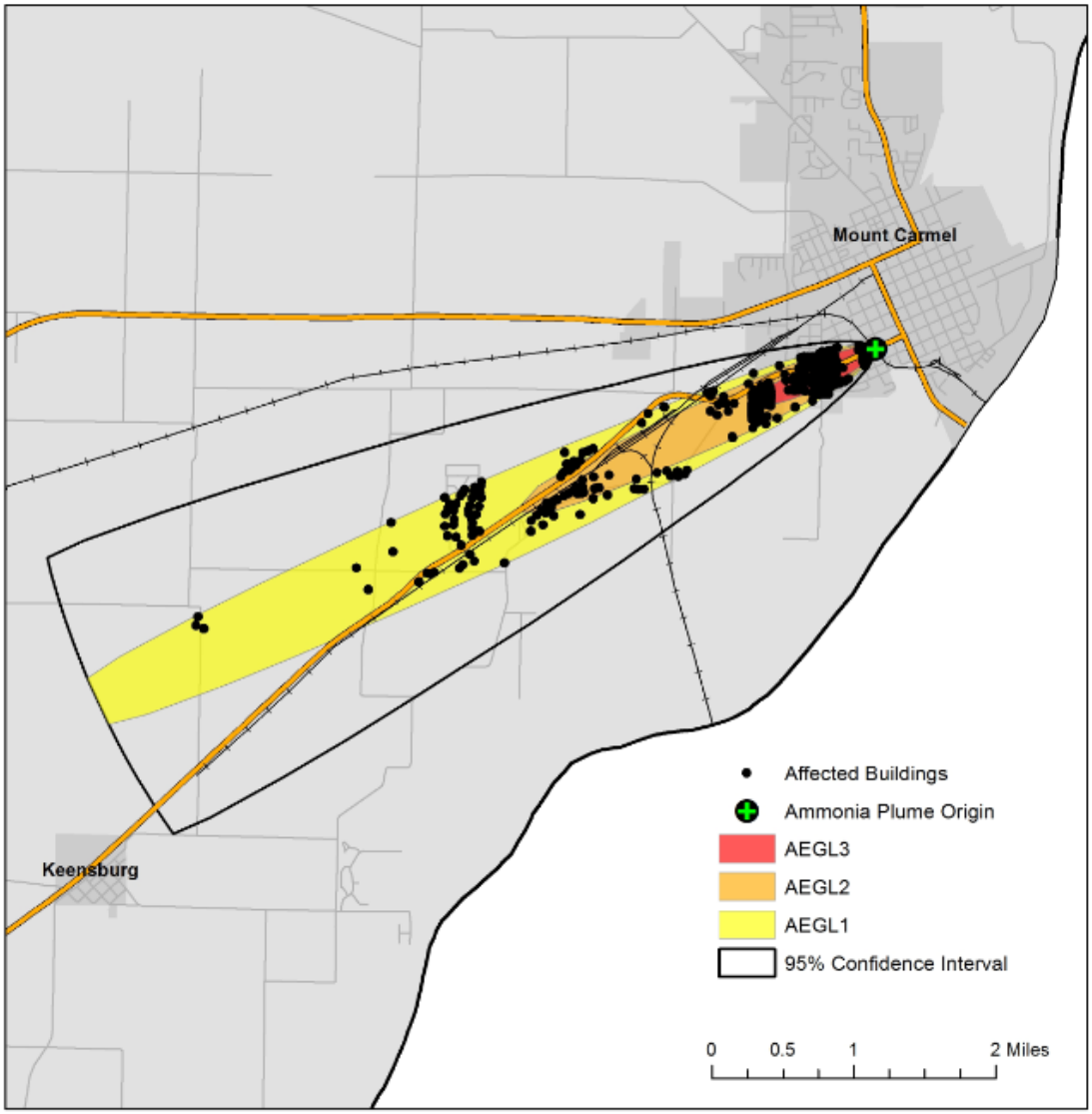
Results for the Ammonia Scenario

An estimate of property exposed to the ammonia spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels. The Wabash County assessment and parcel data was utilized for this analysis. There are 339 buildings within the ammonia plume. It should be noted that the results should be interpreted as potential degrees of loss rather than exact number of buildings damaged to the ammonia release. Table 4-26 lists the total amount of building exposure to each AEGL zone. Figure 4-16 depicts the ammonia spill footprint and location of the buildings exposed.

Table 4-26. Estimated Building Exposure as a Result of the Ammonia Release

	Building Exposure			Number of Buildings		
Occupancy	**AEGL 1**	**AEGL 2**	**AEGL 3**	**AEGL 1**	**AEGL 2**	**AEGL3**
Residential	$12,625,988	$10,810,575	$4,126,208	92	103	74
Commercial	$164,812,680	$274,306,800	$549,243,120	13	14	35
Industrial	$0	$322,050	$0	0	1	0
Agricultural	$37,890	$1,500	$0	6	1	0
Total:	**$177,476,558**	**$285,440,925**	**$553,369,328**	**111**	**119**	**109**

Figure 4-16. ALOHA Plume Footprint and Buildings Exposed to the Ammonia Release

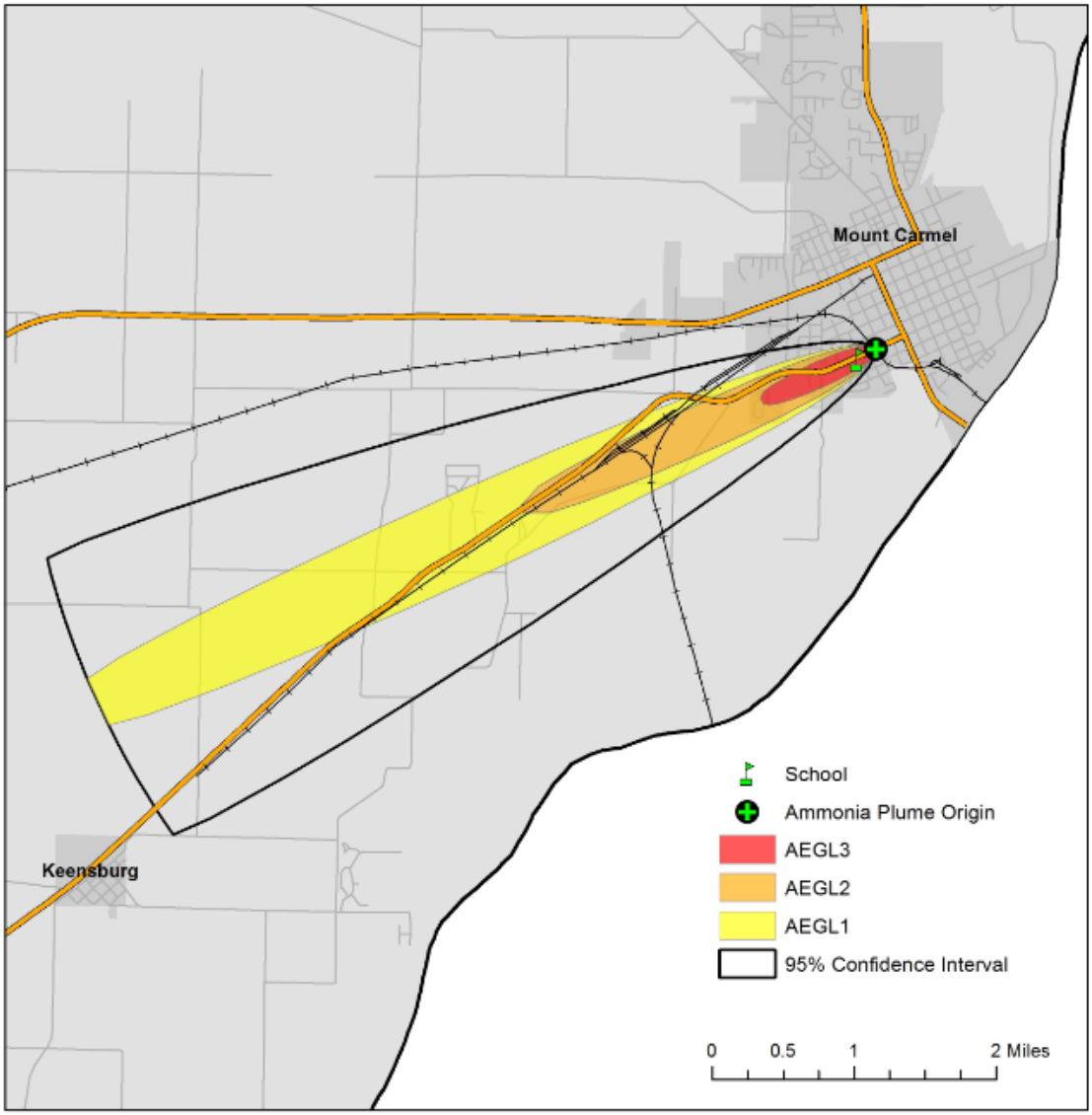


There is one essential facility within the limits of the ammonia scenario. Table 4-27 and Figure 4-17 identifies the affected facilities.

Table 4-27. Essential Facilities within the Ammonia Plume Footprint

Essential Facility	Facility Name
School	South Elementary School

Figure 4-17. Map of Essential Facilities within the Ammonia Plume Footprint



Analysis Parameters of the Chlorine Scenario

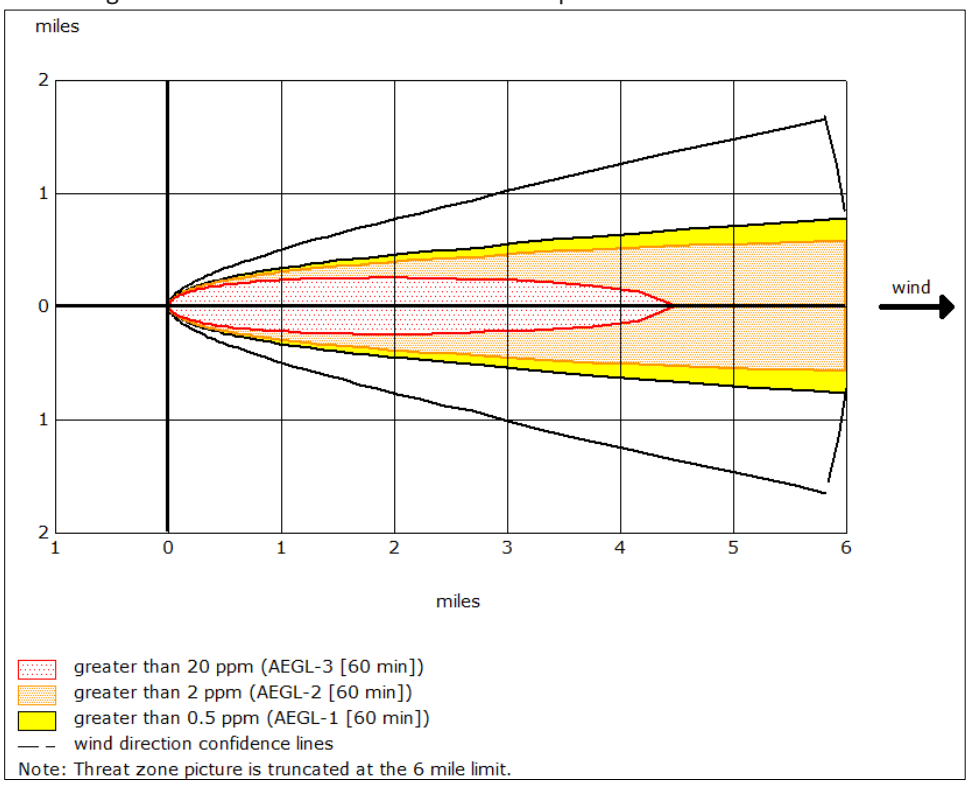
The ALOHA atmospheric modeling parameters for the chlorine release, depicted in Figure 4-18, were based upon a northeasterly speed of 10 miles per hour. The temperature was 48°F with 75% humidity and a cloud cover of five-tenths skies. SIU used average weather conditions reported by NOAA for wind direction, wind speed, and temperature to simulate fall conditions. The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to 8 feet and the length set to 33 feet (12,408 gallons). At the time of its release, it was estimated that the tank was 75% full. The chlorine in this tank is in its liquid state. This release was based on a leak from a 2.5-inch-diameter hole, 12 inches above the bottom of the tank. Figure 4-18 shows the plume modeling parameters in greater detail.

