Threat and Hazard Identification and Risk Assessment (THIRA)

DECEMBER 2015

ALLEN COUNTY OFFICE
OF HOMELAND SECURITY

Table of Contents

The following report was developed by a multi-jurisdictional, interagency local team with assistance from The Polis Center at Indiana University–Purdue University Indianapolis (IUPUI). The planning effort was led by the Allen County Office of Homeland Security.

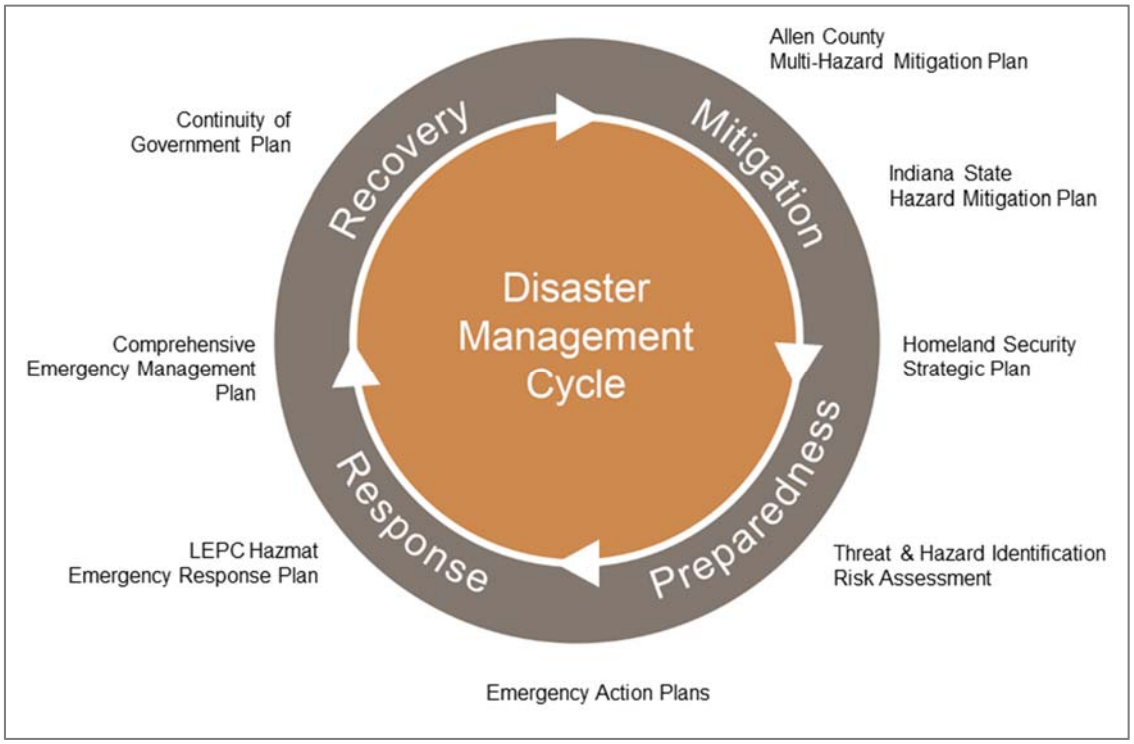
The Polis Center
We bring things into perspective. ™

Executive Summary

The Allen County Threat and Hazard Identification and Risk Assessment (THIRA) is an all-hazards planning tool designed to help the county understand the full-range of its risks and estimate capability requirements for the whole community including individuals, businesses, faith-based organizations, nonprofit organizations, schools and academia, and all levels of government.

Allen County has produced a number of emergency operations and strategy plans to address the different phases of the disaster management cycle. Its goal is to integrate all of those plans into one comprehensive THIRA that serves as a collaborative planning tool for the entire county and serves as a baseline for all future and ongoing planning efforts in the areas of mitigation, preparedness, response, and recovery. Figure 1 illustrates the county documents that inform this document.

Figure 1: An Integrated Planning Process



The Allen County THIRA is a long-term planning initiative that will continue to be developed and refined over time. In this plan, the county focused on the following components: (1) identification of threats and hazards, (2) description and context of threats and hazards within Allen County, (3) quantitative and qualitative analyses of threats and hazards, (4) establishing core capabilities and identifying capability targets, and (5) evaluating its existing capacity to meet the capability targets.

This plan was developed according to guidance from FEMA's 2015 *State Preparedness Report*, which requires states and territories to submit state and local capabilities to FEMA by December 31 each year. Additionally, the plan incorporates guidance from the resources listed in Table 1.

KEY FACTS ABOUT ALLEN COUNTY

The Fort Wayne International Airport serves more than 600,000 passengers per year

Allen County has nearly 200 care facilities

There are six essential facilities located within the 100-year floodplain

Three rivers converge in Fort Wayne: St. Mary's, St. Joseph, and Maumee Rivers

The county has 12 dams and 5 accredited levees

Table 1: Guidance and Planning Documents used for 2015 THIRA Development

Year	Author	Title
2015	Federal Emergency Management Agency	State Preparedness Report
2013	US Department of Homeland Security	Comprehensive Preparedness Guide (CPG) 201
2010	Federal Emergency Management Agency	Comprehensive Preparedness Guide (CPG) 101
2007	US Department of Homeland Security	Target Capability List: A companion to the National Preparedness Guidelines
2015	Homeland Security National Training Program	Readiness: Training Identification & Preparedness Planning
2015	Indiana Department of Homeland Security	Preparedness Cycle Implementation
2014	Allen County Local Emergency Planning Committee	Hazardous Materials Emergency Response Plan
2013	Allen County Office of Homeland Security	Allen County Strategic Plan
2012	Allen County Office of Homeland Security	Comprehensive Emergency Management Plan
2012	Allen County Office of Homeland Security Christopher B. Burke Engineering, LLC	Allen County Multi-Hazard Mitigation Plan Update
2010	Allen County Office of Homeland Security	Continuity of Government Plan
2014	Indiana Department of Homeland Security The Polis Center	Indiana State Hazard Mitigation Plan

Introduction

Every community should understand the risks it faces. The purpose of the Threat and Hazard Identification and Risk Assessment (THIRA) is to present information and data that will inform the county's ability to identify, assess, and prioritize its natural and human-caused hazards and facilitate the identification of capability and resource gaps.

The Allen County THIRA was developed as a collaborative effort among the Allen County Office of Homeland Security, The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI), and a local planning team that consisted of various county stakeholders.

This THIRA follows a four-step planning process as recommended by the US Department of Homeland Security's *Comprehensive Preparedness Guide (CPG) 201.*

1. **Identify threats and hazards:**
   Based on a combination of experience, forecasting, subject matter expertise, and other available resources, identify a list of the threats and hazards of primary concern to the community.
2. **Give the threats and hazards context:**
   Describe threats and hazards of concern and show how they may affect the community
3. **Establish capabilities:**
   Assess core capabilities and desired outcomes, determine threats and impacts, and identify capability targets.
4. **Apply the results:**
   For each core capability, estimate resources required to achieve the capability targets through the use of community assets and mutual aid, while also considering preparedness activities, including mitigation opportunities.

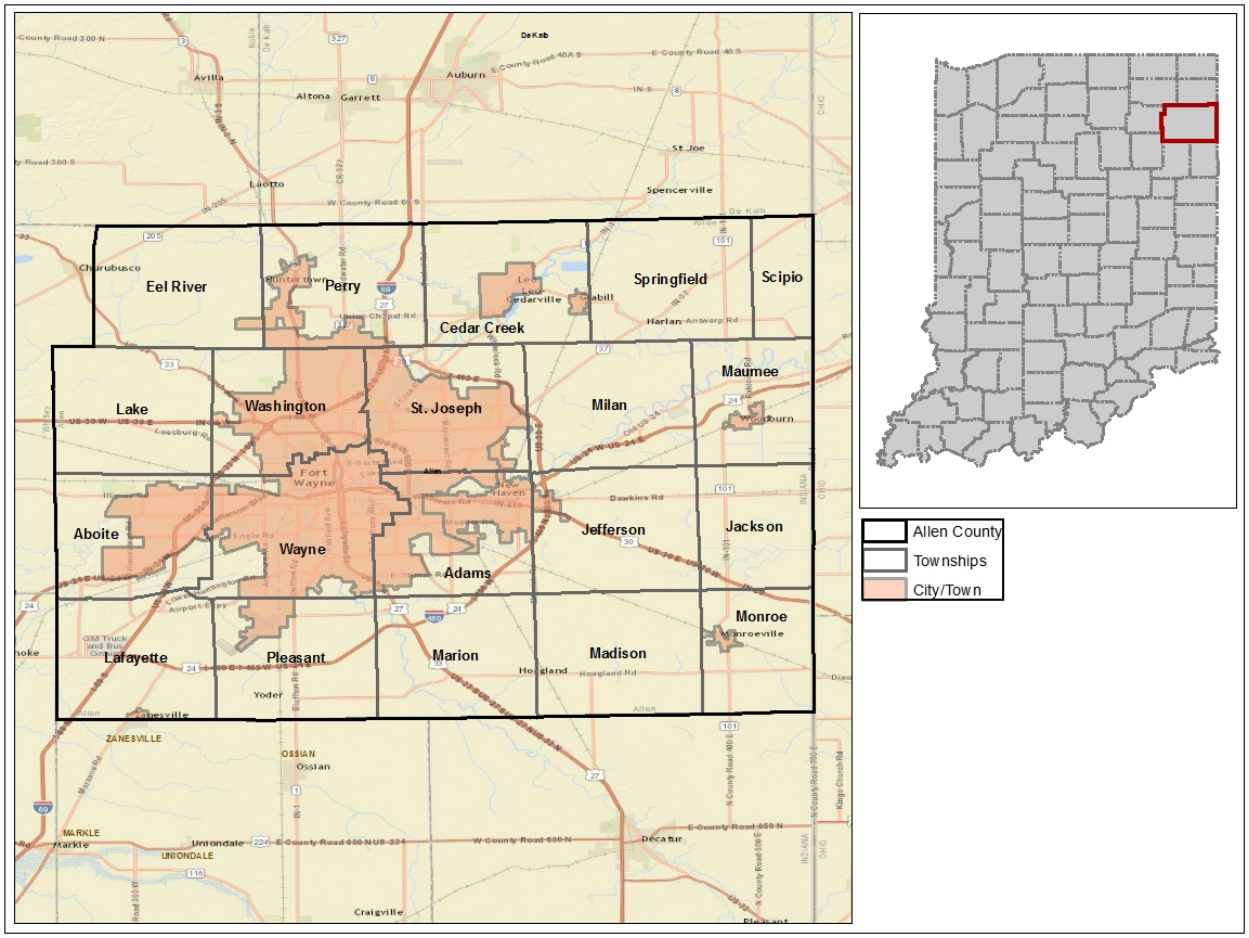
Planning Principles

Effective community-based planning must be representative of the actual population within the community and must engage the whole community in the planning process. This section describes Allen County and the communities within it and provides an overview of the planning team and its process.

The Community

Allen County is located in northeast Indiana on the Indiana-Ohio state border approximately 120 miles northeast of the state capital of Indianapolis. It includes eight incorporated jurisdictions and two census-designated places. Figure 2 shows the location of the county and the boundaries of its incorporated communities.

Figure 2: Allen County, Indiana Location



Demographics

The most recent census data estimates the county's population at 365,918, which is the third highest in the state[i]. Of the total population, more than 70% reside in the City of Fort Wayne. Table 2 lists population by community.

Table 2: Allen County Population by Community

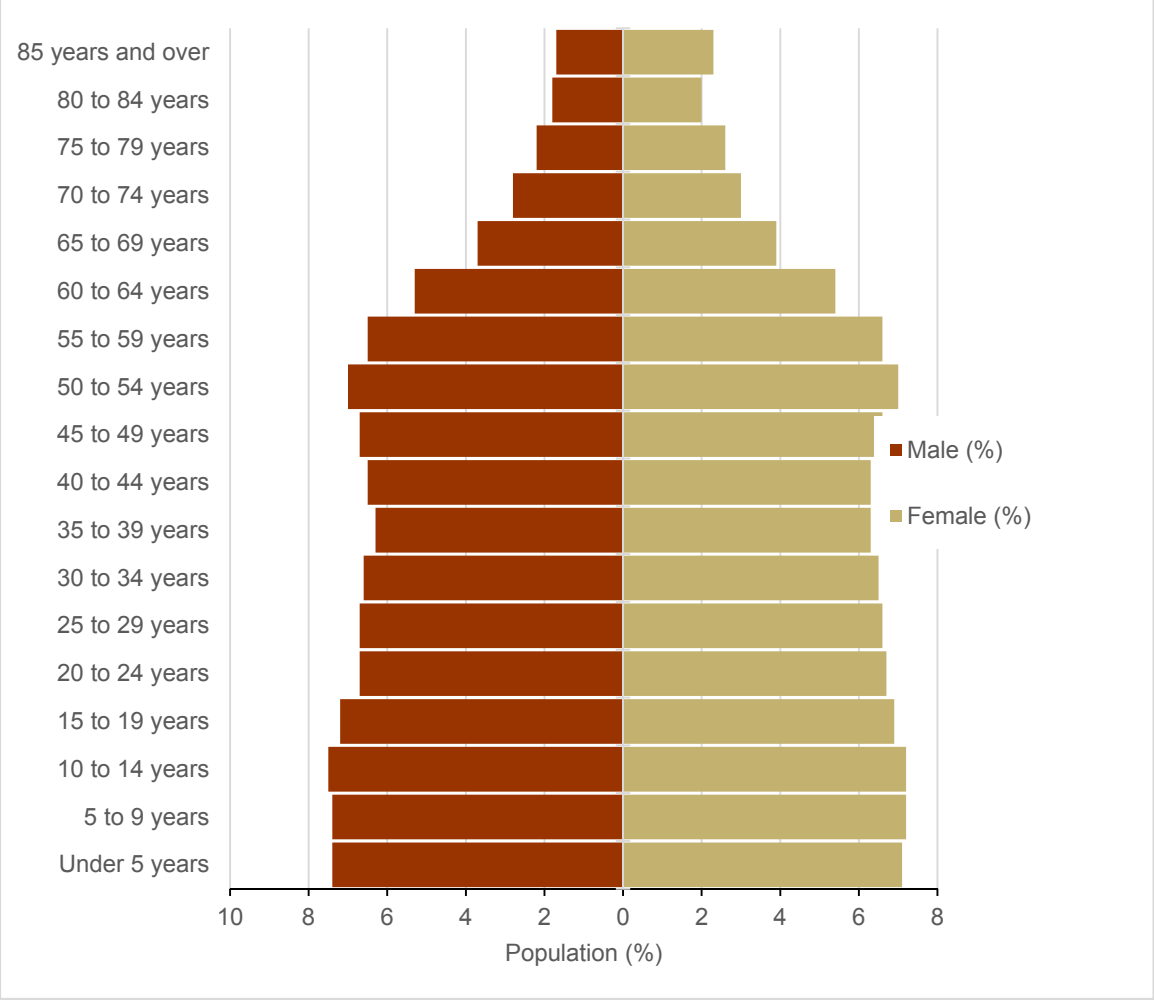
Community	Population (2014)	Percent of County
City of Fort Wayne	258,522	70.7%
City of New Haven	15,608	4.3%
Town of Hunterton	5,349	1.5%
Town of Leo-Cedarville	3,818	1.0%
Town of Monroeville	1,292	0.4%
City of Woodburn	1,601	0.4%
Town of Grabill	1,121	0.3%
Town of Zanesville	134	0.0%*

*The Town of Zanesville crosses county lines. Only the population within Allen County is shown in this table.

Allen County's population is 80.9% White. The largest minority populations are Black (9.6%) and Hispanic (6.6%). The median age of Allen County residents is 35.7, compared to the state's median age of 37.5. Figure 3 shows the county's population pyramid, which illustrates the distribution of population in terms of age groups and gender. Population pyramids are used to analyze growth or decline of fertility, mortality, and migration.

Allen County's population pyramid is relatively stable indicating slow population growth, long life expectancy, and low infant mortality. The slight increase in population from 45 to 59 years represents the tail end of the baby boom generation, which is defined as the population cohort born between 1946 and 1964. This increase will continue to travel upward as that population ages.