Figure 4-18. ALOHA Modeling Parameters for the Chlorine Release

```
SITE DATA:
  Location: MOUNT CARMEL, ILLINOIS
  Building Air Exchanges Per Hour: 0.98 (unsheltered single storied)
  Time: March 27, 2015  1045 hours CDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: CHLORINE                 Molecular Weight: 70.91 g/mol
  AEGL-1 (60 min): 0.5 ppm   AEGL-2 (60 min): 2 ppm   AEGL-3 (60 min): 20 ppm
  IDLH: 10 ppm
  Ambient Boiling Point: -29.8° 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: 10 miles/hour from S at 10 feet
  Ground Roughness: open country          Cloud Cover: 5 tenths
  Air Temperature: 48° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 75%

SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Non-flammable chemical is escaping from tank
  Tank Diameter: 8 feet                   Tank Length: 33 feet
  Tank Volume: 12,408 gallons
  Tank contains liquid                    Internal Temperature: 48° F
  Chemical Mass in Tank: 56.2 tons        Tank is 75% full
  Circular Opening Diameter: 2.5 inches
  Opening is 12 inches from tank bottom
  Release Duration: 20 minutes
  Max Average Sustained Release Rate: 8,670 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 104,157 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).
```

Using the parameters in Figure 4-18, approximately 104,157 pounds of material would be released. The image in Figure 4-19 depicts the plume footprint generated by ALOHA. As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million.

Figure 4-19. ALOHA Generate Plume Footprint of the Chlorine Release



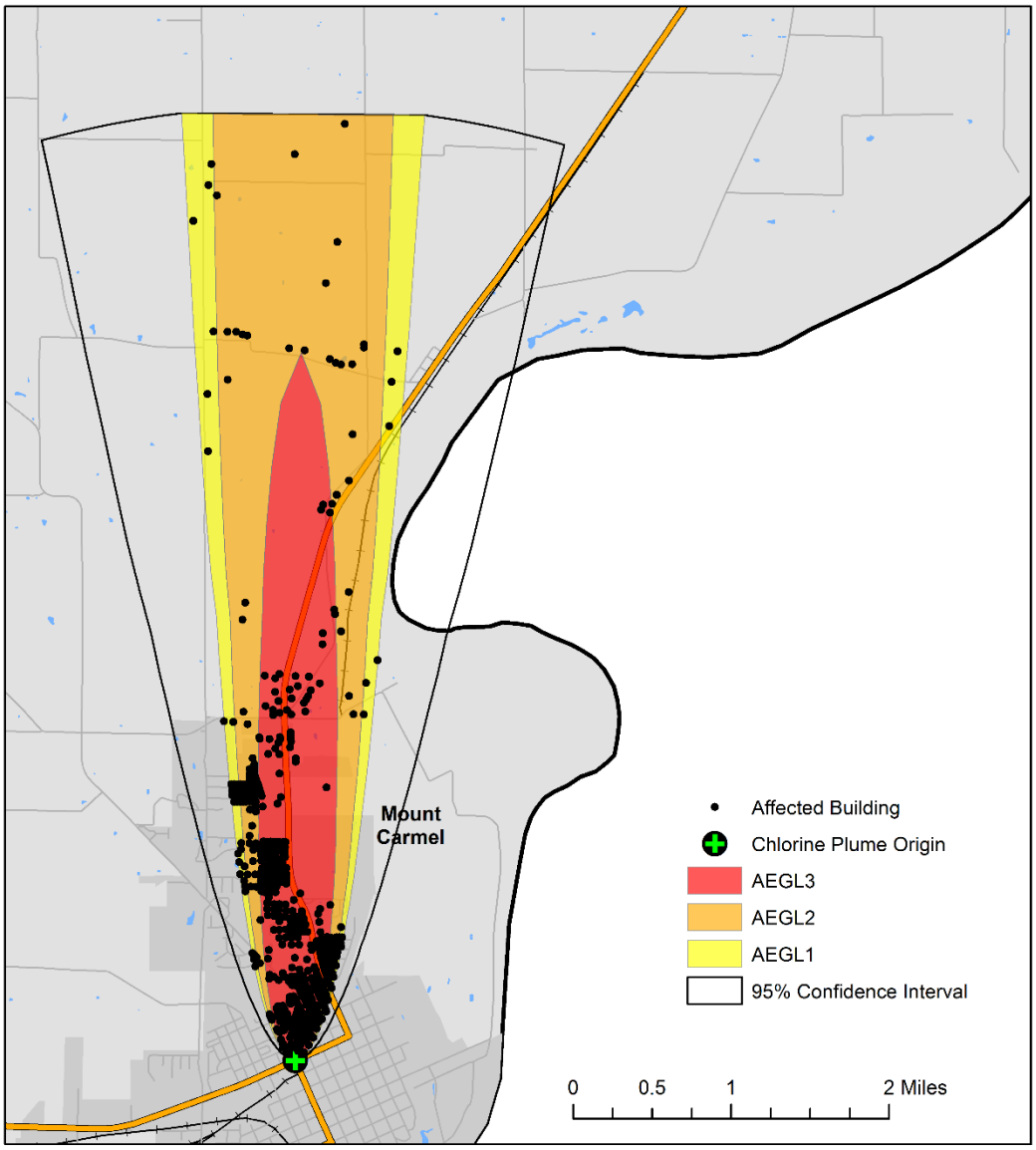
Results for the Chlorine Scenario

An estimate of property exposed to the chlorine spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels. The Wabash County assessment and parcel data was utilized for this analysis. There are 592 buildings within the chlorine plume. It should be noted that the results should be interpreted as potential degrees of loss rather than exact number of buildings damaged to the chlorine release. Table 4-28 lists the total amount of building exposure to each AEGL zone. Figure 4-20 depicts the chlorine spill footprint and location of the buildings exposed.

Table 4-28. Estimated Building Exposure as a Result of the Chlorine Release

	Building Exposure			Number of Buildings		
Occupancy	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL3
Residential	$8,266,545	$17,206,538	$50,863,365	49	102	394
Commercial	$54,808,860	$1,548,000	$173,103,330	2	6	34
Industrial	$0	$0	$36,579,150	0	0	6
Agricultural	$1,200	$77,340	$5,250	2	2	2
Total:	**$63,076,605**	**$18,831,878**	**$260,551,095**	**53**	**110**	**436**

Figure 4-20. ALOHA Plume Footprint and Buildings Exposed to the Chlorine Release

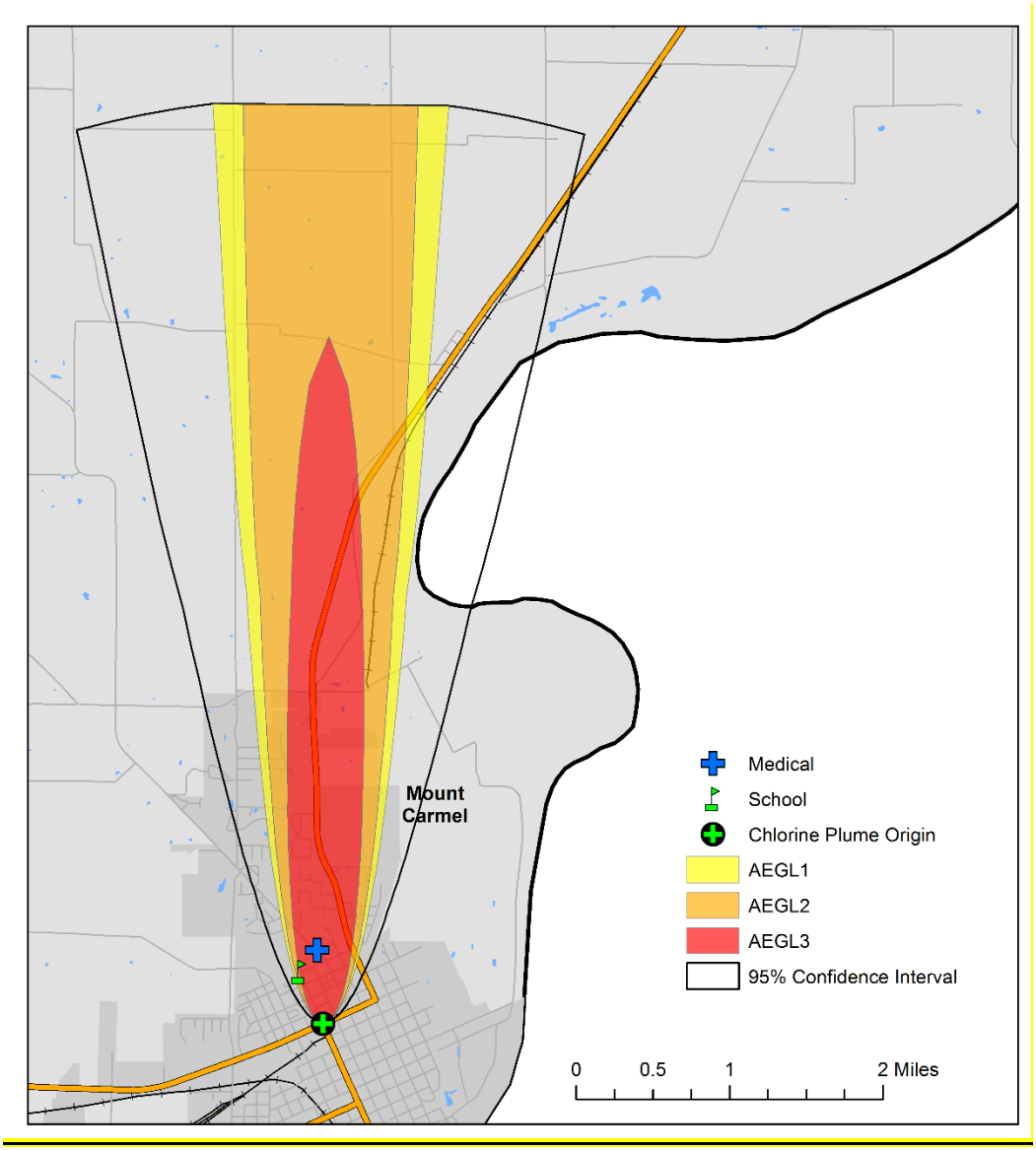


There are two essential facilities within the limits of the chlorine scenario. Table 4-29 and Figure 4-21 identifies the affected facilities.

Table 4-29. Essential Facilities within the Chlorine Plume Footprint

Essential Facility	Facility Name
School	North Intermediate Center of Education
Medical	Wabash General Hospital

Figure 4-21. Map of Essential Facilities within the Chlorine Plume Footprint



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

Wabash County is expected to see future economic expansion within the limits of Mount Carmel. These areas are particularly vulnerable to chemical releases because of transportation of hazardous materials along State Routes 1 and 15.

Suggestion for Community Development Trends

Because the hazardous material hazard events may occur anywhere within the county, future development is susceptible to the hazard. The major transportation routes and the industries located in Wabash County pose a threat of dangerous chemicals and hazardous materials release. Regional

particularly vulnerable are within the incorporated limits of Mount Carmel within close proximity to transportation corridors such as State Routes 1 and 15.

4.3.7 Flooding Hazard

Hazard Definition for Flooding

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

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

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

Previous Occurrences of Flooding

The NCDC database reported seventy-seven flooding events in Wabash County. Table 4-30 identifies NCDC-recorded flooding events that caused damage, death, or injury in Wabash County.

The most significant flood event occurred in June 2008 when excessive rainfall in the upper Midwest caused major flooding on the Wabash River. The ground was already saturated over central Indiana and eastern Illinois when a deluge occurred on the June 6th. Storms on the evening of the June 6th produced a boundary in Southern Illinois and Southern Indiana. A moist southerly low level jet rode over this boundary for more than 12 hours, continually generating showers and thunderstorms. Tremendous rainfall amounts from 2 to nearly 11 inches were observed across central Indiana and eastern Illinois. Runoff sent the Wabash River well above flood stage all the way to the Ohio River. The river was above flood stage for a majority of June. The duration and strength of the flow was so great coming out of the Wabash River into the Ohio River as to cause shoaling. The Ohio River was closed along a mile-and-a-half stretch for a little over a week to conduct dredging operations. Major flooding of the Wabash River occurred. At Mount Carmel, the river crested at 33.24 feet on the 14th. Flood stage there is 19 feet. This

crest was almost one foot below the record flood crest that occurred in January of 2005. Sandbagging operations were conducted at the public utility company's substation. Debris floating in the river snapped a utility pole, causing a power outage over two hours long that affected the whole city of Mount Carmel. All unprotected flood plain areas were flooded, including the northern outskirts of Mount Carmel and eastern Wabash County. Three streets were impacted by backwater flooding of Greathouse Creek. Numerous local roads were impassable. A few evacuations were necessary. Agricultural losses were near 100 percent in areas that were not protected by levees.

Table 4-30. NCDC-recorded Flooding Events that caused Death, Damage or Injury in Wabash County

Location or County*	Date	Deaths	Injuries	Property Damage
Mount Carmel	4/28/1996	0	0	$70,000
Patton	6/8/2008	0	0	$150,000
Mount Carmel	5/3/2009	0	0	$30,000
Patton	6/19/2010	0	0	$10,000
Wabash County	6/27/2011	0	0	$50,000
Wabash County	6/1/2011	0	0	$20,000
Mount Carmel	6/29/2013	0	0	$24,000
Mount Carmel	7/1/2013	0	0	$30,000
Wabash County	4/4/2014	0	0	$40,000
Total:		**0**	**0**	**$424,000**

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

There is one non-residential structure in Wabash County that has experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is ≥ 25% of the market value of the structure at the time of each flood loss.

The Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Wabash County. Records indicate that there is one repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is $3,840. Table 4-31 describes the repetitive loss structures for each jurisdiction.

Table 4-31. Repetitive Loss Structures for each Jurisdiction in Wabash County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Mount Carmel	1	3	$3,840
Total:	**1**	**3**	**$3,840**

Geographic Location of Flooding

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

The primary sources of river flooding in Wabash County is the Wabash River and its tributaries. The Wabash River forms the eastern boundary of the county and is the largest southward-flowing tributary of the Ohio River. The Wabash River drains an area of about 33,150 square miles. On the Wabash River, flooding results from general heavy rains over the entire basin. The main flood season occurs in late winter and early spring. As recently as June 2008, the Wabash River and its tributaries experiences record flooding. The Greathouse Creek is a major tributary of the Wabash River. Flooding on the Greathouse Creek can result from short intense periods of heavy showers that are common throughout the year. However, the major flood problems of the Greathouse Creek are related to backwater flooding from the Wabash.

In Mount Carmel, flood protection measures are provided by the Mount Carmel Local Flood Protection Project and includes a system of levees (see Section 4.3.3), floodwalls, and pumping stations. The levees existing in Wabash County provide the area with some degree of protection against flooding but do not protect against the 1-percent-annual change flood or and not considered in the hydraulic analysis of the 1-percent-annual-change floodplain.

Hazard Extent for Flooding

All floodplains are susceptible to flooding in Wabash County. The floodplain of concern is for the 100-year flood event which is defined as areas that have a 1% chance of flooding in any given year. However, flooding is dependent on various local factors including, but not limited to, impervious surfaces, amount of precipitation, river-training structures, etc. The 100-year flood plain covers approximately 26% of Wabash County.

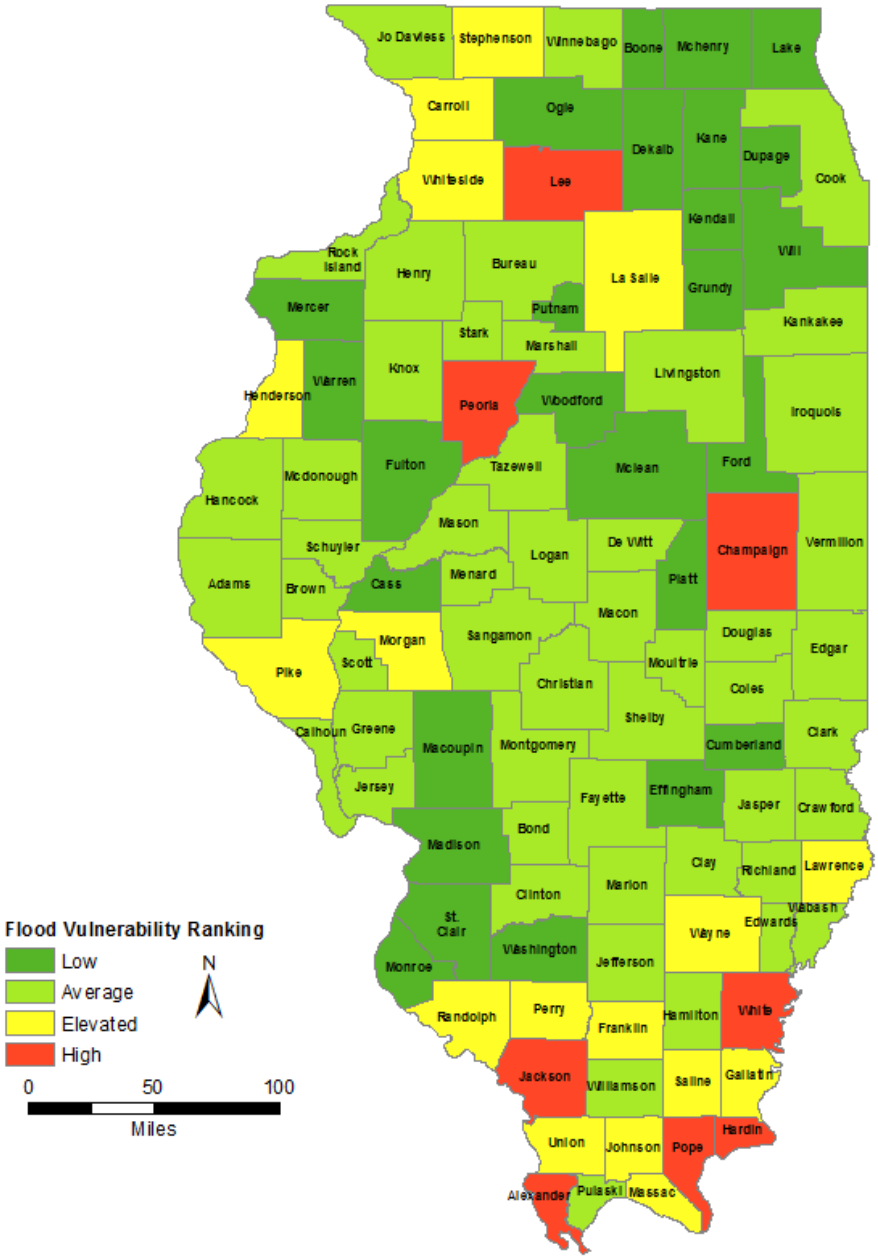
Vulnerability Analysis for Flooding

The 2013 Illinois Hazard Mitigation Plan analyzed a variety potential natural hazards including vulnerability to flooding. A Flood Vulnerability Index (FVI) was calculated for all counties and jurisdictions in Illinois. FVI combines Hazus-based estimates of flood exposure and loss with the widely utilized Social Vulnerability Index (SoVI). The highest vulnerability scores and vulnerability ratings were generally in rural counties and communities located along Illinois's large rivers (i.e., Mississippi, Green, Illinois, Kaskaskia, Rock, and Ohio Rivers). Figure 4-22 displays the Flood Vulnerability Ratings for the 102 Counties in Illinois. The vulnerability ratings are categorically representations (low, average, elevated, or high) of the flood vulnerability index. Wabash County has an Average Flood Vulnerability Rating and ranks 29 out of the 102 Counties in Illinois in terms of loss estimation according to Hazus-MH for floods. Table 4-32 lists the jurisdictional Flood Vulnerability Ratings for Wabash County.

Table 4-32. Jurisdictional Flood Vulnerability Ranking for Wabash County

Jurisdiction	State Ranking	Flood Vulnerability Rating
Mount Carmel	29	Average

Figure 4-22. County Flood Vulnerability Rating for Illinois



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

Risk Identification for Flood Hazard

Based on historical information and the Flood Vulnerability Rating, future occurrence of flooding in Wabash County is highly likely. According to the Risk Priority Index (RPI) and County input, flooding is ranked as the number six hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	2	=	8

Critical Facilities

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

Building Inventory

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

Infrastructure

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

Hazus-MH Flood Analysis

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

According to this analysis, there are 142 buildings located in the Wabash County 100-year floodplain. The estimated damage to these structures is $429 million. It should be noted that the results should be interpreted as degrees of loss rather than exact number of buildings exposed to flooding. Figure 4-23 depicts the building inventory within the 100-year floodplain and Table 4-33 shows the loss estimates by occupancy class.

Figure 4-23. Building Inventory Located within the 100-year Floodplain in Wabash County

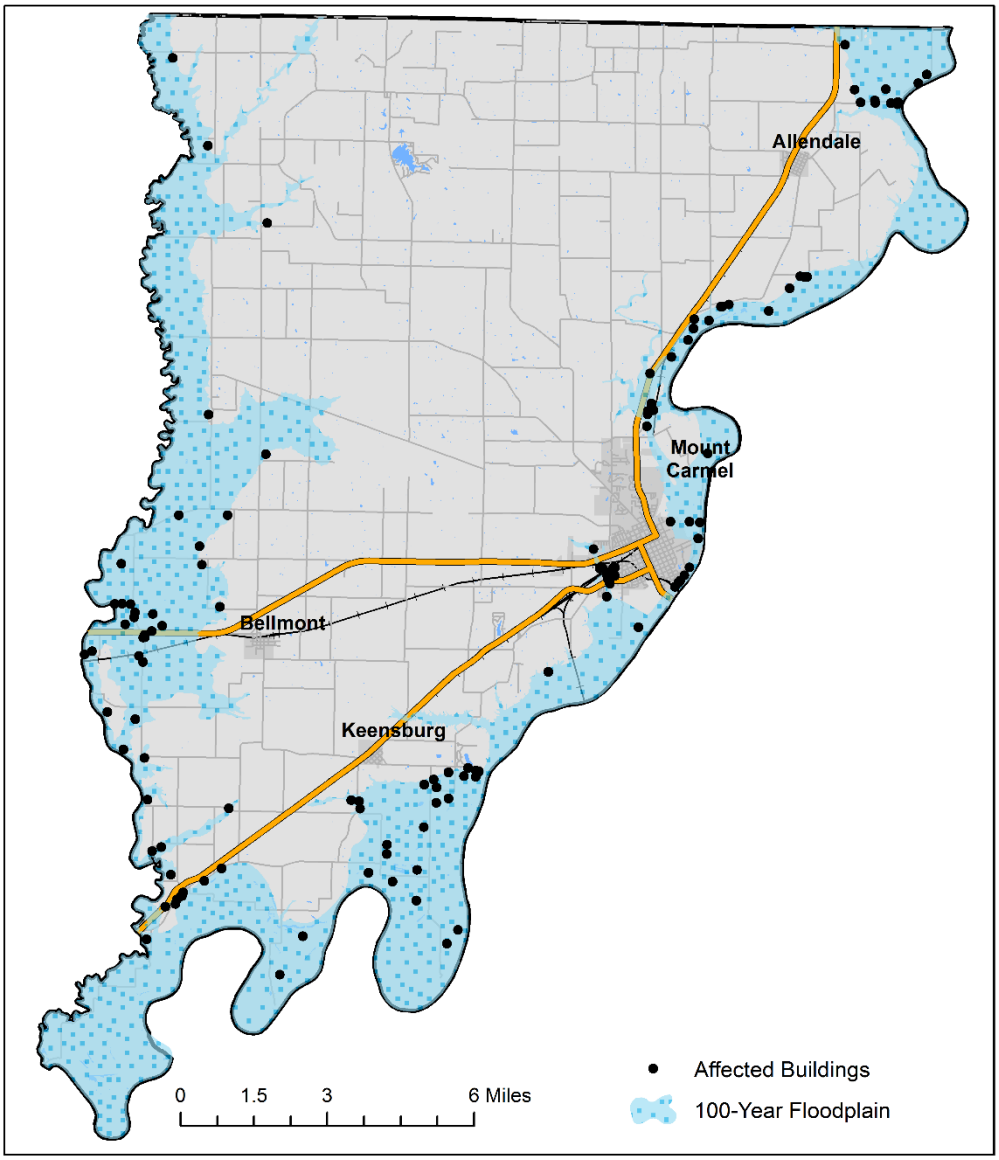


Table 4-33. Estimated Flood Losses within the 100-year Floodplain

Occupancy Class	Number of Structures	Estimated Building Related Losses
Residential	88	$1,987,820
Commercial	18	$421,380,099
Industrial	2	$5,712,918
Agricultural	34	$318,429
Total:	**142**	**$429,399,264**

Essential Facilities Damage

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

Vulnerability Analysis to Future Assets/Infrastructure

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

Suggestions for Community Development Trends

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

4.3.8 Winter Storm Hazard

Hazard Definition of Winter Storm Hazard

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

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

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

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

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

Severe cold involves ambient air temperatures that drop to 0˚F or below. These extreme temperatures can increase the likelihood of frostbite and hypothermia. High winds during severe cold events can

enhance the air temperature's effects. Fast winds during cold weather events can lower the wind chill factor (how cold the air feels on your skin). As a result, the time it takes for frostbite and hypothermia to affect a person's body will decrease.