Figure 3: Allen County Population Distribution by Age and Gender



Special Needs Populations

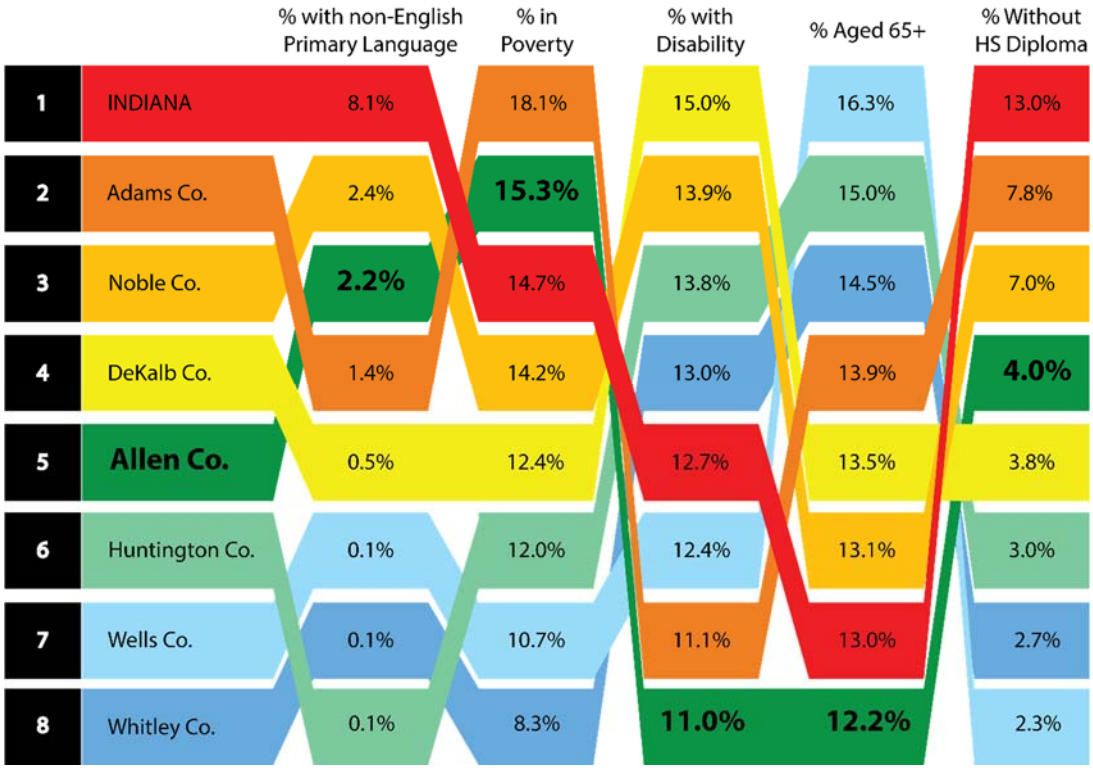
Certain populations require special attention in emergency management planning because they may suffer more severely from the impacts of disasters. It is important to identify these populations and establish targeted capabilities to help them become more disaster-resilient.

Although there are numerous types of vulnerable populations, Allen County has identified five groups on which to focus. The groups include low-income residents, older adults, residents who do not speak English at home, people with disabilities, and people without high school diplomas.

To compare Allen County's vulnerable populations to neighboring counties and the state, we used 2013 US Census Bureau data to calculate the average of percent population of each special needs category. The calculation showed that Allen County's percentages are slightly lower than the state

and Adams and Noble counties; however, the overall results revealed little variation across the region (Figure 4). The special needs category in which Allen County has the highest percentage is percent people in poverty (15.3%). People with low income and socioeconomic status often have difficulty absorbing losses and are therefore less resilient to threats and hazards. The Allen County planning team considered these vulnerable populations while identifying threats and hazards to consider and establishing capability targets.

Figure 4: Regional Comparison of Special Needs Populations by Category



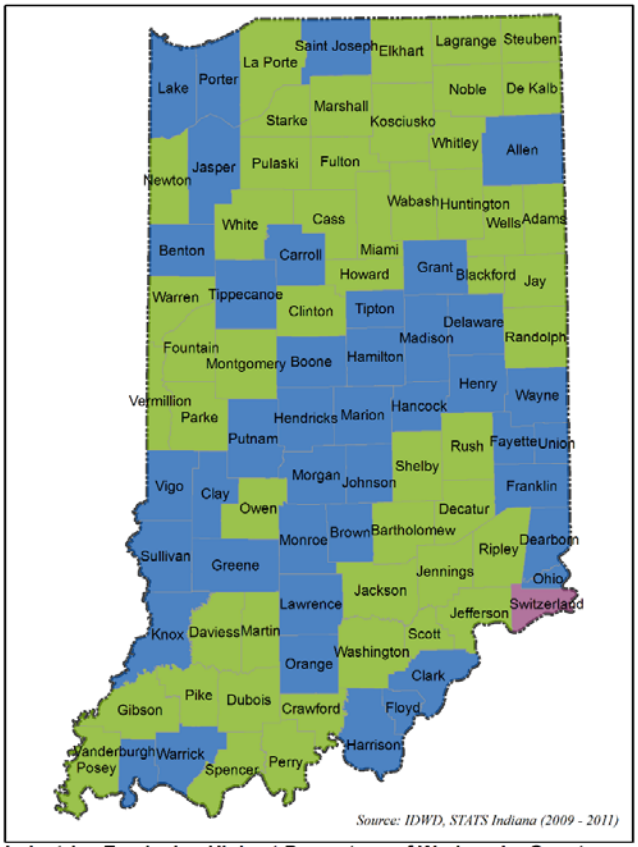
Employment

As of 2014 US Census Bureau estimates, the total resident labor force in Allen County was 175,530 with 10,160 unemployed, resulting in an unemployment rate of 5.8%. Of the county's total work force, 12.4% are employed in the manufacturing industry and 15.0% are employed in the health care and social services industry. Table 3 lists major employers and number of employees as reported by the Greater Fort Wayne Inc. Metro Chamber Alliance. Figure 5 illustrates industries employing the highest percentage of workers in the state by county[ii].

Table 3: List of Major Employers and Number of Employees

Employer	Number of Employees	Community	Services
Parkview Health Systems	4,710	Fort Wayne	Hospitals
Lutheran Health Network	4,301	Fort Wayne	Hospitals
Fort Wayne Community Schools	4,230	Fort Wayne	Elementary and Secondary Schools
General Motors	3,909	Roanoke	Motor Vehicle Manufacturing
Lincoln Financial Group	1,970	Fort Wayne	Insurance Carriers
City of Fort Wayne	1,814	Fort Wayne	Government
Allen County Government	1,605	Fort Wayne	Government
BFGoodrich	1,580	Woodburn	Rubber Tire Manufacturing
IPFW	1,255	Fort Wayne	University
BAE Systems Platform Solutions	1,150	Fort Wayne	Aircraft Electronics

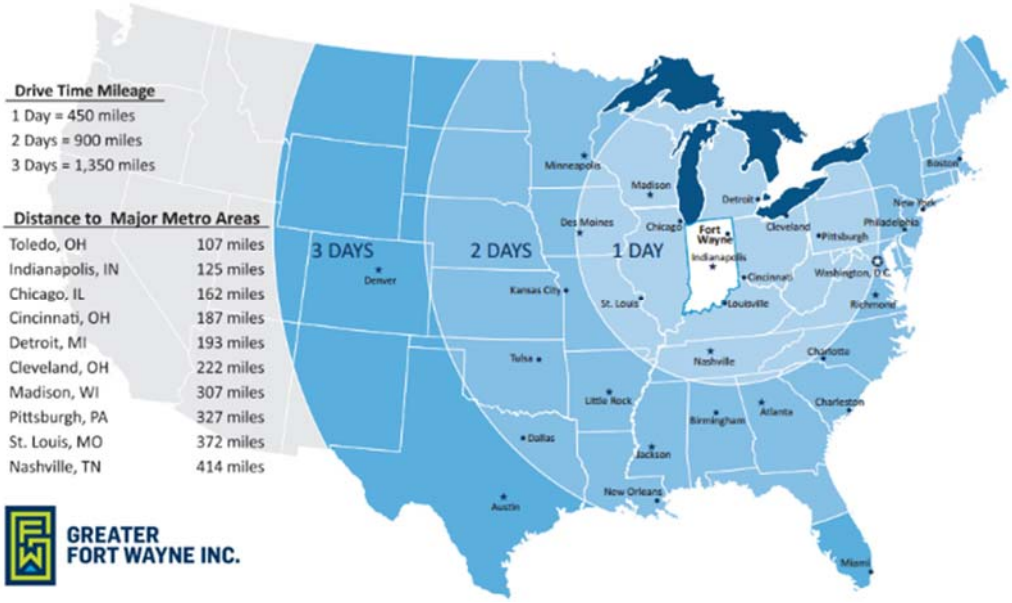
Figure 5: Industries Employing Highest Percentage of Workers by County



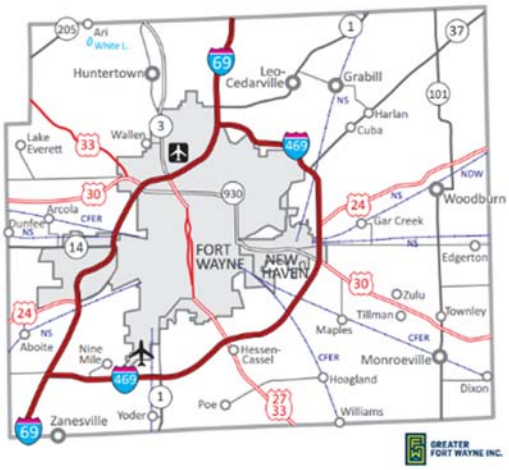
Transportation

Allen County, particularly Fort Wayne, is a central hub for Midwestern transportation. More than half of the continental US is within a two-day drive and approximately 50% of all US markets are within a one-day drive, according to the Greater Fort Wayne Inc. Metro Chamber Alliance. Figure 6 illustrates accessibility according to driving time from major metropolitan areas.

Figure 6: Driving Accessibility around Allen County.



Surface transportation in Allen County Interstates 69 and 469, Highways 24, 27, 30, and 33, and State Roads 1, 3, 14, 37, 101, 205, and 930 (see figure at right).



Allen County's rail system includes Norfolk Southern and two CSX short-line partners: the Chicago, Fort Wayne & Eastern Railroad and the Napoleon, Defiance & Western Railroad. These systems together serve over 42,000 miles of track across 20 states and in part of Canada.

Fort Wayne also has two airports. The Fort Wayne International Airport is home to four major carriers—United, Delta, American, and Allegiant Air—and served over 600,000 passengers in 2014. It has over 100 weekly non-stop flights to Chicago, Atlanta, Dallas/Fort Worth, Tampa, and other major cities. Fort Wayne is also home to Smith Field Airport, which is a general aviation airport that also offers flight instruction classes.

The Planning Team

The planning team is headed by the director of the Allen County Office of Homeland Security. Other members of the planning team include representatives from various county departments, major employers, utilities companies, healthcare facilities, and more. Table 4 lists the planning team members and their affiliations.

Table 4: THIRA Planning Team (alphabetical order)

Name	Title	Organization	Jurisdiction
William Bassett	Director	Allen County Consolidated Communications Partnership	Allen County
Bernie Beier	Director	Allen Co. Homeland Security	Allen County
John Bennett	Chief	New Haven Fire Dept.	New Haven
Gary Booher	Executive Director	Three Rivers Ambulance Authority	Fort Wayne
Tim Davie	Vice President, Network Vice President	Environment of Care, Lutheran Health Network	Fort Wayne
Gary Isley	Sergeant	Allen County Sheriff's Dept.	Allen County
Tim Maloney	Division Chief	Fort Wayne Fire Dept.	Fort Wayne
Scott Snodderly	Senior Master Sergeant, Installation Emergency Manager	Indiana Air National Guard, 122nd CES/CEX	Allen County
Mindy Waldron	Department Administrator	Fort Wayne-Allen Co. Dept. of Health	Fort Wayne, Allen County
Brad Witte	Planning Coordinator	Allen Co. Homeland Security	Allen County

Many of the members of the THIRA planning team have participated in other planning efforts for Allen County's emergency management. This overlap of representation was beneficial for streamlining the process and ensuring that efforts were not duplicated. The planning team held two meetings to develop the THIRA. Prior to Meeting 1, the Allen County Office of Homeland Security worked with The Polis Center to draft much of the THIRA from previous plans.

Meeting 1: November 6, 2015

- Overview of project and planning process
- Review and prioritize hazards
- Determine hazard scenarios
- Review results of vulnerability analyses

Meeting 2: December 15, 2015

- Review core capabilities
- Complete preparedness assessment matrix

Identify Threats and Hazards

In step 1 of the THIRA process, the Allen County planning team developed a list of community-specific threats and hazards. The threats and hazards are categorized according to the following types:

Natural hazards: These result from acts of nature and include floods, tornadoes, earthquakes, animal disease outbreak, and more.

Technological hazards: These result from accidents or failures of systems and structures and include dam failures, hazardous materials spills, power failure, and more.

Human-caused hazards: These result from intention acts of humans and include terrorism, school and workplace violence, chemical attacks, and more.

To identify the threats and hazards of significant concern to Allen County, the planning team considered two factors: the likelihood of occurrence and the significance of the events should they occur. Table 5 lists the threats and hazards identified for Allen County.

Table 5: Threats and Hazards of Significant Concern to Allen County

Natural	Technological	Human-Caused
Flood	Communications System Failure	CBRNE Attack
Severe Thunderstorms	Hazardous Materials Release (Transportation)	Mass Casualty Event
Tornado	Hazardous Materials Release (Fixed Site)	Active Shooter
Earthquake	Dam/Levee Failure	Terrorism
Winter Storms	Public Utility Failure	
Drought	Explosion	
Extreme Temperatures	Large Fire/Conflagration	
Disease Outbreak	Pipeline Transportation Incident	
Invasive Species	Air Transportation Incident	
	Structural Collapse	
	Radiological Accident	

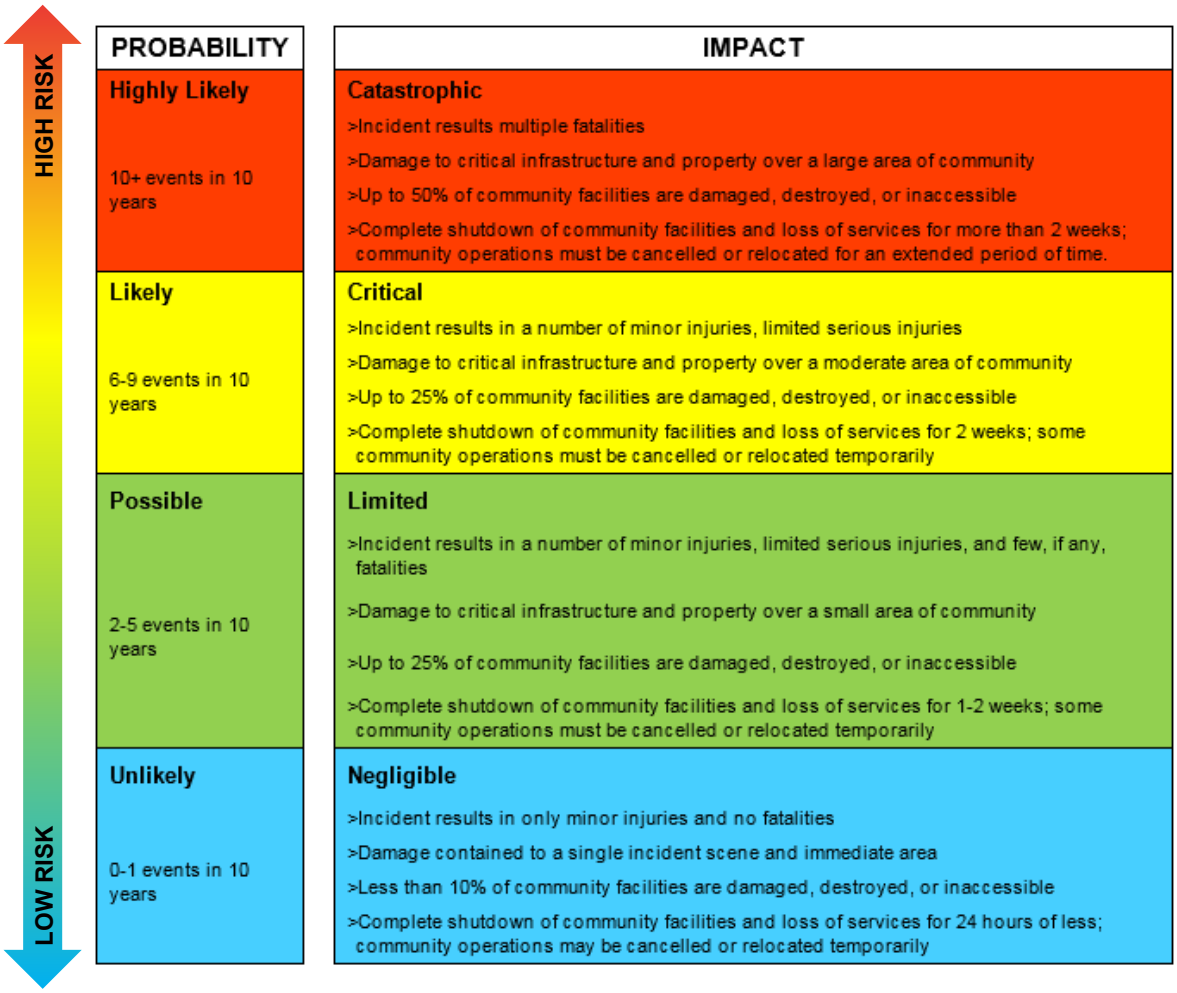
Prioritizing Threats and Hazards

To prioritize its threats and hazards, the planning team used the Calculated Priority Risk Index (CPRI) criteria, which includes four categories: (1) probability, (2) impact, (3) warning time, and (4) duration.