Previous Occurrences of Winter Storm Hazard

The NCDC database reported 157 winter storm and extreme cold events for Wabash County since 1950. The most recent reported event occurred in April of 2014 when a high pressure system moved east across the Ohio Valley. The system brought unseasonably cold air and widespread freezing temperatures. Lows were from 28 to 32 degrees at many locations in southern Illinois. The coldest observed temperature was 28 degrees at the Mount Vernon airport. Other lows included 31 degrees at the Carbondale airport and at Metropolis. Table 4-34 identifies NCDC-recorded winter storm events that caused damage, death, or injury in Wabash County.

Table 4-34. NCDC-Recorded Winter Storms that Caused Damage, Death, or Injury in Wabash County

Location or County*	Date	Deaths	Injuries	Property Damage
Wabash	1/26/2009	0	0	$50,000
	Total:	**0**	**0**	**$50,000**

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

Geographic Location of Winter Storm Hazard

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

Hazard Extent of Winter Storm Hazard

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

Risk Identification of Winter Storm Hazard

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

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	2	=	8

Vulnerability Analysis of Winter Storm Hazard

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

Critical Facilities

All critical facilities are vulnerable to winter storms. A critical facility will encounter many of the same impacts as other buildings within the county. These impacts include loss of gas or electricity from broken

or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow. Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

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

Infrastructure

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

Potential Dollar Losses from Winter Storm Hazard

According to the NCDC, Wabash County has $50,000 incurred direct financial damages relating to winter storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained for Wabash County.

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

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

Suggestions for Community Development Trends

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

4.3.9 Ground Failure Hazard

Hazard Definition

According to the USGS, the term ground failure is generally referred to landslides, liquefaction, lateral spreads, and any other consequence of shaking that affects the stability of the ground. In Illinois, ground failure is typically associated with subsidence of the land surface related to soluble rock (karst), sink holes, or underground mining.

Subsidence Related to Karst Features

Subsidence can 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 and Collapse

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.

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. (White, 1988)

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).

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 is 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., 10ft of material extracted would cause a maximum subsidence of six to seven feet; Bauer, 2008).

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, 2008).

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 materials 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, 2008).

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 my buckle and foundation walls may be pushed inward. Buildings damaged by compressional forces typically need their foundations rebuilt and leveled (Bauer, 2008).

Previous Occurrences of Ground Failure

In Wabash County, undermined areas are generally located near Keensburg in the southeast corner of the County. Mine subsidence incidences that have impacted the residents of southern Illinois and have been documented in the local and regional press for several decades. There are no documented occurrences of karstic or mine collapse in Wabash County.

Geographic Location for Ground Failure

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.

Hazard Extent for Ground Failure

The extent of ground failure hazard in Wabash 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.

Risk Identification for Ground Failure

Based on historical information and the underlying geology of Wabash County, the occurrence of future ground failure is unlikely. According to the Wabash County Planning Team's assessment, ground failure is ranked as the number eight hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
1	x	2	=	2

Vulnerability Analysis for Ground Failure

The Southern Illinois region has a rich history in coal mining. Nearly all of Wabash County is underlain by potential coal bearing strata and undermined areas are generally located near Keensburg in the southeastern corner of the County. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Wabash County.

Critical Facilities

Any critical facility built above highly soluble bedrock could be vulnerable to ground failure. 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 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities, 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 Wabash County potentially affected by ground failure, 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.

GIS-based Analysis of Ground Failure

This section provides an overview of the ground failure hazards in Illinois in general and a discussion of the potential subsidence risk for Wabash County. Ground failure in Illinois is usually associated with either underground mining or collapse of soil into crevice in underling soluble bedrock. Areas at risk for ground failure can be determined from detailed mapping of geologic conditions or detailed mine maps. Figure 4-24 displays data sources that compiled from the Illinois State Geologic Survey (ISGS) and Illinois Department of Natural Resources (IDNR) to assess the risk of ground failure in Wabash County.

Figure 4-24. Distribution of Bedrock with Potential Coal Bearing Strata, Karst, Sinkholes and Mining Efforts

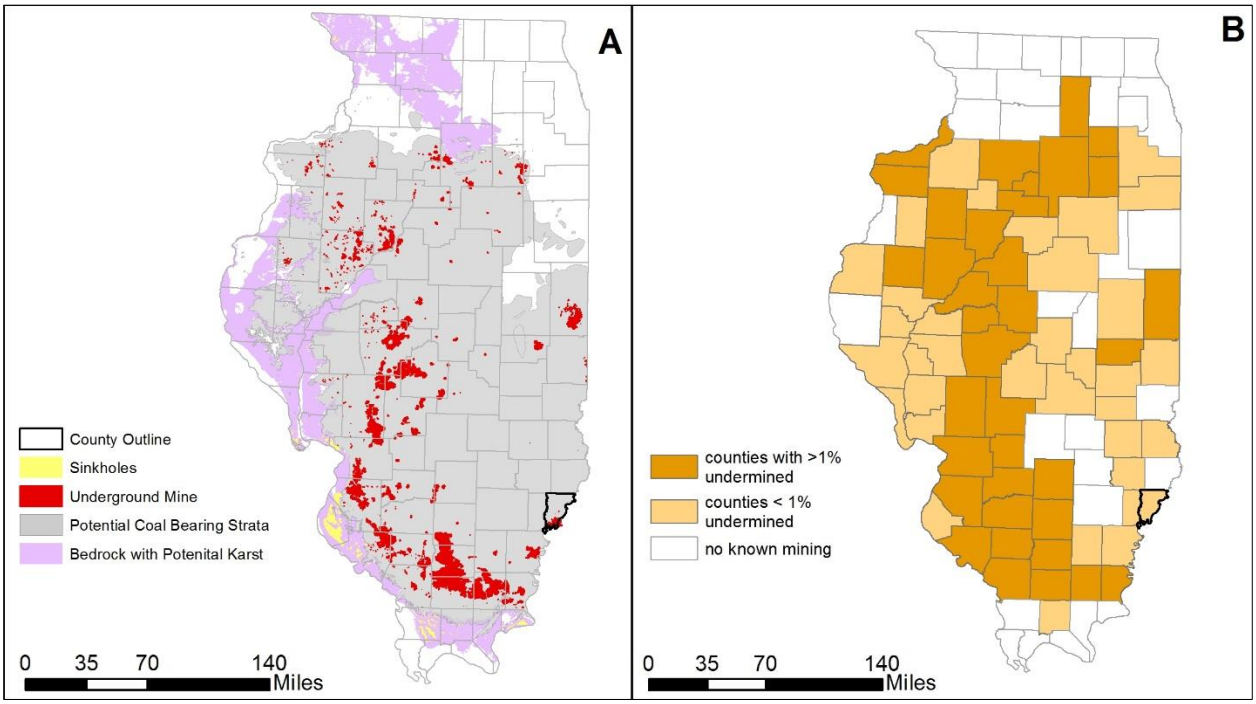
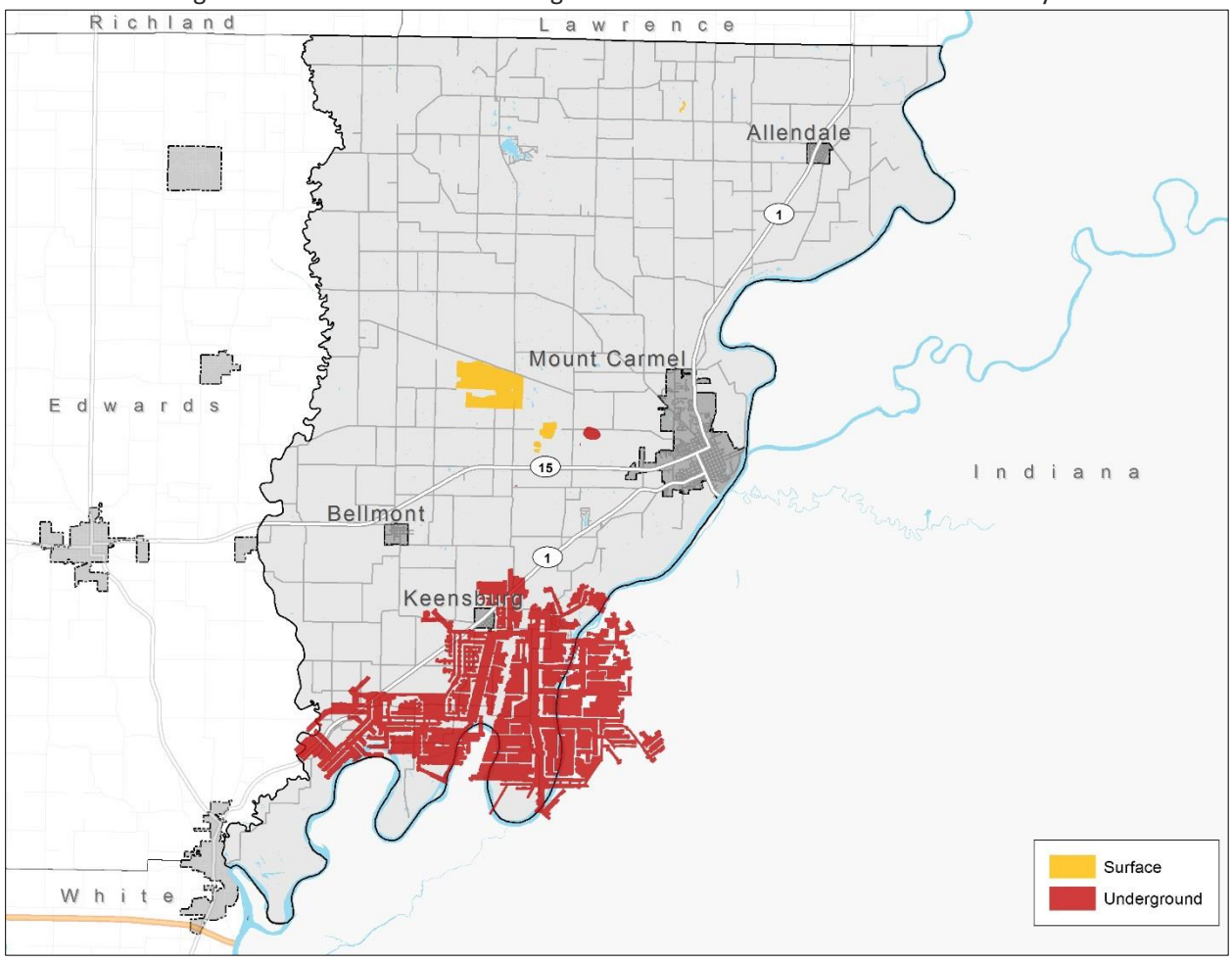


Figure 4-24(A) shows statewide distribution of bedrock with karst potential, coal bearing strata, sink holes. Figure 4-24(B) shows the counties which are 0, <1% and >1% undermined. Nearly all of Wabash County is underlain by rock units which contain coal and is <1% undermined. The Mine Subsidence Insurance Act 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).

Figure 4-25 shows the distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines in Wabash County. Analysis of the GIS data layer of active and abandoned coal mines in Illinois obtained from the IDNR revealed that 50 km^2 out of Wabash County's total 589 km^2 (8%) have been undermined. The undermined areas general are in the area of Keensburg in the southeast corner of the County. Comparison of Wabash County local assessment and parcel data with IDNR GIS layer of active and abandoned underground-coal mines was performed. This analysis revealed that 109 out of the 5,591 or ~2% of the buildings in the county are located above undermined areas.

Figure 4-25. Distribution of Underground and Surface Mines in Wabash County



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.

Suggestions of Community Development Trends

Abandoned underground mine subsidence may affect several locations within the county; therefore, buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

4.3.10 Drought and Extreme Heat Hazard

Hazard Definition for Drought Hazard

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

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

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

Heat Wave

Prolonged period of excessive heat often combined with excessive humidity.

Heat Index

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

Heat Cramps

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

Heat Exhaustion

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

Heat and Sun Stroke

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

Previous Occurrences for Drought and Extreme Heat

The NCDC database reported 53 drought/heat wave events in Wabash County since 1950. The most recent recorded event occurred summer 2012. The drought was only eased when remnants of Hurricane Isaac brought widespread rain totals of 2 to 4 inches from September 1st through 3rd. This was followed by additional rainfall throughout the month that resulted in much of the area being downgraded to the Moderate Drought category (D1) or better. Eight west-central Illinois counties along and northwest of a Marshall to Lincoln line remained in the Severe Drought category (D2) through the end of the month. Total crop losses from the extended drought across central and southeast Illinois was estimated to be $1.2 billion. Thanks to beneficial rainfall of 2 to 4 inches from the remnants of Hurricane Isaac, Wabash County was downgraded to the Moderate Drought category (D1) on September 30th. Total damage to the corn crop was estimated at $3.45 million. Table 4-25 identifies NCDC-recorded drought/heat wave events that caused damage, death, or injury in Wabash County.

Table 4-25. NCDC-recorded Extreme Heat Events that caused Death, Crop Damage or Injury in Wabash County

Location or County*	Date	Deaths	Injuries	Crop Damage
Wabash County	07/21/2005	0	3	$0
Wabash County	09/30/2007	0	0	$3,450,000
	Total:	**0**	**3**	**$3,450,000**

Geographic Location for Drought and Extreme He

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

Hazard Extent for Drought and Extreme Heat

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

Risk Identification for Drought and/or Extreme Heat

Based on historical information, the occurrence of future droughts and/or prolonged extreme heat is highly likely. The County should expect extreme heat and prolonged periods of less than average rainfall in the future. Although historical information equates for a highly likely chance of drought and/or extreme heat events per year for Wabash County, input from the Planning Team suggests drought and/or extreme heat in this area of great magnitude and severity of damage and loss is a possible event. According to the Risk Priority Index (RPI) and County input, drought and/or extreme heat are ranked as the number nine hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	1	=	2

Vulnerability Analysis for Drought and Extreme Heat

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

Critical Facilities

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

Building Inventory

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

Infrastructure

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

Potential Dollar Losses from Drought and Extreme Heat

According to the NDCD, Wabash County has experienced $3.45 million in crop damages relating to drought and extreme heat events storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained.

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

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

Suggestion of Community Development Trends

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

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

Section 5. Mitigation Strategies

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

5.1 Existing Hazard Mitigation Policies, Programs and Resources

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

5.1.1 Successful Mitigation Projects

To be successful, mitigation must be a recurrent process that is continually striving to lessen the impact of natural hazards within the county. Wabash County has made great strides to improve its ability to mitigation against future hazards. The following are projects that have been successfully completed prior to the development of the Wabash County 2017 Multi-Hazard Mitigation Plan.

TITLE OF MITIGATION PROJECT 1

Mount Carmel levee system – 1960's.

5.1.2 National Flood Insurance Program

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

NFIP Status

In Wabash County, one incorporated community participates in the NFIP. Table 5-1 includes a summary of information for Wabash County participation in the NFIP. Wabash County was mapped with a flood risk but was sanctioned on November 3, 1979. Sanctioned communities do not qualify for flood-related Federal disaster assistance for acquisition, construction, or reconstruction purposes in Special Flood Hazard Areas. This may have serious consequences for the community's real estate market and economic viability, as each federally regulated lender must notify the purchaser or lessee that Federal disaster assistance is not available for that property in the event of a flood. Wabash County will continue to provide information to its non-participating jurisdictions regarding the benefits of the National Flood Insurance Program. Mt. Carmel will continue its compliance within the NFIP by enforcing the flood ordinance.

No communities are mapped as Non-Special Flood Hazard Areas (NSFHA). NSFHA areas have a moderate-to-low risk flood zone and is not in any immediate danger from flooding caused by overflowing rivers or hard rains. However, it's important to note that structures within a NSFHA are still at risk. In fact, nearly 1 in 4 NFIP flood claims occur in these moderate- to low-risk areas.

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

Community	Participate in the NFIP	Initial Flood Hazard Boundary Map Identified	Initial FIRM Identified	Current Effective Map Date
Mount Carmel	Yes	03/15/74	07/16/80	12/16/11
Wabash County	No	11/03/78	02/15/85	12/16/11
Allendale	No			
Bellmont	No			
Keensburg	No			

NFIP status and information are documented in the Community Status Book Report updated on 08/30/2016.
NSFHA – No Special Flood Hazard Area
(M) – No Elevation Determined – All Zone A, C and X

Flood Insurance Policy and Claim Statistics

As of June 30, 2016, 18 households paid flood insurance, insuring $4,255,000 in property value. The total premiums collected for the policies amounted to $6,006. Since the establishment of the NFIP in 1978, 10 flood insurance claims were filed in Wabash County, totaling in $30,378.29 in payments. Table 5-2 summarizes the claims since 1978.

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

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
Mount Carmel	10	9	0	1	$30,378.29

*NFIP policy and claim statistics since 1978 until the most recently updated date of 6/30/2016. Closed Losses refer to losses that are paid; open losses are losses that are not paid in full; CWOP losses are losses that are closed without payment; and total losses refers to all losses submitted regardless of status. Lastly, total payments refer to the total amount paid on losses.

Repetitive Loss Structures

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

The Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Wabash County. Records indicate that there are 6 repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is $3,840. Table 5-3 describes the repetitive loss structures for each jurisdiction.

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

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Mount Carmel	1	3	$3,840
Total:	**1**	**3**	**$3,840**

Community Rating System Status

Wabash County and its incorporated areas do not participate in the NFIP'S Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. More than 1,200 communities from all 50 states participate in the CRS. Although joining the CRS is free, completing CRS activities and maintain a CRS rating will require a degree of commitment from the community, including dedicating staff. Joining the CRS could be one way Wabash County or its incorporated communities improve their existing floodplain management policies and further reduce the flood hazard risk.

5.1.3 Jurisdiction Ordinances

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

Table 5-4: Wabash County's Jurisdiction Ordinances

Community	Zoning	Storm water Management	Flood	Subdivision Control	Burning	Seismic	Erosion Mgmt	Land Use Plan	Building Codes	State/National/ Int'national Codes
Mt. Carmel	Municipal Code #234 Passed 8/2/1971 Updated Often	Municipal Code #969 Passed 9/19/2011	Municipal Code #969 Passed 9/19/2011	Municipal Codes #234, #590, #860	Municipal Codes #257, #283, #558, #830, #934	Municipal Code #871	-	-	-	Follows: NEC 2006 IPMC 2006 IBC 2006 IRC 2006 IMC 2006 IEC State Reg

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

The adoption of new ordinances, including the adoption of new development standards or the creation of hazard-specific overlay zones tied to existing zoning regulations, present opportunities to discourage hazardous construction and manage the type and density of land uses in areas of known natural hazards. Adopting and enforcing higher regulatory standards for floodplain management (i.e., those that go beyond the minimum standards of the NFIP) is another effective method for minimizing future flood

losses, particularly if a community is experiencing growth and development patterns that influence flood hazards in ways that are not accounted for on existing regulatory floodplain maps. Revisions to existing building codes also present the opportunity to address safe growth. Many state and local codes are based off national or industry standard codes which undergo routine evaluations and updates. The adoption of revised code requirements and optional hazard-specific standards may help increase community resilience.

5.1.4 Fire Insurance Ratings

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

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

Fire Department	Fire Insurance Rating	Number of Employees
Allendale Rural FPD	7	30
Bellmont Volunteer FPD	6	27
Keensburg Volunteer FD	7	18
Mt Carmel FD	4	19

5.2 Mitigation Goals

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

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

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

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

Objective: Minimize the amount of infrastructure exposed to hazards.

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

Objective: Improve emergency sheltering in Wabash County.

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

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

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

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

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

Objective: Raise public awareness on hazard mitigation.

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

5.3 Multi-Jurisdictional Mitigation Strategies

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

Table 5-6. FEMA's STAPLEE Evaluation Criteria

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

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

All potential strategies and goals that arose through this process are included in Table 5-7. The mitigation strategies are arranged by hazard they directly address. In some cases, certain mitigation strategies can