The team calculated the probability rating (Highly Likely, Likely, Possible, or Unlikely) of each hazard, based on the number of events that have occurred in the county in the past 10 years. For a number of hazards, primarily technological and human-caused, historical information was not available, so the probabilities for these events were determined by the planning team's estimation, derived from local, regional, state, and national experience and records.

After determining probability, the team assessed each hazard's potential impact on the communities (Catastrophic, Critical, Limited, or Negligible). The impact rating captures the potential magnitude and severity of the hazard. Figure 7 highlights the criteria used to determine both probability and impact.

Figure 7: Guidelines for Determining Probability and Impact



The overall threat/hazard risk is calculated by weighting each CPRI category, then combining them for a total value (Table 6).

Table 6: CPRI Categories and Weighting

.45 Probability	.30 Magnitude/Severity	.15 Warning Time	.10 Duration
4 - Highly Likely	4 - Catastrophic	4 - Less Than 6 Hours	4 - More Than 1 Week
3 - Likely	3 - Critical	3 - 6-12 Hours	3 - Less Than 1 Week
2 - Possible	2 - Limited	2 - 12-24 Hours	2 - Less Than 1 Day
1 - Unlikely	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours

The CPRI Formula:

CPRI value = [(Probability X .45) + (Magnitude X .30) + (Warning Time X .15) + (Duration X .10)]

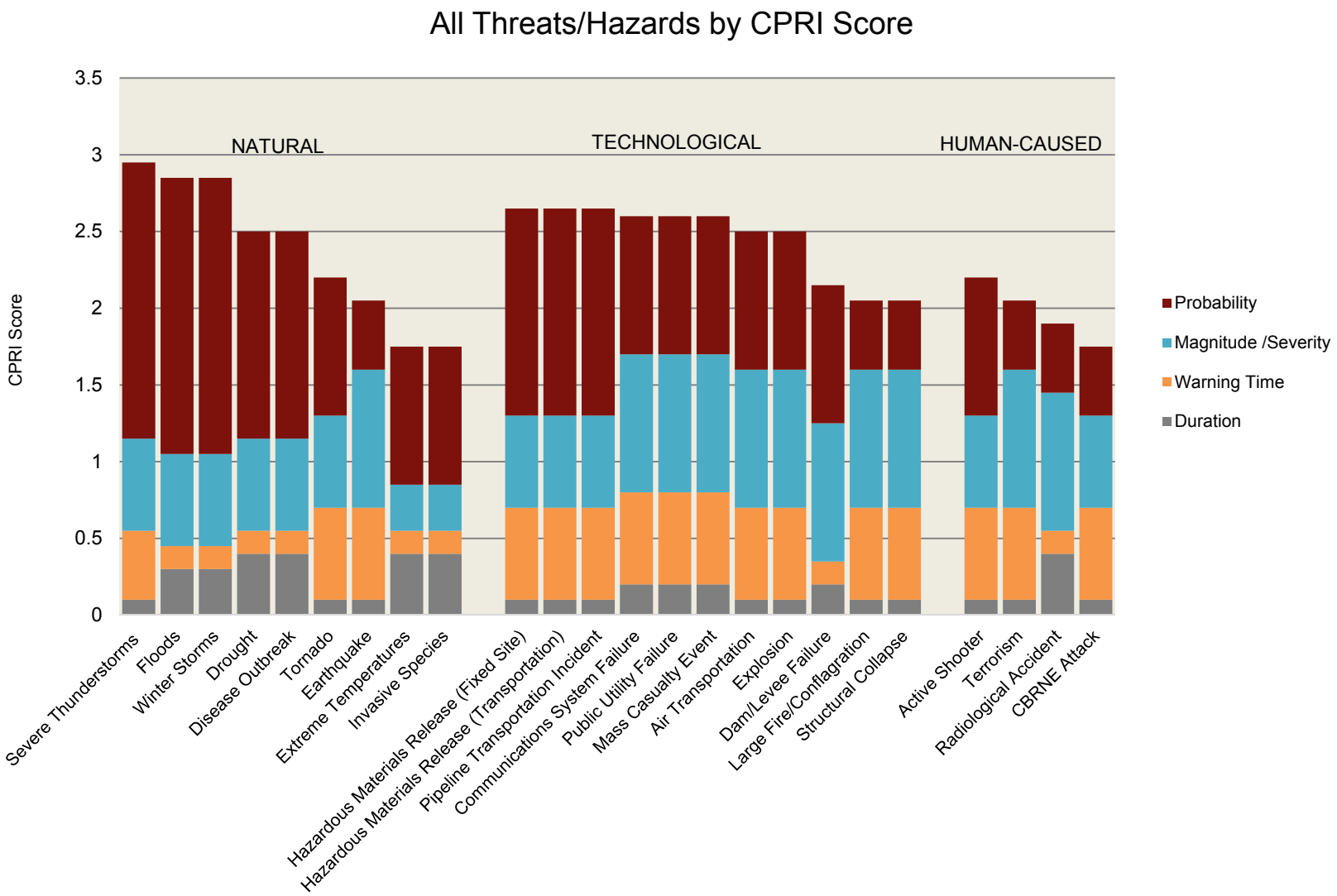
Table 7 lists Allen County's threats and hazards in order of highest priority.

Table 7: Allen County CPRI and Hazard Ranking

Threat/Hazard	Probability	Magnitude /Severity	Warning Time	Duration	CPRI
Severe Thunderstorms	4 - Highly Likely	2 - Limited	3 - 6-12 Hours	1 - < 6 Hours	2.95
Floods	4 - Highly Likely	2 - Limited	1 - > 24 Hours	3 - < 1 Week	2.85
Winter Storms	4 - Highly Likely	2 - Limited	1 - > 24 Hours	3 - < 1 Week	2.85
Hazardous Materials Release (Fixed Site)	3 - Likely	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	2.65
Hazardous Materials Release (Transportation)	3 - Likely	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	2.65
Pipeline Transportation Incident	3 - Likely	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	2.65
Communications System Failure	2 - Possible	3 - Critical	4 - < 6 Hours	2 - < 1 Day	2.6
Public Utility Failure	2 - Possible	3 - Critical	4 - < 6 Hours	2 - < 1 Day	2.6
Mass Casualty Event	2 - Possible	3 - Critical	4 - < 6 Hours	2 - < 1 Day	2.6
Drought	3 - Likely	2 - Limited	1 - > 24 Hours	4 - > 1 Week	2.5
Disease Outbreak	3 - Likely	2 - Limited	1 - > 24 Hours	4 - > 1 Week	2.5
Air Transportation Incident	2 - Possible	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.5
Explosion	2 - Possible	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.5
Tornado	2 - Possible	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	2.2
Active Shooter	2 - Possible	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	2.2
Dam/Levee Failure	2 - Possible	3 - Critical	1 - < 6 Hours	2 - < 1 Day	2.15
Earthquake	1 - Unlikely	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.05
Large Fire/Conflagration	1 - Unlikely	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.05
Structural Collapse	1 - Unlikely	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.05
Terrorism	1 - Unlikely	3 - Critical	4 - < 6 Hours	1 - < 6 Hours	2.05
Radiological Accident	1 - Unlikely	3 - Critical	1 - > 24 Hours	4 - > 1 Week	1.9
Extreme Temperatures	2 - Possible	1 - Negligible	1 - > 24 Hours	4 - > 1 Week	1.75
Invasive Species	2 - Possible	1 - Negligible	1 - > 24 Hours	4 - > 1 Week	1.75
CBRNE Attack	1 - Unlikely	2 - Limited	4 - < 6 Hours	1 - < 6 Hours	1.75

Figure 8 on the following page charts the CPRI scores of Allen County's threats and hazards, grouped by hazard type.

Figure 8: CPRI Scores of Allen County Threats and Hazards



The planning teams also plotted the threats and hazards on a risk graph according to probability (y-axis) and potential impact (x-axis). The following figure describes the methodology of plotting hazards by risk.

Figure 9 illustrates the Risk Graph methodology. In this example, a tornado has a likely probability (y-axis) and a critical impact (x-axis), and an earthquake has a possible probability and a limited impact.

Figure 9: Risk Graph Methodology

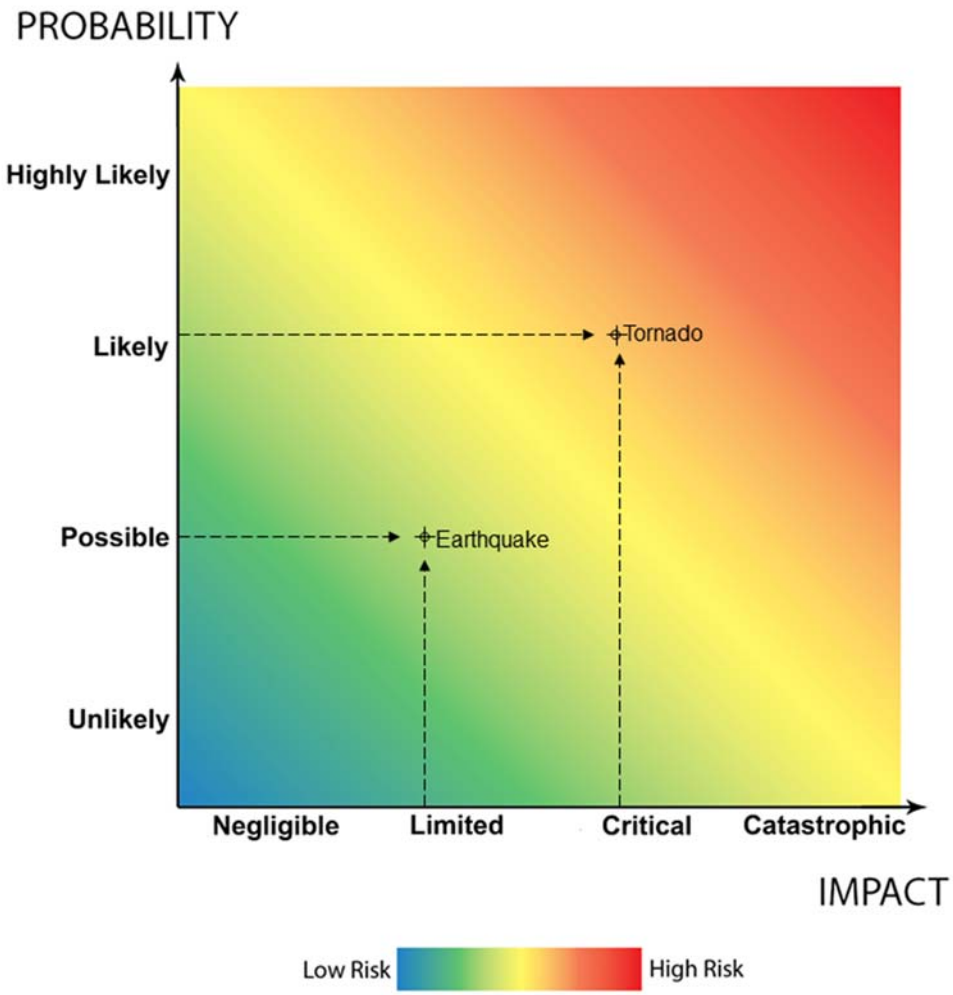
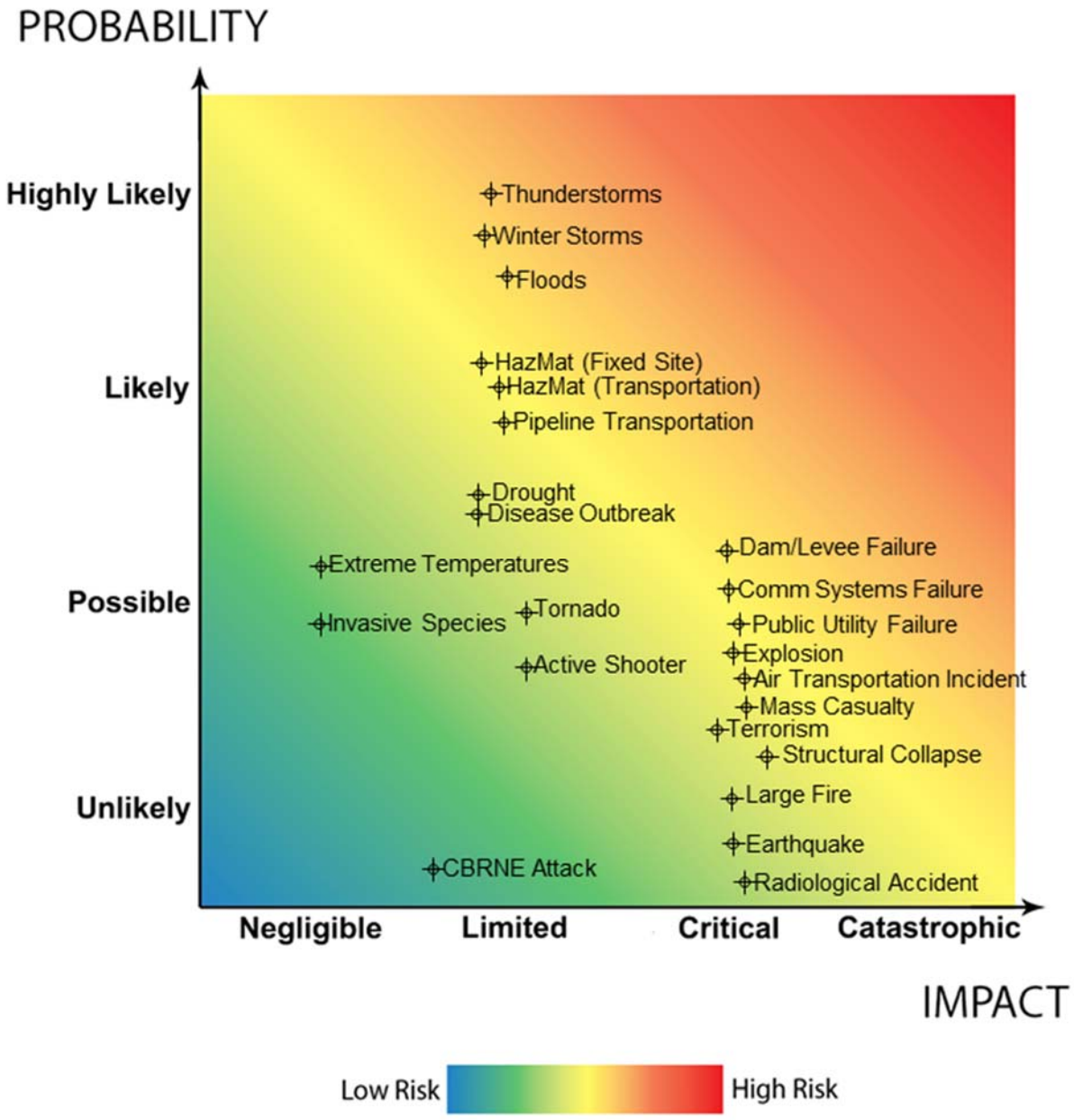


Figure 10 illustrates the probability and impact of Allen County's threats and hazards.

Figure 10: Allen County Risk Graph



Scenario Statements

The Allen County planning team identified the following scenario statements for each threat/hazard impacting the county. These statements include a description of the conditions most relevant to the county.

Threat/Hazard	Scenario Statement
Flood Dam/Levee Failure	In early June, following several days of moderate-to-heavy rainfall, the Maumee River reaches a record crest of 27 feet. Flood stage is 17 feet. Inundation reaches the 100-year threshold in several areas across Allen County. In Fort Wayne, hundreds of residential and commercial buildings are impacted. A number of care facilities in the county are also impacted, and Miller's Merry Manor needs to relocate a significant percentage of its patients. Additionally, the Maumee River North Levee has breached.
Severe Thunderstorms Public Utility Failure	On Saturday morning in mid-June, significant storm front moving northeast from Illinois passes through northern Indiana with winds reaching speeds of 80-100 miles per hour in Brookside Estates. Widespread tree, power line and pole damage is reported across Fort Wayne. Local officials estimate damage to property and infrastructure could easily exceed one million dollars. Power outages reported in Fort Wayne left 20,000 people without power for 24 hours.
Tornado	On Tuesday afternoon in late April, an F-4 tornado rips through Fort Wayne. It causes significant structural damage to residential and commercial buildings in the city. The Allen County Sheriff's Office and Fort Wayne Fire Department Station #14 are inoperable due to damages. Jefferson and Lane Middle Schools were in the path of the tornado, but no severe injuries have been reported.
Earthquake	On Friday morning in September at approximately 3:30 a.m., IDHS District 3 receives a report of a 6.9 magnitude earthquake that struck near Mt. Carmel, IL. There were no felt reports in Allen County, but there were several in Indianapolis. Only minor structural damage is reported in southern Indiana, and there have been no reports of injuries.