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

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

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
	ALL HAZARDS				
AH1	**Improve EMA training, staff, resources, and equipment** *Wabash EMA (WEMA) relies heavily on volunteer support. In the next two years, WEMA will work to develop and complete a volunteer recruitment, retention, and recognition plan for EMA, institute minimum and ongoing training for EMA volunteers, and improve IT, communication, and operational equipment of WEMA, Water rescue team, EOC, etc.*	County EMA	Ongoing	L, S, P	County EMA
AH2	**Equip critical facilities with back-up generators** *County EMA needs to procure and install emergency generator for EOC. Mt. Carmel FD has requested a FEMA AF grant to replace the aging generator at their FD, which is an alternative EOC. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA, Mt. Carmel	Proposed	S, F	County EMA
AH3	**Retrofit and harden critical facilities** *The current EOC is of pole-barn construction and needs to be restructured and relocated with E-911 dispatch center. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	County EMA, Mt. Carmel	Proposed	F	County EMA
AH4	**Develop vulnerable population list** *The county has attempted this strategy before but met opposition from the public. County EMA will look into trying this strategy again. If funding is available, implementation is forecasted within the next five years.*	County EMA	Proposed	L	County EMA
AH5	**Develop and maintain comprehensive plan to incorporate natural hazards** *The county is currently rewriting emergency operations plan to comply with most current CPG-101 recommendations and is moving to ESF format. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
AH6	**Establish an Incident Management Team** *The county is developing new organizational structure for WEMA to conform to NIMS/ICS recommendations. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
AH7	**Develop social media techniques to provide critical weather updates and disseminate critical information** *The county is in process of developing WEMA Webpage, Facebook, and Twitter. Webpage is still a work in progress, Facebook and Twitter are up. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	County EMA	Ongoing	L	County EMA
AH8	**Supply all critical facilities with basic survival gear, food, and water** *Three years ago Wabash County Health Department (WCHD) received a grant to procure and outfit an emergency response trailer. The trailer has all emergency equipment including a generator to set up a Point of Distribution for medication in a disaster. WCHD will work to further supply critical facilities throughout the county. If funding is available, implementation is forecasted within the next year.*	County Health Department	Ongoing	S	WCHD
AH9	**Purchase/ Distribute NOAA Weather Radios** *Allendale School does not currently have a NOAA Weather Radio. County EMA will look into Purchasing and distributing radios to all jurisdictions. If funding is available, implementation is forecasted within the next three years.*	All Jurisdictions	Proposed	F, P	County EMA
AH10	**Promote disaster resilience through workshops, education materials, and planning guides** *County EMA will work with jurisdictions throughout the county to improve readiness for disasters. If funding is available, implementation is forecasted within the next three years.*	All Jurisdictions	Ongoing	F, P	County EMA
AH11	**Compile and publicize location of safe rooms and/or shelters** *County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Mt. Carmel	Proposed	L	County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
	TORNADO / SEVERE THUNDERSTROMS				
ST1	**Provide jurisdiction-wide siren warning coverage** *Currently there is only a warning siren at the fire station in Allendale. At minimum, there needs to be a siren at the sub-station in Lancaster and possibly one in Patton. Allendale Rural Fire Protection District will oversee this strategy and equip stations and other locations with necessary sirens to serve the county. If funding is available, implementation is forecasted within the next three years.*	WEMA	Proposed	F	WEMA
ST2	**Construct new safe room(s)** *Mt. Carmel is interested in protecting citizens via construction and implementation of safe rooms. If funding is available, is forecasted to be complete within the next year.*	Mt. Carmel	Proposed	S, F	County EMA
ST3	**Equip critical facilities with lightning protection devices** *The County EMA will oversee the implementation of this project. If funding is available, is forecasted to be completed within the next one to three years.*	Mt. Carmel	Proposed	S, F	County EMA
	FLOODING / DAM AND LEVEE FAILURE				
F1	**Work towards participating in the NFIP's Community Rating System (CRS) to acquire discounted flood insurance rates** *Currently only Mt. Carmel is under NFIP. The county would like to work towards being a CRS community once they join the NFIP. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.*	County EMA	Proposed	L, S	County EMA
F2	**Develop dam/levee failure emergency action plans** *The county is currently developing a flood plan Annex for EOP. County EMA will be working with local levee commission to develop their emergency action plan. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	County EMA	Proposed	L	County EMA
F3	**Install dewatering pumps for flooding** County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.	Mt. Carmel	Proposed	L, F	Mt. Carmel, County EMA
F4	**Culvert replacement** *Public utilities will oversee the implementation of this project. If funding is available, is forecasted to be completed within one to three years.*	Mt. Carmel	Proposed	S, F	Mt Carmel, County EMA
F5	**Update Flood Insurance Rate Map (FIRM)** *County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.*	Mt. Carmel	Ongoing	S, F	County EMA
F6	**Install Pumping Stations in levee system** *County EMA will oversee the implementation of this project. If funding is available, is forecasted to be completed within the next one to three years.*	Mt. Carmel	Proposed	L, S, F	County EMA, Mt. Carmel
F7	**Inspect and Make Repairs to Dams** *Have an engineering assessment done of the dams and have necessary repairs done*	County EMA	Proposed	L, S, F	County EMA
	EARTHQUAKE				
EQ1	**Develop Earthquake Emergency Action Plan** *The County will rewrite Earthquake Annex of County EOP. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Proposed	L	County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
	HAZARDOUS MATERIALS RELEASE				
HAZ1	**Develop/update hazmat emergency response plan** *The County will rewrite and get IEMA approval of County Hazardous Materials Response Plan. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year. Allendale Rural Fire Protection District annually updates and trains firefighters on HAZMAT response plans for the local businesses of Wabash Valley Service Co. and Van Matre Seeds.*	County EMA, ARFPD	Ongoing	L, S	County EMA
	WINTER STORMS				
WS1	**Purchase deicing chemicals** *Allendale School needs outside funding to help with the purchase of deicing chemicals. Allendale CCSD #17 will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Allendale CCSD #17	Proposed	F, P	Allendale CCSD #17
	DROUGHT / EXTREME HEAT				
H1	**Retrofit water supply systems** *The county EMA will work with the local fire stations to update water supply systems. If funding is available, implementation is forecasted to be initiated within 1-3 years.*	County EMA	Proposed	L	County EMA
H2	**Purchase fans for use during extreme heat** *The county EMA will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within 1-3 years.*	County EMA	Proposed	L	County EMA
H3	**Audit water loss and incentivize water reuse** *Fairfield will oversee the implementation of this project. They will monitor monthly water loss and report findings to the Board of Trustees. Local funds will be used to make timely repairs of all leaks.*	City of Mt. Carmel	Proposed	L	Mt. Carmel
H4	**Develop/enforce burn bans** *City of Mt. Carmel will follow county issued burn ban restrictions during drought/extreme heat situations. Mt. Carmel has burn ordinances and schedules in place in the Village Ordinance Books.*	Mt. Carmel	Ongoing	L	Mt. Carmel
	WATER SYSTEM INFRASTRUCTURE				
WSIF1	**Upgrade Sewage/Rain Water Infrastructure** *The Village of Bellmont would like to continue making improvements to its aging sewage/rain water treatment infrastructure. If funding is available, is forecasted to be completed within the next three to five years.*	Village of Bellmont	Ongoing	F	Village of Bellmont
WSIF2	**Upgrade Municipal Water System** *The Village of Bellmont would like to replace aging water mains with new and larger water mains crucial for providing clean drinking water and adequate water to fight fires. If funding is available, is forecasted to be completed within one to three years.*	Village of Bellmont	Proposed	F	Village of Bellmont

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

5.4 Prioritization of Multi-Jurisdictional Mitigation Strategies

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

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

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

Code	Priority Ranking											
	Wabash County	Allendale	Allendale CCSD#17	Bellmont	Keensburg	Mount Carmel	Mount Carmel Area Economic Allinance	Mount Carmel Public Utility Co.	Dersh Energy Inc.	Wabash General Hospital	Wabash CUSD #348	Wabash Valley College
AH1	H	-	-	-	-	-	-	-	-	-	-	-
AH2	M	-	-	-	-	H	-	-	-	-	-	-
AH3	H	-	-	-	-	M	-	-	-	-	-	-
AH4	L	-	-	-	-	-	-	-	-	-	-	-
AH5	M	-	-	-	-	-	-	-	-	-	-	-
AH6	M	-	-	-	-	-	-	-	-	-	-	-
AH7	H	-	-	-	-	-	-	-	-	-	-	-
AH8	H	-	-	-	-	-	-	-	-	-	-	-
AH9	M	M	M	M	M	M	M	M	M	M	M	M
AH10	M	M	M	M	M	M	M	M	M	M	M	M
AH11	-	-	-	-	-	M	-	-	-	-	-	-
ST1	-	M	-	-	-	-	-	-	-	-	-	-
ST2	-	-	-	-	-	H	-	-	-	-	-	-
ST3	-	-	-	-	-	H	-	-	-	-	-	-
F1	L	-	-	-	-	-	-	-	-	-	-	-
F2	H	-	-	-	-	-	-	-	-	-	-	-
F3	-	-	-	-	-	H	-	-	-	-	-	-
F4	-	-	-	-	-	H	-	-	-	-	-	-
F5	-	-	-	-	-	L	-	-	-	-	-	-
F6	-	-	-	-	-	H	-	-	-	-	-	-
F7	H	M	-	-	-	M	-	-	-	-	-	-
EQ1	M	-	-	-	-	-	-	-	-	-	-	-
HAZ1	H	M	-	-	-	-	-	-	-	-	-	-

Code	Priority Ranking											
	Wabash County	Allendale	Allendale CCSD#17	Bellmont	Keensburg	Mount Carmel	Mount Carmel Area Economic Allinance	Mount Carmel Public Utility Co.	Dersh Energy Inc.	Wabash General Hospital	Wabash CUSD #348	Wabash Valley College
WS1	-	-	M	-	-	-	-	-	-	-	-	-
H1	M	M	-	-	-	M	-	-	-	H	-	M
H2	M	L	-	-	-	M	-	-	-	H	-	M
H3	M	M	-	-	-	M	-	-	-	-	-	-
H4	M	M	-	-	-	M	-	-	-	-	-	-
WSIF1	-	-	-	M	-	-	-	-	-	-	-	-
WSIF2	-	-	-	H	-	-	-	-	-	-	-	-

Section 6. Plan Implementation and Maintenance

6.1 Implementation through Existing Programs

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

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

6.2 Monitoring, Evaluation, and Updating the MHMP

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

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

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

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

Definitions

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

Hazard Mitigation Grant Program (HMPG)	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration.
Hazus-MH	A geographic information system (GIS)-based disaster risk assessment tool.
Multi-Hazard Mitigation Planning	Identify policies and actions that can be implemented over the long term to reduce risk and future losses from various hazardous events.
National Flood Insurance Program	Administered by the Federal Emergency Management Agency, which works closely with nearly 90 private insurance companies to offer flood insurance to property owners and renters. In order to qualify for flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards.
Planning Team	A group composed of government, private sector, and individuals with a variety of skills and areas of expertise, usually appointed by a city or town manager, or chief elected official. The group finds solutions to community mitigation needs and seeks community acceptance of those solutions.
Risk Priority Index	Quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards.
Risk Assessment	Quantifies the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.
Strategy	A collection of actions to achieve goals and objectives.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions.

Acronyms

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

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

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

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

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

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

G
GIS – Geographic Information System

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

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

M

MHMP – Multi-Hazard Mitigation Plan

N

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

P

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

R

RPI – Risk Priority Index

S

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

U

USGS – United States Geological Survey

Appendices

Appendix A. Meeting Minutes

Formal Mitigation Planning Meetings

Meeting 1 – November 20th, 2014

Meeting 2 – March 23rd, 2015

Meeting 3 – October 21st, 2015

Meeting 4 – March 10th, 2016

April 12th, 2016

Meeting 5 – December 19th, 2016

Meeting 1 – November 20th, 2014

Wabash County Multi-Hazard Mitigation Meeting 1
Chairman: Gerald Brooks (EMA Coordinator)
Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: November 20th, 2014

Meeting Time: 10:00 pm

Place: WVC Main Hall Room – 101 College Drive, Mt. Carmel, IL

Attendance: 28

Introduction to the Multi-Hazard Mitigation Planning Process

The planning team was welcomed by Prof. Nicholas Pinter, project director from SIU. Prof. Pinter gave an overview of Southern Illinois University's involvement in Regional Mitigation Planning. He introduced the plan partners: Gerald Brooks Wabash County EMA Coordinator and Greater Wabash Regional Planning Commission. Next he turned the meeting over to Amanda Damptz, project manager at SIU.

Amanda explained that the objective of this project is to develop Wabash County's Multi-Hazard Mitigation Plan (MHMP) to meet the requirements of the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA). This project is in response to the Disaster Mitigation Act of 2000, which requires communities to develop and maintain a mitigation plan in order to be eligible for Hazard Mitigation Assistance. Because the county does not participate in the National Flood Insurance Program (NFIP), Amanda stressed that any potential funds can only be used for projects outside of Special Flood Hazard Areas. In addition, the County cannot apply for Flood Mitigation Assistance because it requires NFIP participation.

Next, Amanda explained that the grant requires a 25% match from the county but will be met by sweat equity by an accumulation of time spent at the meetings, on research assignments, surveys, along with the time spent reviewing and producing the planning document.

Finally, Amanda presented a PowerPoint that divided the project into five to six meetings:

> Meeting 1 will consist of an overview of the planning process and discussion of schedule and milestones. This meeting will also include a discussion of roles, responsibilities, decision-making processes, administrative procedures, and communication strategies. SIU will collect and organize GIS and assessor's resources to use for the improved risk assessment and will confirm locations of essential and critical facilities.
>
> Meeting 2 will consist of profiling pertinent hazards to County and ranking them based on probability and risk for potential damage.
>
> Meeting 3 will be the public meeting. At the public meeting, the university will present the results of the risk assessment and describe the GIS and Hazus models. The meeting will conclude with open Q&A and an introduction to mitigation strategies.
>
> Meeting 4 will be a mitigation brainstorming session. The group will review the risk assessment from Meeting 2 to assist in prioritizing developed mitigation strategies. At the end of the meeting, the group will develop goals and objectives, as well as determining a 'pre-plan' on how to implement the strategies. Following this meeting, the university will compile a draft version of the mitigation plan.

1

> Meeting 5 is an opportunity for the planning team to review and revise the draft plan. They will make any necessary changes and fill in any gaps, and then submit the revisions to the university. The university partnership does not typically attend this meeting, but is available upon request.
>
> Meeting 6 is not technically a formal meeting. Meeting 6 consists of adopting the final plan upon FEMA's approval. The approval process can take several months, but once the plan is approved, the County will have to the end of their grant period to adopt the plan. The date the County adopts the plan is the date that is set for the five-year update.

Lastly, Prof. Pinter and Amanda Damptz fielded any questions from the planning team about the process of mitigation planning.

Meeting was adjourned.

2

Wabash County PDMP First Meeting
November 20, 2014 at 10 am
Wabash Valley College- Main Hall Room 101, Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
17	Tim Grounds	Village of Allendale	618 299 5291	805 S. Main Allendale	tim.grounds@frontier.com	President of Village	16
18	Ben Ross	Mt. Carmel Area Economic Alliance	618 262 5446	Mt. Carmel 62863 528 Market St.	ben.ross@wabash.com	Executive Director	4
19	Karen Uhelker	Vigo Coal	812-746-6780	7790 Hwy 15 Mt. Carmel, IL	kuhelker@vigocoal.com	Safety Director	6
20	Eric Bramlet	Mt. Carmel Public Utility Co	618 263-3502	P.O. Box 278 Mt. Carmel IL	ericbramlet@reporbramlet.com	C.U.O.	1 1/2
21	Margaret Fults	Mt. Carmel Public Utility Co	(618) 262-5151	P.O. Box 220 LITE 316 N. Market St	mfults@mtcpu.com	President	1 1/2
22	Tom Dorsch	Dorsch Electric	(618) 262-5181	Po Box 217 Mt Carmel IL	tomdorsch@hotmail.com	President	1
23	Bob Bowser	Allendale CCSD 17	618-299-3161 (ext 18)	PO Box 130 Allendale, IL	BBOWSER@ALLENDALESCHOOL.NET	SUPERINTENDENT	16
24	Chris Taylor	WCUSD #348 W.C.I.C.E.	263-3876	1300 N. Walnut St.	ctaylor@wabash348.com	Principal	2
25	Kyle Smith	Wabash County 911	740 5309	130 E 4th St	wabash911@gmail.com	911 Coordinator	1

Tawyn Bunting CWRPC
Amanda Dunston
Nicholas Porter

36

Wabash County PDMP First Meeting
November 20, 2014 at 10 am
Wabash Valley College- Main Hall Room 101, Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
1	Gerald Brooks	W.C. Health Dept. W.C. EMA Allendale RFPD	618-262-6715	10664 N. 1800 E Rd. Mt. Carmel, IL	gbrooks50@live.com	E.P. Coord. E.M.A. Coord. Chief	5
2	Bobby Moyers	WVC	262-1920		moyersb@iecc.edu	IT	1
3	Bob Efflandt	Amateur WVJCN Radio	262-7111	1422 Lisa Ln Mt Carmel	befflandt@gmail.com	Radio Engineer	3
4	Tamara Gould	Wabash Carmel Hospital	263-6307	1418 College Dr. mt. Carmel, IL 62863	tgoulder@wabashgeneral.com	CNE	2m
5	Sheila Odom	Wabash CUSD #348 Southside Elem.	263-3851	715 W 3rd St Mt. Carmel, IL	sodom@wabash348.com	Principal	4m
6	[illegible]	Wabash Co. Sheriff's		916 OAK ST			2m
7	Ross Madden	OAK VIEW VILLA	240-9022		MADDEN42@FRONTIER.COM	MAINT'S SAFETY	2
8	Bill Hudson	City/Mt Carmel	262-4831	219 N. MARKET		Mayor	2
9	Katie Hendelette On behalf of Matt Fowler	Wabash Valley College	263-8641	2200 College Dr. Mt. Carmel, IL 62863	fowlerm@iecc.edu	President	—
10	Shawn Perry	Village of Keensburg	599-8641	9322 Jackson St Mt Carmel IL	Perry07@frontier.com	Mayor	5
11	Steve Holt	Mt. Carmel Shuttle Bus	618-262-5194	1520 Poplar Mt Carmel, IL 62863	sholt@wabash348.com	Principal	1
12	Pat Cheesman	Mount Carmel High School	618-262-5104	201 North Pear Mount Carmel, IL 62863	pcheesman@wabash348.com	Principal	1 1/2
13	Rudy Witsman	City of Mount Carmel	618-262-4822	219 N. Market St. Mount Carmel	rudyw@cityofmtcarmel.com	Administrator	1 1/2
14	John Lockhart	City of Mt. Carmel Police Dept	618-262-4433	120 E. 4th St. Mount Carmel	jlockhart@wabash911.net	Chief	1 1/2
15	Terry McGuire	Mt. Carmel Fire Dept	618 262-4311	830 N. Walnuts Mt. Carmel	MTFD@frontier.com	Captain	1 1/2

Meeting 2 – March 23rd, 2015

Wabash County Multi-Hazard Mitigation Plan Meeting 2
Chairman: Gerald Brooks (EMA Coordinator)
Plan Directors: Southern Illinois University and Greater Wabash Regional Planning Commission

Meeting Date: March 23rd, 2014

Meeting Time: 2:00 pm

Place: Wabash Valley College, Main Hall Room 101, Mount Carmel, IL

Attendance: 25

Hazard Ranking

The planning team was welcomed by Amanda Damptz, project manager from SIU. Amanda Damptz gave an overview of the planning process and discussion of schedule and milestones. She explained that the objective of this project is to develop Wabash County's Multi-Hazard Mitigation Plan (MHMP) to meet the requirements of the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA).

The first task of the meeting was to assemble a list of disaster-related threats facing the community. A power point presentation was presented by Amanda and she discussed the historical disasters that have occurred in Wabash County. This information was used to guide the Hazard Ranking Exercise that the County and each participating jurisdiction must complete.

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

Hazard	Probability	Severity	Risk Index	Ranking
Tornadoes	4	4	16	1
Levee Failure	2	8	16	2
Earthquakes	2	6	12	3
Severe Thunderstorms	4	2	8	4
Hazardous Materials Release	3	3	9	5
Flooding	4	2	8	6
Winter Storms	3.5	2	7	7
Ground Failure	1	2	2	8

Each jurisdiction within the county is responsible for filling out a separate Risk Assessment and submit it to SIU. The next meeting will be the public meeting where SIU will present the results of the risk assessment, describe the GIS and Hazus models. This which will give the public a chance to voice their opinions regarding the plan. After the public meeting the team will meet and review the Risk Assessment.

Meeting was adjourned.

Wabash County PDMP Second Meeting
March 23, 2015 at 2 p.m.
Wabash Valley College- Main Hall Room 101, Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
17	Shawn Perry	Keensburg IC	618-838-3062	9322 Jackson St Mount Carmel	Perry 07@Frontier.com	Village Presidente	10
18	Rusty Weitsman	City of Mount Carmel	618-262-4822	MOUNT CARMEL, IL 62863 219 N. MARKET ST.	rusty@cityofmtcarmel.com	CITY CLERK/ ADMINISTRATOR	1
19	Bill Hudson	City of Mount Carmel	618-262-4822	219 N. Market St.	William_Hudson@Hotmail.com	Mayor	
20	John Lockhart	Mt. Carmel Police	618-262-4433	120 E. 4th St.	jlockhart@wabash911.net	Chief Police	—
21	J. Derek Morgan	Wabash Co Sheriff	618-262-5406	120 E. 4th St.	dmorgan@wabash911.net	SHERIFF	—
22	Dawn Burtis	OWRPC					81
23	Tim Deesel	Deesel Energy	618-262-5181	1200 Oak St Mt Carmel IL	tim.deesel@hotmail.com	Prop Rep	WA
24	Wayne Heregar				heregarw@hci-consulting.net		
25	Amanda Demaar	SIU					
26							
27							
28							
29							
30							

Wabash County PDMP Second Meeting
March 23, 2015 at 2 p.m.
Wabash Valley College- Main Hall Room 101, Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
1	Aaron Brown	City of Mt Carmel - Fire Dept	618-262-4311	830 Walnut Mt Carmel, IL 62863	MTCFD@Frontier.com	Fire Chief	
2	Gerald Brooks	Allendale RFPD Health Dept/EMA	618-262-6715	10669 N. 1800 Mt. Carmel	gjbrooks50@live.com	Fire chief EMA coord. EA coord	
3	Jim Pflieger	Grealon Wabash	618-262-8846	Mt Carmel 603 W 5th St	jimpflieger@yahoo.com	Board Member	
4	Chris Taylor	NICE					1
5	Sheila Odom	South Elementary Wabash Co. #348					2
6	Tamara Gould	Wabash General Hospital	618 263 1207	1418 College Dr. MC	tgould@wabashgeneral.com	CNE	2
7	Ben Ross						
8	Courtney Yost	University of Illinois Extension - Unit 25	618-943-5219	1600 Cherry Lane Lawrenceville	yostc@illinois.edu	Community & Economic Development	25 Miles
9	Tim Grounds	Village of Allendale	618-299-5291	308 Main Street	tmgrounds@frontier.com	Village President	10
10	Bob Bowser	Allendale School	618-845-7305		BBOWSER@ALLENDALESCHOOL.ORG	SUPERINTENDENT	10
11	Steve Holt	Mt Carmel Middle School	618-262-5694	1520 Poplar St Mt Carmel	sholt@wabash348.com	Principal	1
12	Katie Hinderliter, on behalf of Matt Fowler	WVC	618-262-8641	2200 College Dr. Mt. Carmel, IL	hinderliterk@iecc.edu fowlerm@iecc.edu	Admin Asst. President	
13	Eric Bramlet	Mt. Carmel Public Utility Co.	618-263-3502	PO Box 278 Mt. Carmel IL	ebramlet@rogerbramlet.com	Atty.	
14	Margaret Fultz	Mt. Carmel Public Utility Co.	(618) 262-5151	P.O. Box 220 Mount Carmel IL 62863	mfultz@mtcpu.com	President	
15	Kyle Smith	Wabash County 9-1-1	618-262-2501	120 E 4th St Mt Carmel IL 62863	Wabash911@gmail.com	9-1-1 Coordinator	

Meeting 3 – October 21st, 2015

Wabash County Multi-Hazard Mitigation Plan Meeting 3

Chairman: Gerald Brooks (EMA Coordinator)

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

Meeting Date: October 21, 2015

Meeting Time: 1:30 p.m.

Place: Wabash Valley College

Attendance: see sign in sheet

SIU presented the draft risk assessment, derived from the Hazus-MH and GIS modeling of the identified disasters, to the planning team. The general public was invited to this meeting through a public release in the newspaper. At the end of the meeting, SIU encouraged the general public to ask questions and provide input to the planning process, fulfilling one of FEMA's requirements for public input. A powerpoint presentation was made by SIU on the historic accounts of natural disasters that have affected the County.

Next meeting: identify and prioritize mitigation strategies

Wabash County PDMP Public Meeting
Wednesday, October 21, 2015 1:30 pm
Wabash Valley College Main Hall, Room 101 Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Mileage
1	Tim Grounds	Village of Allendale	618-299-3181	E 1st Main Street	timgrounds@frontiercom		20
2	Bob Bowser	Allendale School	618-299-3761	101 N 3rd St	bbowser@allendale.k12.il.us	Superintendent	20
3	Shawn Perry	Keensburg	618-895-8691	9382 Jackson St	Perry07@frontiercom	Village Pres.	15
4	Matt Fawcett	WVC	618-262-8641	2200 College Dr	fawcettm@iecc.edu	Prof. CAPT	2
5	Approved	Mt Carmel Fire Dept	618-263-0311	830 W Alvord Mt Carmel, IL	mtcfd@frontier.com		3
6	John Lockhart	Mt. Carmel Police	812-262-4933	122 E. 4th St. Mt. Carmel	JLockhart@mtcarmelpolice.net	Chief	3
7	Steve Holt	Wabash 349	618-263-5699	1530 Hyde St Mt. Carmel IL	sholt@wabash349.com	Mtce Director	2
8	Bear Ross	MCAEA	618 262 5433	P.O. Box 41 Mt Carmel, IL 62863	ben.ross@mcaea.com	Ex. Director	2
9	Rudy Witsman	Mount Carmel	618-262-4862	211 N. Market Mt C	rudyw@cityofmtcarmel.com	Administrator	2
10							
11							
12							
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15							

Meeting 4 – March 10th, 2016

Wabash County Multi-Hazard Mitigation Plan Meeting 4

Chairman: Gerald Brooks (EMA Coordinator)

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

Meeting Date: March 10, 2016

Meeting Time: 9:00 a.m.

Place: Wabash Valley College- Main Hall Room 101- Mt. Carmel, IL

Attendance: see sign in sheet

GWRPC was present for a public meeting to discuss the importance of brainstorming mitigation strategies. The group was told about possible goals and objectives that could be implemented into the County's plan. Those present were invited to return on April 12th for a follow up meeting to receive input from SIUC representatives on further mitigation strategies.