Threat/Hazard	Scenario Statement
Winter Storms Communications System Failure	A late February storm system brings widespread precipitation to northern Indiana, primarily in the form of freezing rain. After several hours of near constant precipitation, Allen County emergency management officials receive local reports of approximately ¼ to ½ inch of ice accumulation in some areas. Accompanying wind speeds of 10-20 mph have caused fallen tree limbs in neighborhoods around Fort Wayne, causing road closures and power outages. Temperatures are expected to drop below freezing for the next two days.
Drought	A prolonged summer drought gradually worsens becoming severe by early September. Allen County is among many others in the state that have received little to no measureable rainfall during the month of August. The main concern is crop loss, particularly in corn production.
Extreme Temperatures	In July, Allen County registers triple-digit temperatures for four days in row. Friday and Saturday reached 104 and 103 degrees respectively. Humidity caused the heat index to peak at 114 degrees on Friday, making this the warmest month on record for Allen County.
Disease Outbreak	From November through February, Allen County reports a highly pathogenic influenza virus, followed by the onset of pneumonia in a number of cases. The outbreak produces a 20% infection rate in the general population. A vaccine becomes available in January, and the county conducts a mass campaign targeted at vaccinating the entire eligible population.
Invasive Species	In mid-June, The Indiana DNR receives multiple reports of large populations of soybean aphids in northern Indiana farms. Direct crop yield losses from the soybean aphid's damage have been reported in Steuben and DeKalb counties at 10% and 8% respectively.
HazMat Release (Fixed Site)	In February, Fort Wayne fire and hazardous materials crews are called to the Raytheon Plant on Wednesday night. There are reports that approximately one foot of water has mixed with corrosive material creating a vapor cloud. No injuries are yet reported.

Threat/Hazard	Scenario Statement
HazMat Release (Transportation) Large Fire/Conflagration	In late September, a truck carrying anhydrous ammonia leaks anhydrous ammonia onto I-69 just west of Fort Wayne. The time is 10 a.m. on Wednesday morning. The leak comes from a hole in the cylindrical tank. There is concern for the potential of a large fire on the interstate if the leaking chemical comes into contact with oil or other combustible materials.
Structural Collapse	A three-story apartment in Fort Wayne collapses in early October. There are multiple casualties and at least one fatality. The full extent of damage is unknown.
Radiological Accident	On Tuesday morning in August, a medical transportation vehicle carrying radioactive materials from a hospital overturns in Fort Wayne. It is unknown whether the radioactive material packaging was damaged.
CBRNE Attack	Between September and October, three postal workers in Allen County reported injuries consistent with exposure to anthrax. Follow-up investigation confirmed that a series of letters containing anthrax spores were mailed to several government offices. There were no fatalities but 12 people were infected. The source of the letters is suspected to be an unknown terrorist group.
Active Shooter Mass Casualty Event	On Wednesday morning in early December, a 17-year-old student at a Fort Wayne high school opened fire on a classroom with a semi-automatic pistol. Thirteen students and one teacher were killed. Four other students were injured. The shooter then took his own life.
Terrorism Explosion	On Saturday afternoon at 1:00 p.m. in late August, the Fort Wayne air show performance begins at the Indiana Air National Guard hangar. There are 200,000 people in attendance. At approximately 1:30 pm., a 200 kg vehicle bomb is detonated at the main entrance of the venue. There are a number of reported casualties and fatalities. The full extent of damage and human impact is unknown.

Profile Threats and Hazards

The Allen County THIRA expands on previously developed risk assessments to further guide the county in a risk-based approach to preventing, protecting against, responding to, and recovering from disasters that may threaten the county's citizens, infrastructure, and economy. It documents historical disasters, assesses probabilistic disasters through Hazus-MH and GIS analyses where possible, and provides scenario statements for each hazard to inform capabilities requirements.

In this section, each threat/hazard is evaluated in the following areas:

1. Definition: A general definition of the threat or hazard with context as to why it is of significance to Allen County
2. Previous Occurrences: A description of historical occurrences with associated deaths, injuries, and damage estimates when available
3. Future Probability: An estimation based on previous occurrences and unique community characteristics
4. Potential Impact: An estimation of impacts (based on the scenario statements in the previous section) in terms of injuries and deaths, damage to infrastructure, and operation of essential services

Vulnerability Analysis Overview

The Allen County THIRA uses FEMA's Hazus-MH software and other Geographic Information System (GIS) analyses to quantify hazard impacts where possible using site-specific data from the county.

For this analysis, Hazus-MH generated a combination of site-specific (flood) and aggregated loss (earthquake) estimates. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across census blocks/tracts. With this in mind, total losses tend to be more reliable over larger geographic areas than for individual census blocks/tracts. Site-specific analysis is based on loss estimations for individual structures. For flooding, analysis of site-specific structures takes into account the depth of water in relation to the structure. Hazus-MH also takes into account the actual dollar exposure to the structure for the costs of building reconstruction, content, and inventory. Damages, however, are based upon the assumption that each structure will fall into a structural class, and structures in each class will respond in a similar fashion to a specific depth of flooding. Site-specific analysis also is based upon a point location rather than a polygon; therefore the model does not account for the percentage of a building that is inundated.

It is important to note that Hazus-MH is not intended to be a substitute for detailed engineering studies. Rather, it is intended to serve as a planning aid for communities interested in assessing their risk to flood, earthquake, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project. It is only intended to highlight the major steps that were followed during the project.

The Allen County Office of Homeland Security, through IndianaMap, provided parcel boundaries to The Polis Center, and the Indiana Department of Local Government and Finance provided the Allen County assessor records. The Allen County GIS department provided building footprint data which denote the locations of buildings. Polis revised the Hazus-MH default data tables to reflect these updates prior to performing the risk assessment in order to improve the accuracy of the model predictions.

The default Hazus-MH general building stock (to include building count, building square footage, content and structure exposure), Hazus-MH critical facilities, and Hazus-MH essential facilities were updated based on the most recent available data sources. Then, the essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) were applied to the Hazus-MH model data. Hazus-MH reports of essential facility losses reflect updated data.

Facility Types

This plan includes two types of facilities: essential facilities and critical facilities.

ESSENTIAL FACILITIES are defined as those that are vital to the county in the event of a hazard. These include emergency operations centers, police departments, fire stations, schools, and care facilities. Essential facilities are a subset of critical facilities.

Table 8 identifies the essential facilities in Allen County.

Table 8: Essential Facilities of Allen County

Category	Number of Facilities
Care Facilities	199
Emergency Operations Centers	1
Fire Stations	39
Police Stations	11
Schools	125
Total	**375**

CRITICAL FACILITIES are buildings that are deemed economically or socially viable to the county. Allen County has the following categories of critical facilities.

- **Transportation Systems** – *24 airports (includes private helipads and hangars), 1 railroad, 1 bus facility*– necessary for transport of people and resources including airports, highways, railways, and waterways.
- **Lifeline Utility Systems** – *7 wastewater treatment plants, 2 potable water systems, 1 oil facility, 1 electric power facility, 71 communications facilities* – vital to public health and safety including potable water, wastewater, oil, natural gas, electric power, and communication systems.
- **High Potential Loss Facilities** – *13 dams* – failure or misoperation may have significant physical, social, and/or economic impact to neighboring community including nuclear power plants, high hazard dams, and military installations.
- **Hazardous Material Facilities** – *226 hazardous materials facilities* – involved in the production, storage, and/or transport of corrosives, explosives, flammable materials, radioactive materials, and toxins.

Building Replacement Costs

The total building exposure for Allen County is identified in Table 9 along with the estimated number of buildings within each occupancy class. These counts and costs were derived from the county assessor and parcel data.

Table 9: Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure ($)
Agricultural	3,469	$713,339,491
Commercial	3,894	$3,073,257,768
Education	195	$774,615,210
Government	116	$127,031,711
Industrial	1,214	$2,203,323,616
Religious/Non-Profit	929	$1,351,436,042
Residential	113,274	$16,947,951,291
Total	**123,091**	**$25,190,955,129**

Natural Hazards Analysis

Floods

Definition

Allen County is at risk to two classifications of flood—upstream (flash flooding) and downstream (riverine flooding).

Upstream floods, also called flash floods, generally occur in the upper parts of drainage basins and are characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Indiana, 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 Indiana generally occurs during either the spring or summer.

Previous Occurrences

Floods are the most common and widespread of all natural disasters. Flooding and associated flood damages is most likely to occur during the spring as a result of heavy rains combined with melting snow. However, provided certain conditions, summer rainstorms are also capable of producing damaging flood conditions.

The National Climatic Data Center (NCDC) reports that there were 25 reported flood events over the past 20 years (June 1995–July 2015), resulting in more than $12,000,000 in property damage. The NCDC data is based on preliminary reports; the final damage estimates are likely higher. Table 10 lists the NCDC reported events for Allen County floods.

Table 10: NCDC-Reported Flooding Events (June 1995–July 2015)

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Fort Wayne	07/23/97	Flash Flood	0	0	$ -	$ -
Near Leo	08/16/97	Flash Flood	0	0	$ 5,000	$ -
Fort Wayne	09/10/97	Flash Flood	0	0	$ 1,000	$ -
Fort Wayne	05/03/98	Flash Flood	0	0	$ -	$ -
Fort Wayne	04/22/99	Flood	0	0	$ -	$ -
Fort Wayne	04/22/99	Flood	0	0	$ -	$ -
Fort Wayne	06/26/02	Flash Flood	0	0	$ -	$ -
Fort Wayne	06/27/02	Flash Flood	0	0	$5,000,000	$ -
Allen County	07/05/03	Flood	0	0	$7,000,000	$ -
Fort Wayne	07/21/03	Flash Flood	0	0	$ 50,000	$ -
Allen County	05/07/04	Flood	0	0	$ -	$ -
Fort Wayne	05/30/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	06/13/04	Flash Flood	0	0	$ -	$ -
New Haven	06/13/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	06/13/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	06/13/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	09/03/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	09/03/04	Flash Flood	0	0	$ -	$ -
Fort Wayne	07/27/06	Flash Flood	0	0	$ -	$ -
Fort Wayne	07/18/07	Flash Flood	0	0	$ 10,000	$ -
Aboite	05/25/11	Flash Flood	0	0	$ -	$ -
Aboite	05/26/11	Flash Flood	0	0	$ -	$ -
Edgerton	06/01/13	Flash Flood	0	0	$ -	$ -
Dunfee	08/02/13	Flash Flood	0	0	$ -	$ -
Westlawn	11/24/14	Flood	0	0	$ -	$ -

Future Probability

The probability of future occurrences of flooding—expressed in terms of frequency—is the likelihood that a specific event will happen. The following Hazus analysis identifies the current facilities that are at risk for a 1%-annual-chance flood, based on the NFIP maps and studies that use the 1%-annual-chance floodplain area (area inundated during a 100-year flood). Previous occurrences of flooding indicate that Allen County has a high probability of flooding in the future. Ongoing work in climate change science, coupled with increased development, will provide better data on whether extreme flood events will occur more frequently in the future.

Potential Impact

To quantify the impact of a riverine flood in Allen County, Hazus-MH was used to generate a flood depth grid for a 100-year return period based on the DFIRM boundary and a 1/3 ArcSecond DEM provided by the Indiana Geological Survey. Hazus-MH was then used to perform a user-defined facility analysis by creating points representing building locations that were generated from the Indiana Department of Local Government Finance (IDLGF) assessor data linked to parcel data and building footprint data provided by the county and IndianaMap. These data were analyzed to determine the depth of water at the location of each building point and then related to depth damage curves to determine the building losses for each structure.

Hazus-MH estimates the 1%-annual-chance flood (100-year flood) would damage 1,399 buildings county-wide at a cost of $55 million. In the modeled scenario, Fort Wayne sustained the most damage with 1,087 buildings damaged at a cost of $45 million.

The total estimated numbers and cost of damaged buildings by community are given in Tables 11 and 12. Figure 11 depicts the Allen County buildings that fall within the 1% annual chance flood risk area (100-year floodplain). Figures 12 through 16 highlight damaged buildings within the floodplain areas in each flood-prone community.

The Assessor records often do not distinguish parcels by occupancy class when the parcels are not taxable; therefore, the total number of buildings and the building replacement costs for government, religious, including non-profit, and education may be underestimated.

Table 11: Number of Buildings Damaged by Community and Occupancy

Community	Total Buildings Damaged	Building Occupancy Class						
		Agriculture	Commercial	Education	Government	Industrial	Religious	Residential
Allen County (Unincorporated)	269	15	12	3	0	9	3	227
Fort Wayne	1,087	0	101	2	10	28	13	933
Grabil	0	0	0	0	0	0	0	0
Huntertown	0	0	0	0	0	0	0	0
Leo-Cedarville	2	0	0	0	0	0	0	2
Monroeville	2	0	0	0	0	1	0	1
New Haven	39	0	12	0	0	0	0	27
Woodburn	0	0	0	0	0	0	0	0
Zanesville	0	0	0	0	0	0	0	0
Total	1,399	15	125	5	10	38	16	1190

Table 12: Building Damages by Community and Occupancy

Community	Total Building Damages	Building Occupancy Class						
		Agriculture	Commercial	Education	Government	Industrial	Religious	Residential
Allen County (Unincorporated)	$6,666,871	$135,706	$1,293,155	$120,032	$0	$544,857	$10,371	$4,562,750
Fort Wayne	$45,409,994	$0	$6,541,179	$1,117,214	$127,319	$8,845,602	$1,050,085	$27,728,595
Grabil	$0	0	0	0	0	0	0	0
Huntertown	$0	0	0	0	0	0	0	0
Leo-Cedarville	$75,202	$0	$0	$0	$0	$0	$0	$75,202
Monroeville	$137,931	$0	$0	$0	$0	$117,609	$0	$20,322
New Haven	$3,103,511	$0	$450,230	0	$0	$0	$0	$2,653,281
Woodburn	$0	$0	$0	$0	$0	$0	$0	$0
Zanesville	$0	$0	$0	$0	$0	$0	$0	$0
Total	$55,393,509	$135,706	$8,284,564	$1,237,246	$127,319	$9,508,068	$1,060,456	$35,040,150

Figure 11: Allen County Buildings in Floodplain (1% Annual Chance Flood)

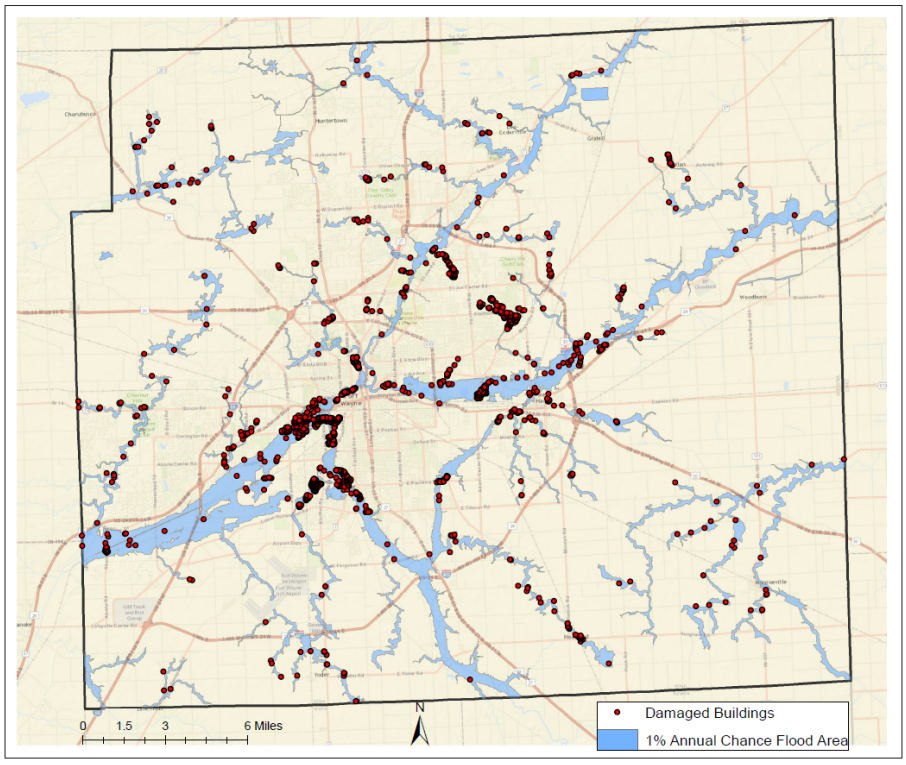


Figure 12: Fort Wayne Flood-Prone Areas (1% Annual Chance Flood)

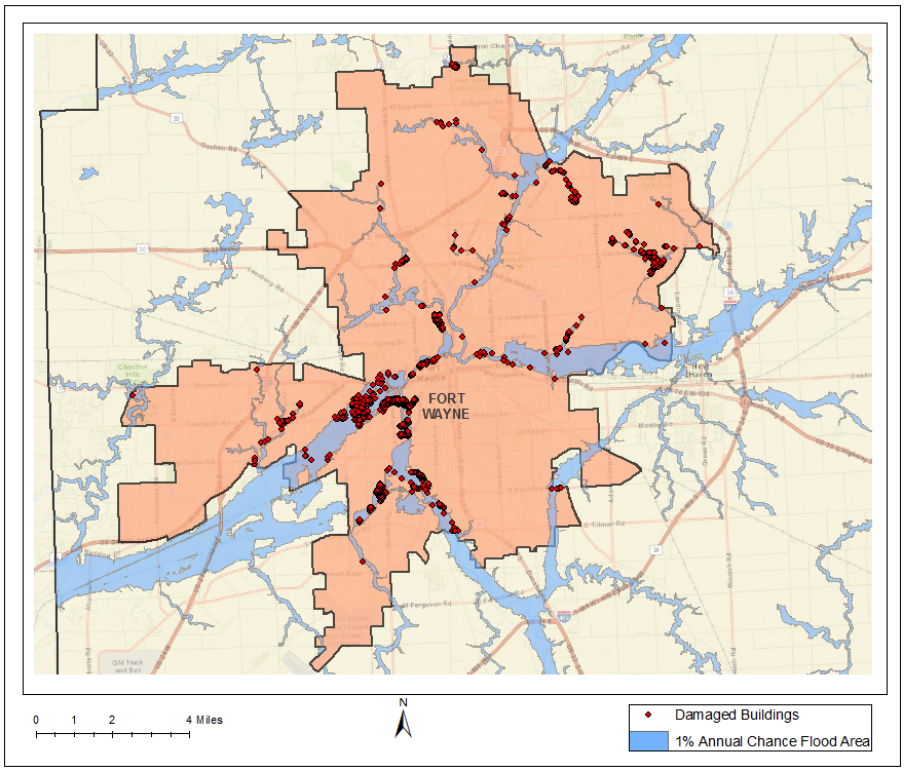


Figure 13: New Haven Flood-Prone Areas (1% Annual Chance Flood)

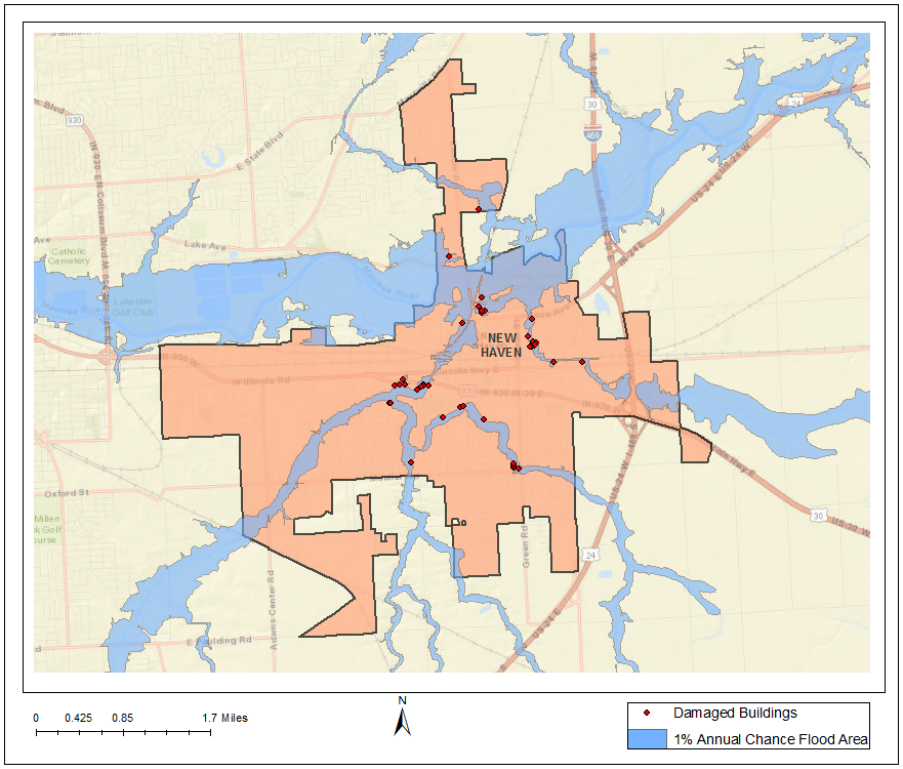


Figure 14: Leo-Cedarville Flood-Prone Areas (1% Annual Chance Flood)

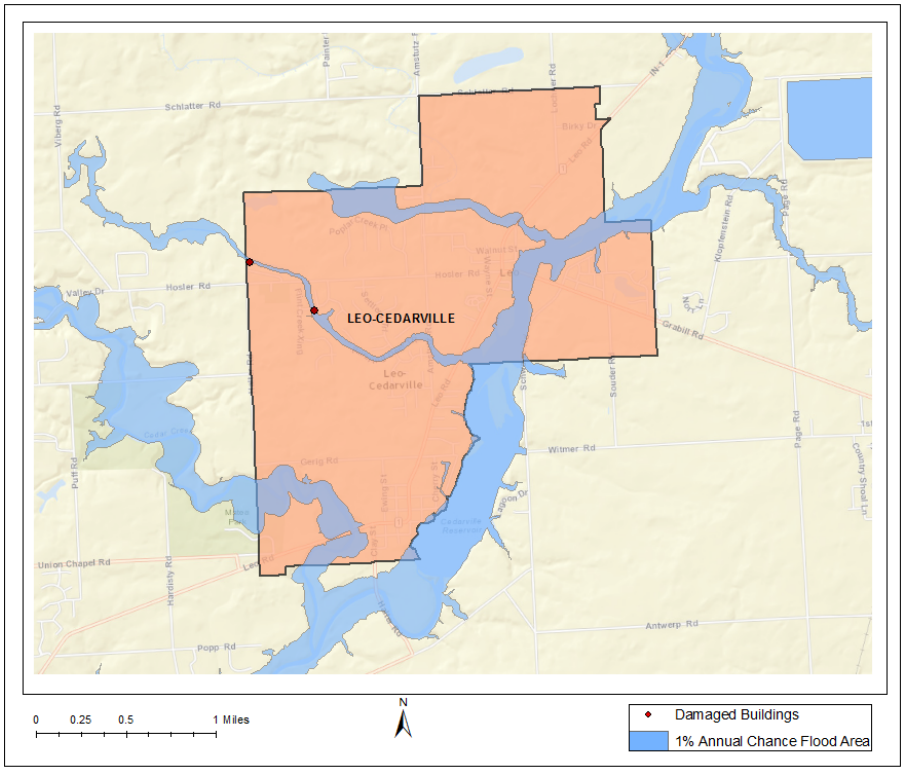


Figure 15: Monroeville Flood-Prone Areas (1% Annual Chance Flood)

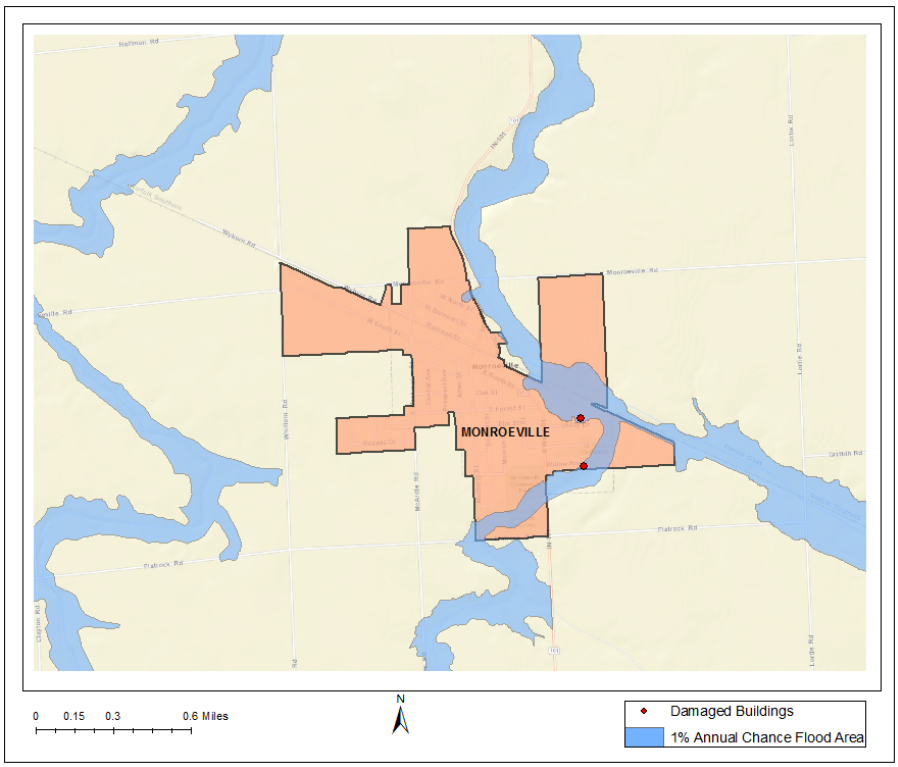
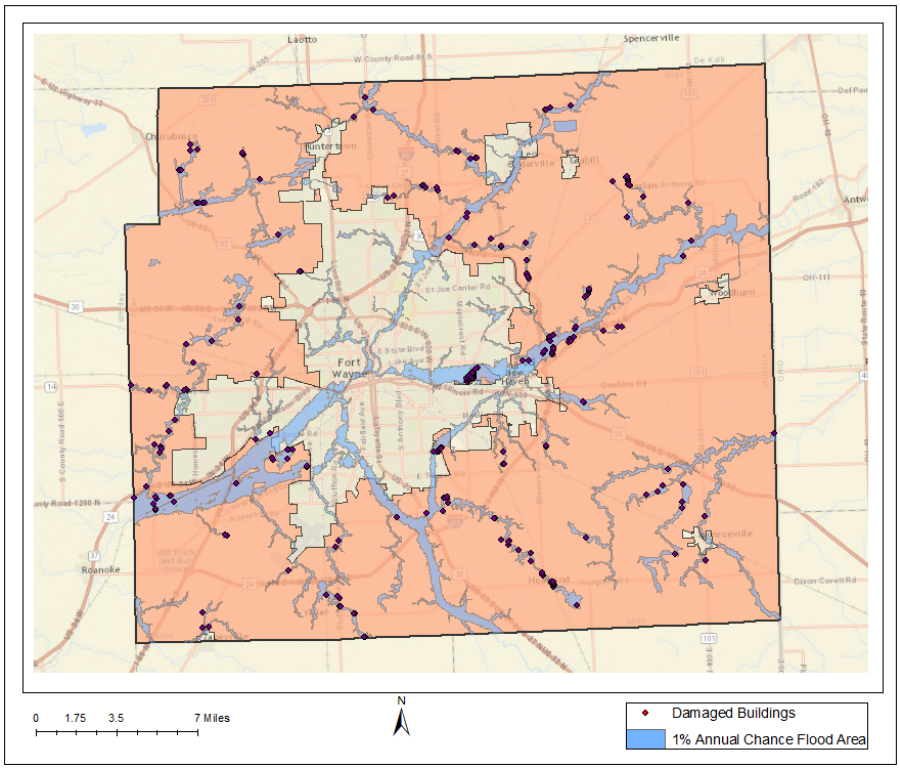


Figure 16: Unincorporated County Flood-Prone Areas (1% Annual Chance Flood)



Direct Impact to Essential Facilities

An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the community). The overlay analysis estimates that six essential facilities in Allen County could sustain damage. One Fire Station and four Medical Care facilities in Fort Wayne is located within the 1% Annual Chance floodplain as shown in Figure 17. Figure 18 shows one school located in the unincorporated area within the 1% Annual Chance floodplain. Table 13 lists the flood-prone essential facilities.

Table 13: Flood-Prone Essential Facilities

Facility Name	Facility Type
Covington Manor Health And Rehabilitation	Medical Care
Miller's Merry Manor	Medical Care
Heartland Home Care	Medical Care
Heartland Home Health Care And Hospice	Medical Care
Ft Wayne Fire Department Station 2	Fire Station
Heritage Jr/Sr High School	School

Figure 17: Fort Wayne Flood-Prone Essential Facilities

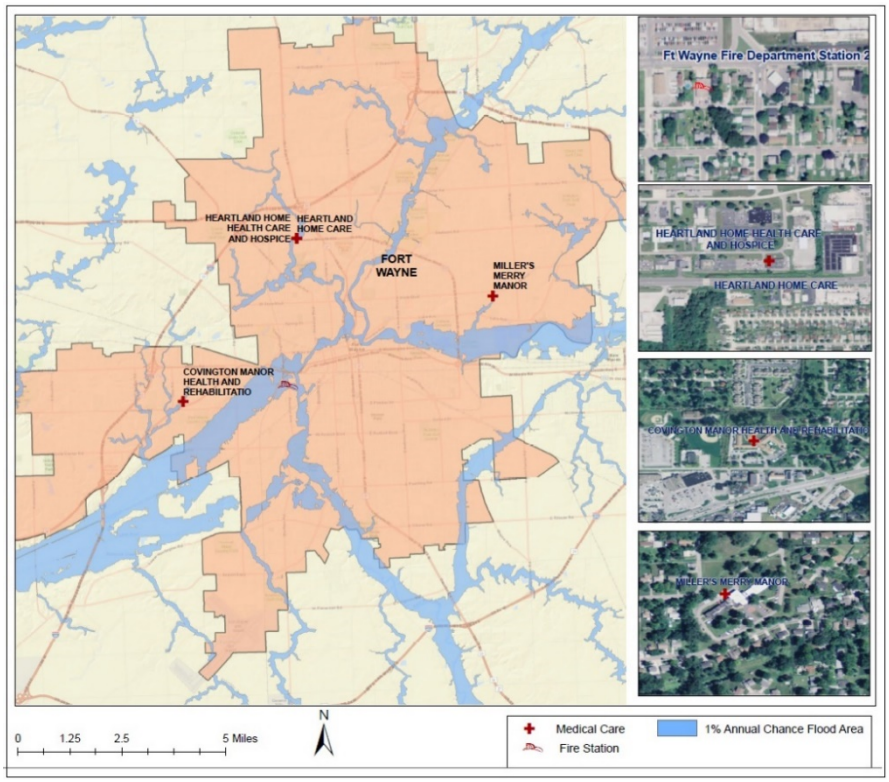
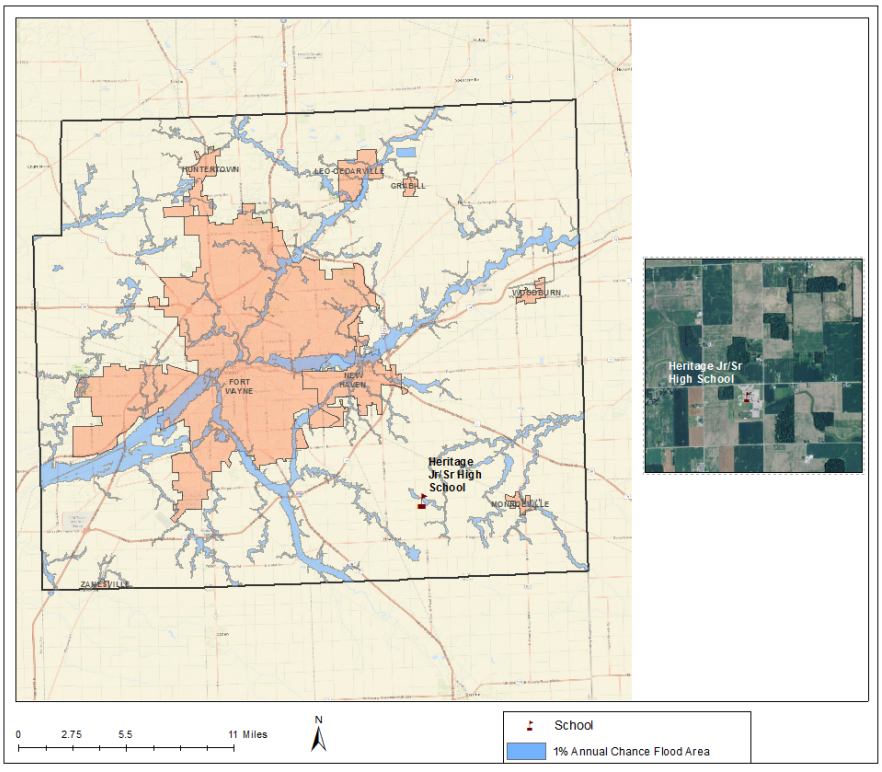


Figure 18: Allen County Unincorporated Flood-Prone Essential Facilities



Direct Impact to Critical Facilities

A critical 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. As an example, a damaged waste water facility would no longer be able to serve the community.

As shown in Figures 19 and 20, the results of the overlay analysis indicate that a total 11 critical facilities in Allen County could sustain damage. In Fort Wayne, there are two hazardous material sites, three communication facilities, one waste water facility and one electric power facility in the flood boundary. One natural gas facility, one communication facility and one waste water facility are located within the within the 1% annual chance flood area in the unincorporated area. Table 14 lists the flood-prone critical facilities.