Wabash County PDMP Public Meeting
Thursday, March 10, 2016 9:00 am
Wabash Valley College,Main Hall, Room 101 Mt. Carmel, IL

17	Kyle Smith X	Wabash County 911	6182622501	120 E 4th St Mt Carmel	wabash911egmail.com	911 Coordinator	2
18	Ronda Banks	EMA Wabash County	618-450-0361	54 Lambert Dr. mt. Carmel	Ema22-30@Frontier.com	EOC Captian	2
19	Terry McGuire X	MT. CARMEL Fire	618-262-4911	830 N. WALNUT MT. CARMEL IL.	MTEFD@Frontier.com	MTCFD CAPT.	2
20	Bob Bowser X	ALLENDALE CCSD17	618-299-3161	101 N. 3RD ST ALLENDALE, IL.	BBOWSER@ALLENDALESCHOOL.NET	SUPERINTENDENT	12
21							
22							
23							
24							
25							

Wabash County PDMP Public Meeting
Thursday, March 10, 2016 9:00 am
Wabash Valley College,Main Hall, Room 101 Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Milage
1	MATT FOWLER X	WABASH VALLEY COLLEGE	618-262-8641	2200 College Dr.	fowlerme@iecc.edu	Pres.	0
2	John LOCKHART X	CITY MT. CARMEL	618-262-4433	130 E. 4TH ST.	JLockhart@Wabash911.NET	CHIEF	0
3	DUSTIN BUNTING X	CO HWY DEPT.	618-262-4466	1132 N 1550 BLVD	countyeng@frontier.com	CO. ENGR.	1
4	Rudy Witsman X	CITY MTCARMEL	618 262 4822	219 N. Market	rudyw@cityofmtcarmel.com		1
5	J. DEREK MORGAN X	WABASH CO. SHERIFF	618-262-1702	120 E. 4th St.	dmorgan@wabash911.net	SHERIFF	10
6	Mark Myer X	WABASH EMA	618-262-5307	930½ NorthMarket	Hamcom@FRONTIER.com	ASST COORDINATOR	2
7	Ben Ross X	MCAEA	618-262-5432	1001 Market St	ben.ross@MCAEA.com	PRESIDENT	2
8	Gerald Brooks X	WEMA/WCHD	618-262-6715	930½ Market St	gbrooks58@live.com	Coord. Chief	2
9							
10							
11							
12							
13							
14							
15	Name	Representing	Phone Number	Address	Email Address	Job Description	

Meeting 4 (Redo) – April 12th, 2016

Wabash County Multi-Hazard Mitigation Plan Meeting 4

Chairman: Gerald Brooks (EMA Coordinator)

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

Meeting Date: April 12, 2016

Meeting Time: 9:00 a.m.

Place: Wabash Valley College- Main Hall Room 101- Mt. Carmel, IL

Attendance: see sign in sheet

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

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

Wabash County PDMP Meeting
April 12, 2016 at 9:00 AM
Main Hall, Room 101, Mt. Carmel, IL

	NAME	REPRESENTING	PHONE	ADDRESS	EMAIL	JOB TITLE	Milage
17	Debra Thompson	Wabash EMA	262-2949	227 McDowell	sheriffic@gmail.com	weather Captain	2.0
18							
19							
20							
21							
22							
23							
24							
25							

Wabash County PDMP Meeting
April 12, 2016 at 9:00 AM
Main Hall, Room 101, Mt. Carmel, IL

	Name	Representing	Phone Number	Address	Email Address	Job Description	Milage
1	Gerald Brooks	WEMA WCHD ARFPD	618-262-6715	930½ Market St. Mt. Carmel IL	gbrooks5@live.com	Coordinating Coordinator Chief	2
2	Mark MAJORS	WEMA ARFPD	618-262-1570	930½ Market St Mt. Carmel IL	Hamcom@Frontier.com	Asst. coordinator member	1
3	Rudy Witsman	CITY MT. CARMEL	618-262-4822	219 N. Market St.	rudyw@cityofmtcarmel.com	Adm	2
4	Justin Bunting	CO. HWY.	618-262-2446	11324 N 1550 BLVD	countyeng@frontier.com	Co Engineer	3.5
5	(Rhonda) Elizabeth Banks	WEMA	618-262-2681	1031 w 6th	bankselizabeth30@gmail	ema member	
6	Kyle Smith	9-1-1	618-262-2501	120 E 4th St Mt Carmel	wabash911@gmail.com	9-1-1 Coordinator	2
7	J. Derek Morgan	Sheriff	618-262-2706	" "	dmorgan@wabash911.net	Sheriff	2
8	Bob Bowser	Allendale CCSD 17	618-299-3161	101 N. 3rd ST, Allendale	bbowser@allendaleschool.net	Superintendent	12
9	Ben Ross	MCAEA	618-262-5455	1001 Market St. Mt. Carmel	ben.ross@mcaea.com	MCAEA President	2
10							
11							
12							
13							
14							
15	Name	Representing	Phone Number	Address	Email Address	Job Description	

Meeting 5 – December 19th, 2016

Wabash County Multi-Hazard Mitigation Plan Meeting 5

Chairman: Gerald Brooks (EMA Coordinator)

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

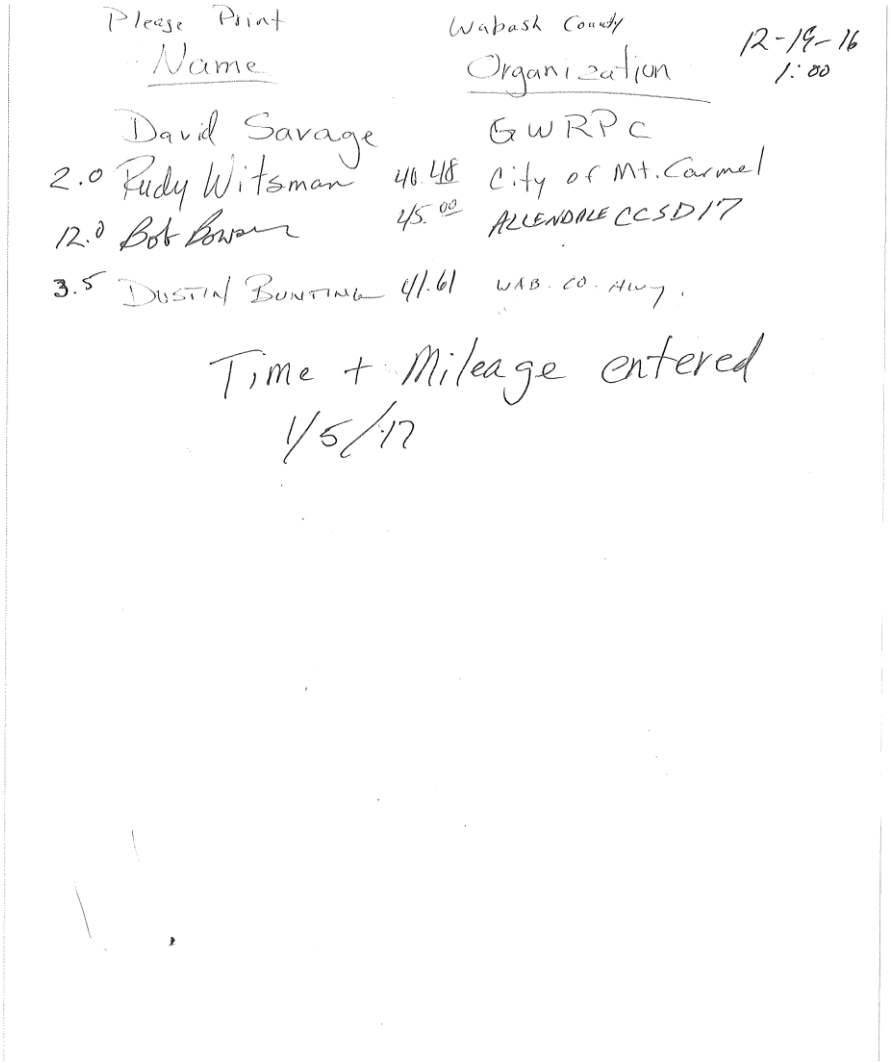
Meeting Date: December 19, 2016

Meeting Time: Come and Go- informal

Place: GWRPC 10 W. Main St. Albion, IL

Attendance: see sign in sheet

David Savage with GWRPC met with individuals on a one on one basis to hand deliver the plan and explain the process of editing errors. Each person who attended was given a printed copy of the draft plan that was provided by SIU. Each person was asked to spend time reviewing the plan and bring back and editted version with any errors within 2 weeks.



Wabash County Multi-Hazard Mitigation Plan

Chairman: Gerald Brooks (EMA Coordinator)

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

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

Call Log

Date	Name	Representing	Job Description	Call Duration	Wabash County Planning Team Member
08/15/16	Shawn Berg	Village of Bellmont	Public Works	1 hour	EMA Coordinator

Appendix B. Press Release and Newspaper Articles

October 13, 2015
Press Release- For Immediate Release
For more information, contact:
David Savage, Grant Administrator, Greater Wabash Regional Planning Commission
(618) 445-3612

The Wabash County Hazard Mitigation Steering Committee will host a public meeting at 1:30 p.m. on Wednesday, October 21, in room 101 of Main Hall, on the campus of Wabash Valley College.

The Federal Emergency Management Agency (FEMA) requires each unit of government in the United States to have a FEMA-approved Multi-Hazard Mitigation Plan. In the pursuance of compliance, Wabash County and Southern Illinois University – Carbondale (SIU-C) have worked to identify potential natural hazards and to produce a mitigation plan to address the hazards. The partnership will result in a Draft Multi-Hazard Mitigation Plan (MHMP). The draft plan seeks to identify potential natural hazards for Wabash County and establish mitigation measures that are intended to reduce or eliminate the negative impact that a particular hazard may have on the county.

For this meeting, the MHMP jurisdictions will be brainstorming mitigation strategies. Representatives from SIU-C will offer sample strategies and those of previous plans to help give the group ideas of what they might include in the Wabash County plan. Anyone who has questions or would like to provide input should attend the meeting on March 10th or contact David Savage, Grant Administrator, Greater Wabash Regional Planning Commission at 618-445-3612 or davidsavage@gwrpc.com.

March 3, 2016
Press Release- For Immediate Release
For more information, contact:
David Savage, Grant Administrator, Greater Wabash Regional Planning Commission
(618) 445-3612

The Wabash County Hazard Mitigation Steering Committee will host a public meeting at 9:00 a.m. on Thursday, March 10th, in room 101 of Main Hall, on the campus of Wabash Valley College.

The Federal Emergency Management Agency (FEMA) requires each unit of government in the United States to have a FEMA-approved Multi-Hazard Mitigation Plan. In the pursuance of compliance, Wabash County and Southern Illinois University – Carbondale (SIU-C) have worked to identify potential natural hazards and to produce a mitigation plan to address the hazards. The partnership has resulted in a Draft Multi-Hazard Mitigation Plan (MHMP). The draft plan seeks to identify potential natural hazards for Wabash County and establish mitigation measures that are intended to reduce or eliminate the negative impact that a particular hazard may have on the county.

For this meeting, the MHMP jurisdictions will be choosing/writing mitigation strategies. Representatives from SIU-C will bring sample strategies and those of previous plans to help give the group ideas of what they might include in the Wabash County plan. Anyone who has questions or would like to provide input should attend the meeting on March 10th or contact David Savage, Grant Administrator, Greater Wabash Regional Planning Commission at 618-445-3612 or davidsavage@gwrpc.com.

Appendix C. Adopting Resolutions

See Attached Adopting Resolutions

Appendix D. Historical Hazards

See Attached Newspaper Clippings and Large Format Map

Appendix E. List of Essential Facilities

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

Emergency Operations Center

Name	Address	City
Wabash Emergency Management Agency	930 ½ Market Street	Mount Carmel

Fire Stations

Name	Address	City
Allendale Rural FPD	404 E. Main Street	Allendale
Bellmont Volunteer FPD	102 S Freetrade Street	Bellmont
Keensburg Volunteer FD	6108 3rd Street	Keensburg
Lancaster FD	404 E. Main Street	Allendale
Mt Carmel FD	830 Walnut Street	Mt. Carmel

Police Stations

Name	Address	City
Mount Carmel PD	120 E. 4th Street	Mount Carmel

Medical Care Facilities

Name	Address	City	Comments
Wabash General Hospital	1418 College Drive	Mount Carmel	

Schools

Name	Address	City	Comments
Allendale CCSD #17	101 N. 3rd Street	Allendale	Elementary School
Mount Carmel High School	201 N Pear Street	Mount Carmel	High School
Mount Carmel Middle School	1520 Poplar Street	Mount Carmel	Middle School
North Intermediate Center of Education	1300 N Walnut Street	Mount Carmel	Elementary School
Lancaster Christian School	6484 Highway 11	Mount Carmel	Private School
South Elementary School	715 W 3rd Street	Mount Carmel	Elementary School
St Mary's Catholic School	417 Chestnut Street	Mount Carmel	Private School
Wabash Valley Community College	2200 College Drive	Mount Carmel	College

Appendix F. Critical Facilities Map

See Attached Large Format Map of Critical Facilities.