Table 14: Flood-Prone Critical Facilities

Facility Name	Facility Type
Panhandle Eastern Pipeline	Natural Gas
American Indiana Michigan Power	Electric Power
Fort Wayne City Utilities	Waste Water
Hoagland Wwtp	Waste Water
Slater Steels, Ft. Wayne Specialty Allo	Hazmat
Dana Corp. Spicer Mfg. Inc.	Hazmat
New	Communication
WLDE	Communication
WFCV	Communication
WJFX	Communication
Fort Wayne-District Operations	Airport

Figure 19: Fort Wayne Flood-Prone Critical Facilities

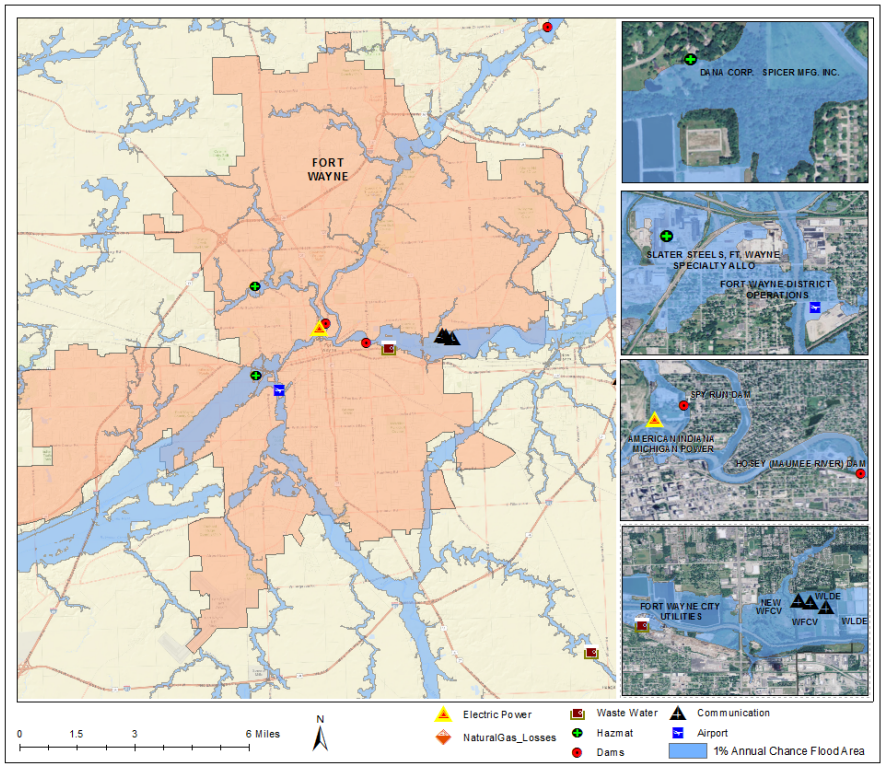
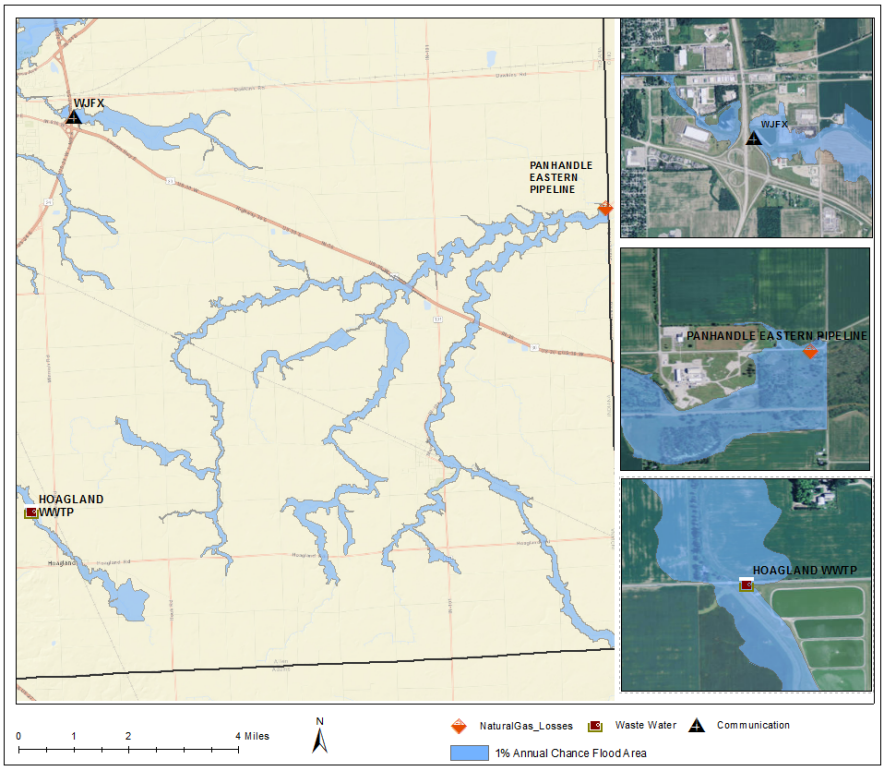


Figure 20: Unincorporated Flood-Prone Critical Facilities



Indirect Impact

Flooding also results in a number of indirect impacts on the community. Allen County's MHMP lists some of the most common indirect impacts as follows:

- Increased response times for emergency personnel if roads are impassable
- Increased risk of explosions and other hazards associated with floating propane tanks or other debris
- Losses associated with missed work or school due to closures or recovery activities

Severe Thunderstorms

Definition

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

- Hail of diameter 0.75 inches or higher
- Frequent and dangerous lightning
- Wind speeds equal to or greater than 58 miles an hour

Hail is a product of a strong thunderstorm. Hail usually falls near the center of a storm; however, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in damage in other areas near the storm. Hailstones range from pea-sized to baseball-sized, but hailstones larger than softballs have been reported on rare occasions.

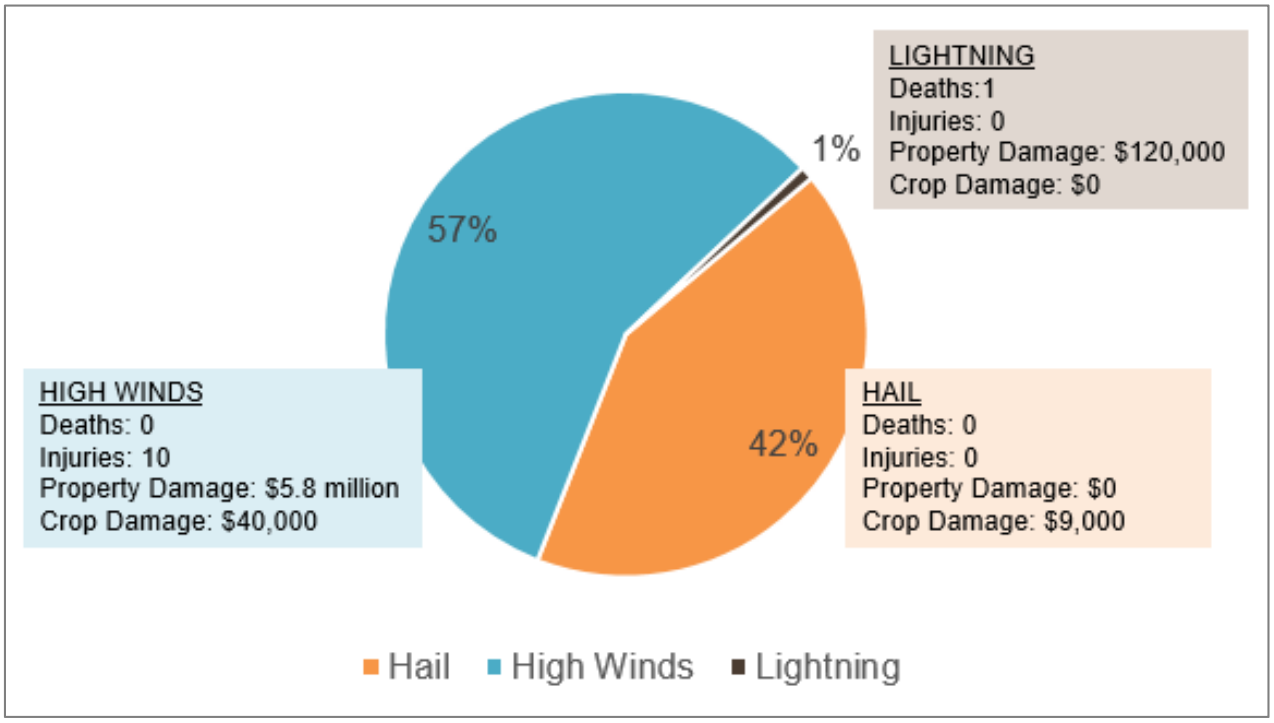
Lightning is a discharge of atmospheric electricity from a thunderstorm. It can travel at speeds up to 140,000 mph and reach temperatures approaching 54,000 degrees. Lightning often is perceived as a minor hazard; in reality, lightning causes damage to many structures and kills, or severely injures, numerous people in the United States. It is estimated that there are 16 million lightning storms worldwide every year.

Straight-line winds from thunderstorms are a fairly common occurrence across Indiana. 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

The probability of severe thunderstorm events in Allen County is highly likely in any given year. Between June 1995 and July 2015, NCDC reported 341 storms events. These events resulted in one death, ten injuries, nearly $6 million in property damage, and nearly $50,000 in crop damage collectively. Figure 21 shows the number and damage estimates associated with each category of thunderstorm event. The NCDC data is based on preliminary reports; the final damage estimates are likely higher.

Figure 21: NCDC-Reported Thunderstorm Events by Category (June 1995–July 2015)



Future Probability

Severe thunderstorms are an annual occurrence. Due to the unpredictability of this hazard, all new buildings and infrastructure in Allen County are at risk of damage including temporary or permanent loss of function. For hailstorms, thunderstorms, and windstorms, it is not possible to isolate the essential or non-essential facilities that would be more or less vulnerable to damages.

According to the Institute for Business and Home Safety, northeastern Indiana can expect damaging hailstorms three to four times over 20 years, the average life of a residential roof[iii]. High winds are also considered a high-frequency hazard and occur numerous times per year.

Potential Impact

As evidenced by historical events, severe thunderstorms are one of the costliest hazards that Allen County faces, primarily due to the significant risks they pose to infrastructure and crops. The types of physical impacts to infrastructure could include damage to roadways, utility lines, railroads, bridges, and more. Other direct and indirect impacts may include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, impassable bridges and roadways, fires caused by lightning, and lost building functionality. The threat of severe thunderstorms is equally distributed across the county, so all communities and infrastructure are vulnerable. Due to its unpredictability, all 123,091 buildings in Allen County are at risk of damage.

Tornado

Definition

Tornadoes can occur at any time during the day or night and within any month of the year. The unpredictability of tornadoes makes them one of Indiana's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum potential velocity of tornados at about 300 miles per hour.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado. Tornadoes are classified according to the Enhanced Fujita tornado intensity scale shown in Table 15.

Table 15: Enhanced Fujita Tornado Rating[iv]

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 Gale	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
EF1 Moderate	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 Significant	111-135 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.
EF3 Severe	136-165 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.
EF4 Devastating	166-200 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.
EF5 Incredible	Over 200 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

Tornadoes are widespread throughout the state and may cause varying amounts of damage to property and injuries to Allen County's residents and visitors. NCDC reported nine tornadoes in Allen County since 1995. These events collectively resulted in three injuries and more than $6.5 million in property damage. Table 16 lists the NCDC-reported events.

Table 16: NCDC-Reported Tornado Events (June 1995–July 2015)

Location	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Harlan	3/28/1998	Tornado	F1	0	0	$ 25,000	$ -
Monroeville	5/3/1998	Tornado	F0	0	0	$ -	$ -
New Haven	5/3/1998	Tornado	F0	0	0	$ -	$ -
Monroeville	5/3/1998	Tornado	F0	0	0	$ -	$ -
Grabill	5/18/2001	Tornado	F0	0	0	$ 500	$ -
Fort Wayne	5/26/2001	Tornado	F0	0	0	$ 2,000	$ -
Fort Wayne	5/26/2001	Tornado	F2	0	3	$ 6,500,000	$ -
Zulu	10/26/2010	Tornado	EF0	0	0	$ -	$ -
Milan Center	10/26/2010	Tornado	EF1	0	0	$ -	$ -

Future Probability

The Indiana State Climate Office estimates that throughout Indiana, there are an average of 20 tornado touchdowns per year[v]. Based on this information, the planning team determined that the probability of future tornadoes touching down in Allen County within the next five years is possible. However, due to the unpredictability of this hazard, all buildings and infrastructure in the county are at risk of damage including temporary or permanent loss of function. For tornadoes, it is not possible to isolate specific essential or non-essential facilities that would be more or less vulnerable to damages.

Recent construction of new buildings to codes that address tornado strength winds will reduce damage in future events. Continuing efforts to increase public awareness to the dangers of tornadoes should mitigate injury, death and property losses in the future. As the population increases and more areas are developed, the potential damage from such storms will increase.

Potential Impact

GIS overlay modeling was used to determine the potential impacts of an F4 tornado in Allen County. The analysis used a hypothetical tornado path running across the county from south-west to north-east. The modeled path ran for over 31 miles. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these five categories. Table 17 depicts tornado damage curves, as well as path widths.

Table 17: Tornado Path Widths and Damage Curves

Enhanced Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	2,400	100%
EF4	1,800	100%
EF3	1,200	80%
EF2	600	50%
EF1	300	10%

The hypothetical tornado path is depicted in Figure 22. The damage curve buffers for this hypothetical tornado path are shown in Figures 23 and 24.

Figure 22: Hypothetical F4 Tornado Path in Allen County

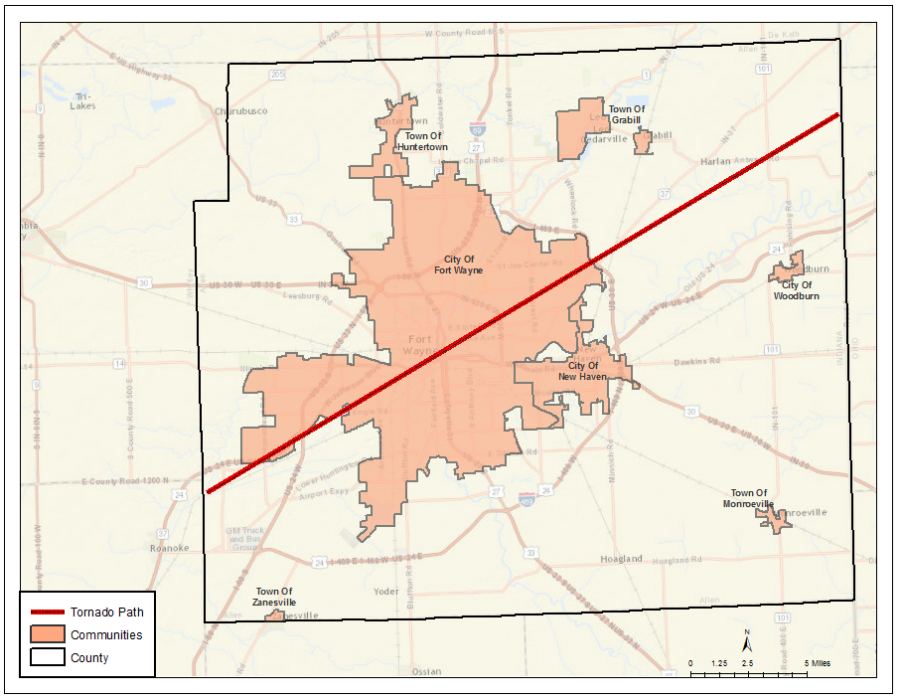


Figure 23: Modeled F4 Tornado Damage Buffers in Allen County

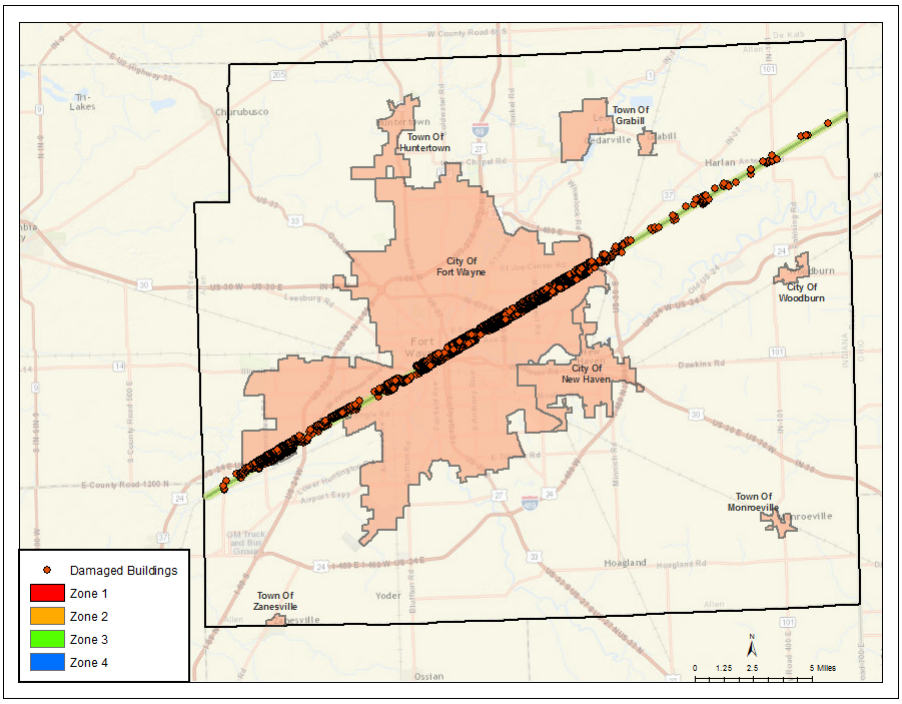
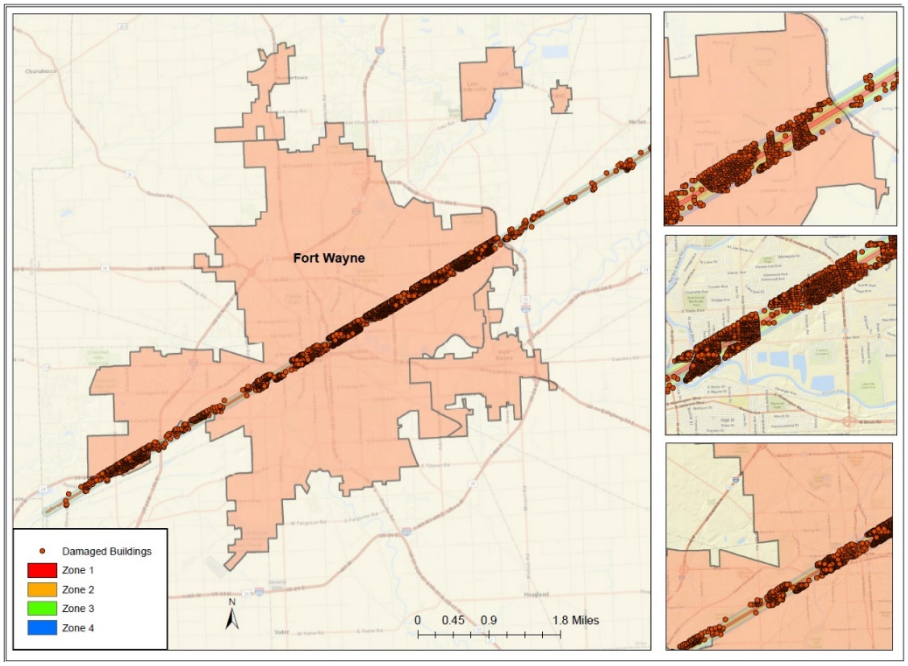


Figure 24: Modeled F4 Tornado Damage Buffers in Allen County



The GIS analysis estimates 4,676 buildings could be damaged. The estimated potential building losses would be $614 million.

The building losses are an estimate of building costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Allen County (through IDHS and IndianaMap) that were joined with assessor records showing property improvement.

The Assessor records often do not distinguish parcels by occupancy class when the parcels are not taxable; therefore, the total number of buildings and the building replacement costs for government, religious, including non-profit, and education may be underestimated. The results of the analysis are depicted in Table 18.

Table 18: Estimated Building Losses by Occupancy Type:

General Occupancy	Buildings Damaged	Building Losses
Agricultural	38	$5,238,789
Commercial	206	$115,403,824
Education	14	$23,703,860
Government	7	$4,164,811
Industrial	21	$45,584,992
Religious	51	$55,112,632
Residential	4,339	$365,699,698
Total	4,676	$614,908,606

Direct Impact to Essential Facilities

There are thirty-nine essential facilities located within 600 feet of the hypothetical tornado path. The model predicts that twenty three medical care centers, one emergency operation center, one fire station, five police stations and seven schools would experience damage. Although other structures would be impacted, the affected essential facilities are identified in in Table 19.

Table 19: Estimated Essential Facilities Affected

Facility Name	Facility Type
Allen Co Sheriff Dept Bur-Id	Police
Allen County Sheriff-Civil Div	Police
Allen County Sheriff'S Dept	Police
Allen County Sheriff-Warrants	Police
Allen County Sheriff Criminal	Police
Fort Wayne Arson Dept	Fire
Ft Wayne Fire Department Station 14	Fire
Ft Wayne Fire Department Station 2	Fire
Allen County Ema	EOC
Jefferson Middle School	School
Lane Middle School	School
Brentwood Elementary School	School
Glenwood Park Elementary Sch	School
Saint John Lutheran School	School
Saint Jude Elementary School	School
Emmanuel St Michael Lutheran Sch	School
Peace Of Mind In Home Care	Care
Home Nursing Services	Care
Angel Corps Inc	Care
Sunshine Home Health Care	Care
Sunshine Home Care Services	Care
St Joseph Hospital - Fort Wayne	Care
Select Specialty Hospital - Fort Wayne	Care
Transitional Care Unit Of St Joseph	Care
Aws	Care
Coventry Meadows	Care
Coventry Meadows Assisted Living	Care
Fresenius Medical Care Fort Wayne Jeffer	Care
Cli Surgery Center	Care
Saint Anne Home	Care
Parkview Home Health & Hospice	Care
Parkview Home Health And Hospice	Care
Vibra Hospital Of Fort Wayne	Care
Parkview Memorial Hospital-Ccc	Care
Parkview Hospital Campus	Care
Fort Wayne Home Dialysis	Care
Woodview Home Care Llc	Care
Easter Seals Arc Of Northeast	Care
Voca Corporation Of Indiana	Care

Indirect Impact

In addition to the direct physical impacts of tornados, i.e. damages to structures and above-ground utility lines, indirect impacts may include:

- Expenses related to debris clean-up and/or reconstruction
- Loss of revenue for affected businesses
- Loss of work to businesses required to close

Earthquakes

Definition

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Ninety-five percent of earthquakes occur at the plate boundaries; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern United States. The most seismically active area in the central US is the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the central US capable of producing damaging earthquakes. The Wabash Valley Fault System in Indiana shows evidence of large earthquakes in its geologic history, and there may be other currently unidentified faults that could produce strong earthquakes.

The USGS asserts that a large earthquake that will seriously impact southwestern Indiana is inevitable; however, it is currently impossible to predict when such an earthquake will occur. According to the USGS, there is a 25-40% chance of a magnitude 6.0 or greater earthquake in the next 50 years for the central US. There is a 7-10% chance of a repeat of events similar to the New Madrid earthquakes of 1811-12[vi].

Ground shaking from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers or homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Earthquake magnitude, which is determined from measurements on seismographs, measures the energy released at the source of the earthquake. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects of people, human structures, and the natural environment.

Tables 20 and 21 define earthquake magnitudes and their corresponding intensities.

Table 20: Abbreviated Modified Mercalli Intensity Scale

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

Table 21: Earthquake Magnitude vs Modified Mercalli Intensity (MMI) Scale

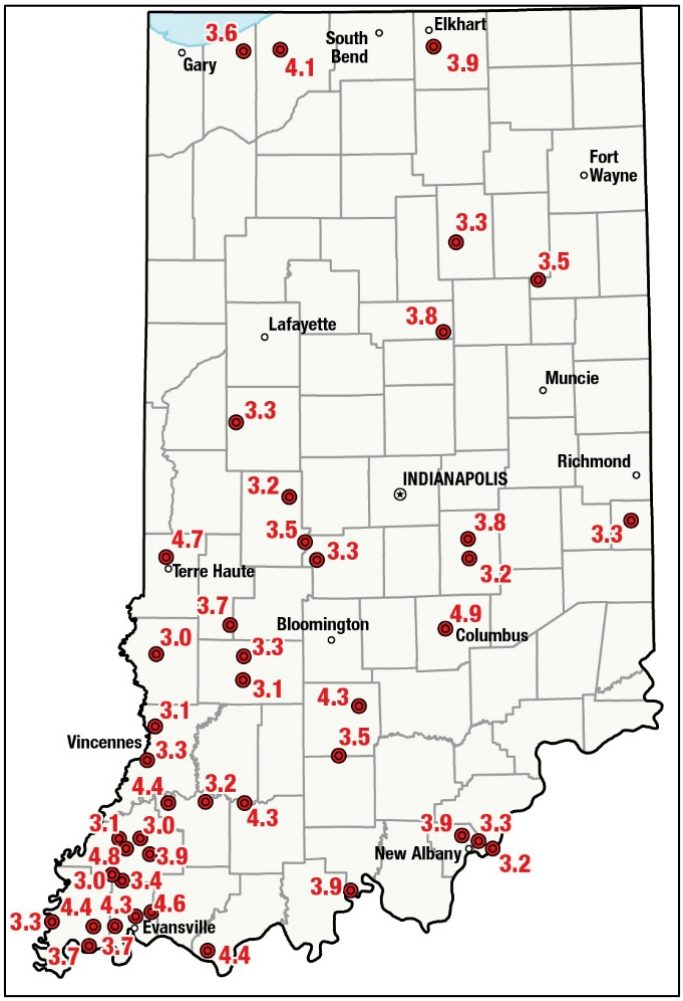
Earthquake Magnitude	Typical Maximum MMI
1.0-3.0	I
3.0-3.9	II-III
4.0-4.9	IV-V
5.0-5.9	VI-VII
6.0-6.9	VII-IX
7.0 and higher	VIII or higher

Previous Occurrences

At least 43 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event was a M3.1 centered just north of Vincennes on May 10, 2010. A M3.8 earthquake occurred in December later that same year with approximately 10,390 individuals submitting felt reports to the USGS. More recently, a magnitude 5.8 centered in Mineral, Virginia affected much of the East Coast on August 23, 2011. Ten nuclear power plants were shutdown of precautionary inspections following the quake, over 400 flights were delayed, and the Washington Monument was closed indefinitely pending detailed inspections by engineers.

Although the majority of seismic activity in Indiana occurs in the southwestern region of the state, there are some documented instances in the central and northern parts of the state. Figure 25 depicts Indiana's historical earthquake epicenters.

Figure 25: Historical Epicenters in Indiana



Future Probability

The probability of future earthquakes is unknown. The USGS asserts that a large earthquake that will seriously impact southwestern Indiana is inevitable; however, it is currently impossible to predict when such an earthquake will occur. According to the USGS, there is a 25 to 40% chance of a magnitude 6.0 or greater earthquake in the next 50 years for the central US. There is a 7 to 10% chance of a repeat of events similar to the New Madrid earthquakes of 1811-12.

Future earthquake events will affect larger populations, business development, and aged vulnerable infrastructure.

Upgraded codes will protect newer construction, but much of the population will remain vulnerable because of low public interest in earthquake safety due to the relative inactivity of the fault systems presents a serious problem.

Potential Impact

To estimate the impact of an earthquake in Allen County, we ran three Hazus-MH scenarios—two deterministic and one probabilistic.

The deterministic scenarios included a 7.7-moment magnitude epicenter along the New Madrid fault zone and a 6.8-moment magnitude epicenter in Mt. Carmel, Illinois.

Additionally, the analysis included a probabilistic scenario. This type of scenario is based on ground-shaking parameters derived from US Geological Survey probabilistic seismic hazard curves. The probabilistic scenario was a 500-year return period scenario. This analysis evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude that would be typical of that expected for a 500-year return period. These analysis options were chosen because they are useful for prioritization of seismic reduction measures and for simulating mitigation strategies.

Modeling a deterministic scenario requires user input for a variety of parameters. One of the most critical sources of information required for accurate assessment of earthquake risk is soils data, which was obtained from a National Earthquake Hazards Reduction Program (NEHRP) soil classification map for Indiana. NEHRP soil classifications portray the degree of shear-wave amplification that can occur during ground shaking. The Indiana Geologic Survey supplied the soils map used for the analysis. FEMA provided a map for liquefaction potential that was used in the Hazus-MH analysis.

An earthquake depth of 10.0 kilometers was selected for all deterministic scenarios based on input from IGS. Hazus-MH also requires the user to define an attenuation function unless ground motion

maps are supplied. Because Indiana has experienced smaller earthquakes, the decision was made to use the Central Eastern United States (CEUS) attenuation function.

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

The probabilistic scenario was based on ground-shaking parameters derived from US Geological Survey probabilistic seismic hazard curves. The probabilistic scenario was a 500-year return period scenario. This analysis evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude that would be typical of that expected for a 500-year return period. These analysis options were chosen because they are useful for prioritization of seismic reduction measures and for simulating mitigation strategies.

7.7 magnitude New Madrid earthquake scenario: Hazus-MH estimates that the damages would be negligible in Allen County.

6.8 magnitude Mt. Carmel earthquake scenario: Hazus-MH estimates that the damages would be negligible in Allen County.

Probabilistic 500-year earthquake scenario: Hazus-MH estimates that approximately 31 buildings will be at least moderately damaged. This is a very small percentage of the total number of buildings in the region. No buildings will be damaged beyond repair.

The results of the probabilistic 500-year analysis are depicted in Tables 22 and 23 and Figure 26.

The model estimates that the aggregate building-related losses would total over $5.99 million; 10% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss—56% of the total.

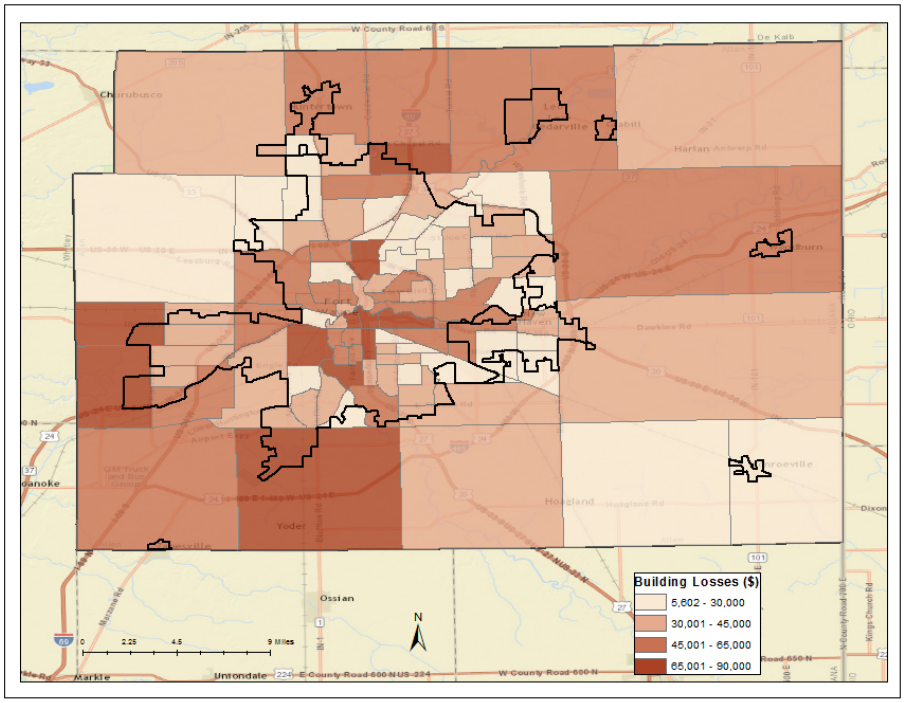
Table 22: Probabilistic 500-Year Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	3,457	2.82	12	2.34	1	1.71	0	0.03	0	0.00
Commercial	3,875	3.16	17	3.37	1	4.61	0	9.65	0	0.00
Education	194	0.16	1	0.18	0	0.18	0	0.24	0	0.00
Government	115	0.09	0	0.10	0	0.10	0	0.17	0	0.00
Industrial	1,209	0.99	5	0.93	1	1.99	0	3.68	0	0.00
Other Residential	4,413	3.60	37	7.32	6	18.55	0	83.75	0	0.00
Religion	924	0.75	4	0.88	0	0.85	0	0.92	0	0.00
Single Family	108,366	88.42	430	84.88	22	72.00	0	1.56	0	0.00
Total	**122,553**		**507**		**31**		**0**		**0**	

Table 23: Probabilistic 500-Year Scenario-Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.01	0.05	0.01	0.04	0.11
	Capital-Related	0.00	0.00	0.05	0.01	0.01	0.07
	Rental	0.05	0.03	0.08	0.01	0.01	0.17
	Relocation	0.11	0.03	0.04	0.03	0.05	0.26
	Subtotal	**0.15**	**0.06**	**0.22**	**0.06**	**0.11**	**0.61**
Capital Stock Losses							
	Structural	0.33	0.06	0.09	0.05	0.06	0.59
	Non_Structural	1.87	0.41	0.42	0.36	0.43	3.48
	Content	0.42	0.08	0.21	0.21	0.24	1.15
	Inventory	0.00	0.00	0.02	0.11	0.02	0.15
	Subtotal	**2.62**	**0.55**	**0.74**	**0.72**	**0.75**	**5.38**
	Total	**2.77**	**0.61**	**0.96**	**0.78**	**0.86**	**5.99**

Figure 26: Building Losses in Thousands of Dollars



Direct Impact to Essential Facilities

Before the earthquake, the analysis estimated that region would have 10,300 care beds available for use. On the day of the earthquake, the model estimates that 9,618 care beds (93%) would be available for use by patients already in medical care facilities, as well as those injured by the earthquake. After one week, 97% of the beds would be back in service.

Table 24: Probabilistic 500-Year Scenario - Essential Facility Damage

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	199	0	0	199
Schools	125	0	0	125
EOCs	1	0	0	1
PoliceStations	11	0	0	11
FireStations	39	0	0	39

Indirect Impact

Indirect impacts associated with earthquakes may include the following:

- Costs associated with increased emergency response personnel to assist in areas of significant damage
- Cost to provide shelter and supplies to residents
- Delays in delivery of goods or services in areas of damage
- Business losses

Winter Storms

Definition

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

Indiana can experience snowfall during most years from November through March, especially in the lake effect snow belt in the northern part of the state. Snow has occurred as early as September and as late as May, although these events are rare. The first measurable snowfall of the season usually occurs by the start of November in northern Indiana and by mid-November in southern Indiana.

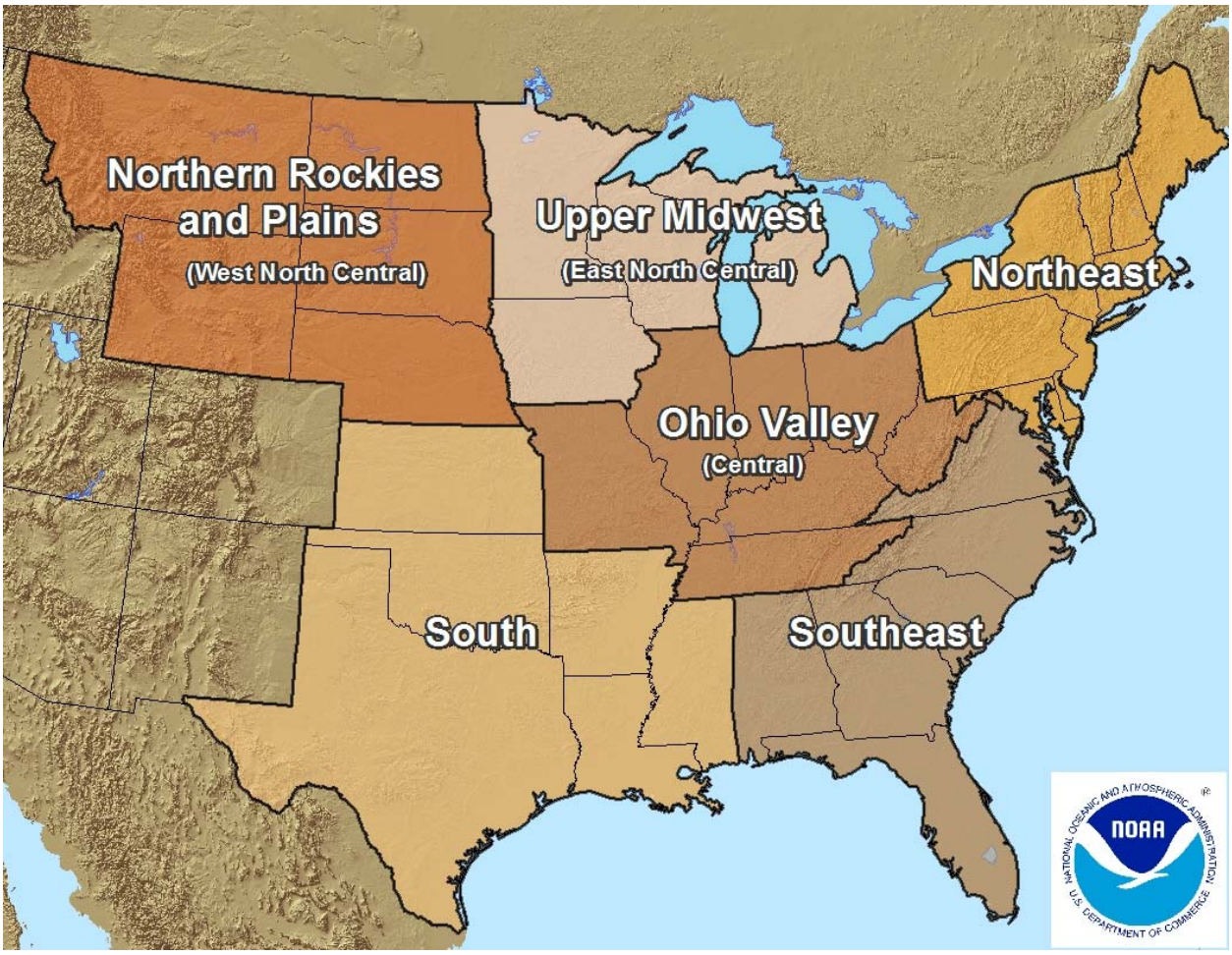
NOAA's National Climatic Data Center produced a Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the US. The RSI (Table 25) ranks snowstorm impacts on a scale from 1 to 5, similar to the Enhanced Fujita scale for tornadoes.

Table 25: Regional Snowfall Index

Category	RSI Value	Description
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

The RSI is based on the spatial extent of the storm and the amount of snowfall and considers how these elements interact with an area's population. It is produced for each of the six NCDC climate regions (Figure 27).

Figure 27: NCDC Climate Regions



Previous Occurrences

NCDC reported 59 winter storm events between 1995 and 2015. Only $25,000 in property damage was reported, but final damage estimates may be far greater. Additionally, winter storms result in significant indirect costs and impacts that are more difficult to evaluate. Table 26 lists the winter storm events in Allen County over the past 20 years.

Table 26: NCDC-Reported Winter Storm Events (June 1995–July 2015)

Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Allen County	02/13/07	0	0	$ -	$ -
Allen County	02/01/11	0	0	$ -	$ -
Allen County	01/02/99	0	0	$ -	$ -
Allen County	03/11/00	0	0	$ -	$ -
Allen County	12/13/00	0	0	$ -	$ -
Allen County	12/16/00	0	0	$ -	$ -
Allen County	12/25/02	0	0	$ -	$ -
Allen County	02/22/03	0	0	$ -	$ -
Allen County	12/08/05	0	0	$ -	$ -
Allen County	01/27/09	0	0	$ -	$ -
Allen County	02/25/11	0	0	$ -	$ -
Allen County	11/29/11	0	0	$ -	$ -
Allen County	02/04/12	0	0	$ -	$ -
Allen County	03/05/13	0	0	$ -	$ -
Allen County	03/24/13	0	0	$ -	$ -
Allen County	02/01/15	0	0	$ -	$ -
Allen County	01/31/02	0	0	$ -	$ -
Allen County	01/05/05	0	0	$ -	$ -
Allen County	02/24/07	0	0	$ 25,000	$ -
Allen County	12/09/07	0	0	$ -	$ -
Allen County	12/18/08	0	0	$ -	$ -
Allen County	01/02/96	0	0	$ -	$ -
Allen County	01/26/04	0	0	$ -	$ -
Allen County	12/22/04	0	0	$ -	$ -
Allen County	01/22/05	0	0	$ -	$ -
Allen County	12/15/07	0	0	$ -	$ -
Allen County	02/01/08	0	0	$ -	$ -
Allen County	02/25/08	0	0	$ -	$ -
Allen County	03/04/08	0	0	$ -	$ -
Allen County	02/09/10	0	0	$ -	$ -
Allen County	12/12/10	0	0	$ -	$ -
Allen County	12/13/13	0	0	$ -	$ -
Allen County	01/05/14	0	0	$ -	$ -
Allen County	02/04/14	0	0	$ -	$ -
Allen County	03/12/14	0	0	$ -	$ -
Allen County	01/17/06	0	0	$ -	$ -
Allen County	12/26/08	0	0	$ -	$ -
Allen County	01/07/10	0	0	$ -	$ -
Allen County	12/05/10	0	0	$ -	$ -
Allen County	01/11/11	0	0	$ -	$ -

Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Allen County	02/05/11	0	0	$ -	$ -
Allen County	02/20/11	0	0	$ -	$ -
Allen County	01/12/12	0	0	$ -	$ -
Allen County	01/19/12	0	0	$ -	$ -
Allen County	01/20/12	0	0	$ -	$ -
Allen County	12/26/12	0	0	$ -	$ -
Allen County	12/28/12	0	0	$ -	$ -
Allen County	01/27/13	0	0	$ -	$ -
Allen County	02/04/13	0	0	$ -	$ -
Allen County	02/22/13	0	0	$ -	$ -
Allen County	02/26/13	0	0	$ -	$ -
Allen County	01/01/14	0	0	$ -	$ -
Allen County	02/01/14	0	0	$ -	$ -
Allen County	02/17/14	0	0	$ -	$ -
Allen County	01/05/15	0	0	$ -	$ -
Allen County	01/08/15	0	0	$ -	$ -
Allen County	02/14/15	0	0	$ -	$ -
Allen County	03/01/15	0	0	$ -	$ -
Allen County	03/03/15	0	0	$ -	$ -

Future Probability

Winter storms are a common occurrence in Allen County, and the probability of future winter storms will remain high. Due to the unpredictability of this hazard, all buildings and infrastructure in Indiana are at risk of damage including temporary or permanent loss of function. Global climate change may have an impact on the probability of future events; however, it is unclear as to the extent of this impact.

Potential Impact

The aftermath of a winter storm can affect a community or region for days, weeks, and even months. Storm effects such as extreme cold, flooding, and snow accumulation can cause hazardous conditions and hidden problems for people in the affected area. People can become stranded on the road or trapped at home, without utilities or other services, including food, water, and fuel supplies. The conditions may overwhelm the capabilities of a local jurisdiction. Winter storms are considered deceptive killers as they may indirectly cause transportation accidents, and injury and death resulting from exhaustion/overexertion, hypothermia and frostbite from wind chill, and asphyxiation; and house fires occur more frequently in the winter due to lack of proper safety precautions.

It is highly likely that this type of hazard will occur in this area and will typically affect the entire county, and possibly several surrounding counties, at one time, resulting in primarily limited severity. The City of Fort Wayne is anticipated to have an especially significant impact due to the number of critical infrastructure and the population within the community. The warning time for severe temperatures or several inches of snow associated with a winter storm is usually greater than 24 hours while the duration of the incident is anticipated to last less than 1 week.

A snow storm typically affects a large regional area with potential for physical, economic, and/or social losses. Direct and indirect impacts of a snow storm or ice storm within Allen County may include:

Direct Impacts:

- More urban area (Fort Wayne and New Haven) employers may experience loss of production as employees may not be able to get to work
- Rural (County) roads may impassable
- Expenses related to snow removal or brine/sand applications

Indirect Impacts:

- Loss of revenue as businesses are closed
- Increased emergency response times based on safety of roads
- Loss of income if unable to get to place of employment

Snow storms can also result in substantial indirect costs. Increased emergency response times, loss of work or the inability to get to work, as well as business interruption, are possible indirect impacts of a winter storm. According to a report by the National Center for Environmental Predictions, the cold and snowy winter in late 1977 and early 1978, which impacted several heavily populated regions of the country, was partially responsible for reducing the nation's Gross Domestic Product (GDP) from an estimated growth rate of between 6% and 7% during the first 3 quarters of 1977 to approximately -1% in the last quarter of 1977 and 3% during the first quarter of 1978.

Drought

Definition

Droughts are created by below normal rainfall; however, excessive heat can lead to increased evaporation, which will enhance drought conditions. A drought can occur in any month and is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more). The severity of a drought depends on location, duration, and geographical extent. Additionally, drought severity depends on the water supply, usage demands made by human activities, vegetation, and agricultural operations.

Indiana is increasingly vulnerable to drought hazards due to growth and shifts in population; land use changes, which can result in water shortage and degrade water quality; and climate change, which increases the frequency, severity, and duration of drought events.

The US Drought Monitor categorizes droughts on a scale from D0 to D4 as outlined in Figure 28.

Figure 28: US Drought Monitor – Categories of Drought Severity

		Ranges					
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

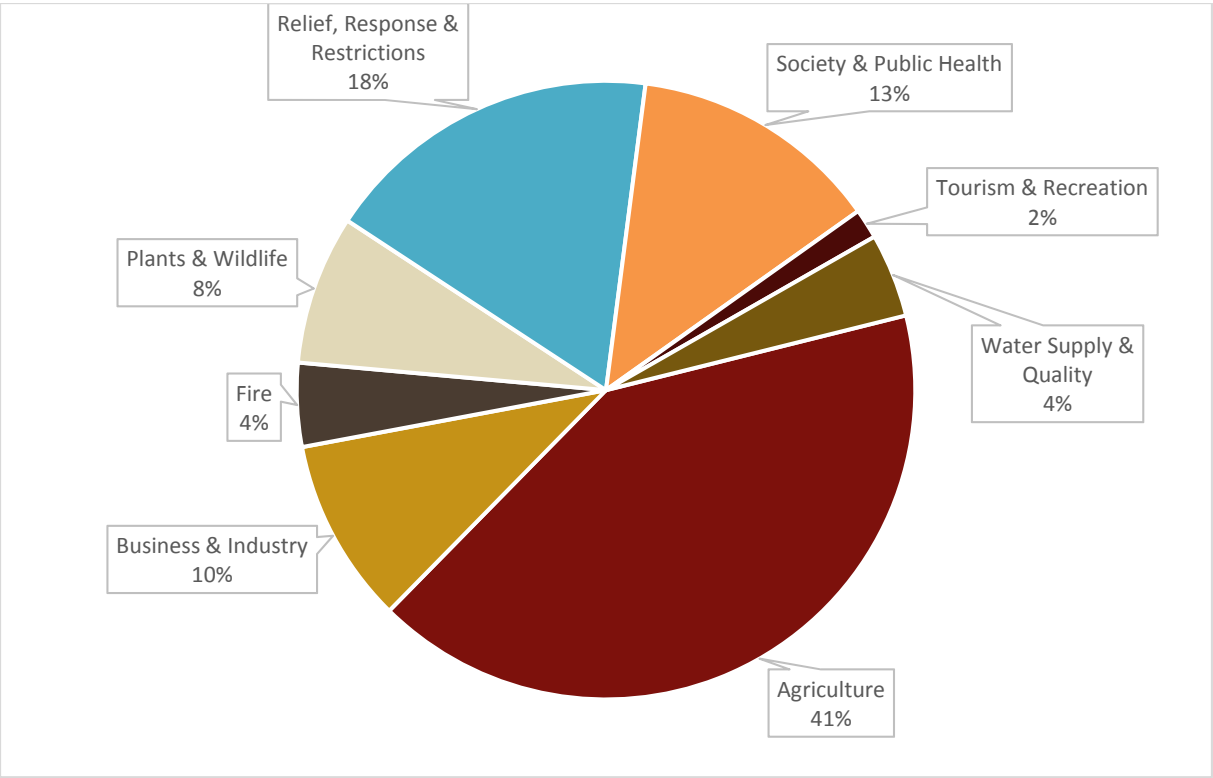
Previous Occurrences

During the 1988 drought, crop yields were 50%-86% less than in the previous year, as indicated in a study by the USGS. Additionally, the IDNR issued a 90-day water conservation decree for the northwest quadrant of Indiana. State surface water reservoirs approached, and some reached, record low water levels. Some power plants reduced, or shut down, operations temporarily where cooling reservoirs fell to a level that could not support the capacity to cool discharge waters from the plant.

The 1999 drought affected the eastern and Midwestern portions of the United States, with Indiana facing hard-felt crop and other agricultural losses.

Data gathered from the National Drought Mitigation Center's Drought Impact Reporter indicated that between August 2005 and September 2015, there were 191 total drought-related impacts to Allen County. Figure 29 shows the results categorized by type of impact.

Figure 29: Drought Impacts in Allen County (August 2005–September 2015)



In August of 2011, approximately 73% of Indiana was experiencing drought conditions, including Allen County, which was listed as a "D1 Drought – Moderate" where there may be some damage to crops and pastures, streams and reservoirs may be low, and water shortages may be developing or imminent. No losses have been documented in Allen County specific to these droughts but the National Climate Data Center (NCDC) has documented similar losses in southwestern Indiana counties.

Future Probability

Over the past decade, Indiana has experienced significant droughts, but the probability of future droughts is unknown. The National Drought Mitigation Center states that scientists have difficulty predicting droughts more than one month in advance due to the numerous variables such as

precipitation, temperature, soil moisture, topography, and air-sea interactions. Due to the unpredictability of this hazard, both rural and urban areas in Allen County are at risk. Global climate change may have an impact on the probability of future events; however, it is unclear as to the extent of this impact.

Potential Impact

This type of hazard will generally affect entire counties and even multi-county regions at one time. Within Allen County, direct and indirect impacts from a long period of drought may include:

Direct Impacts:

- Urban and developed areas may experience revenue losses from landscaping companies, golf courses, restrictions on industry cooling and processing demands, businesses dependent on crop yields; and increased potential for fires.
- Rural areas within the County may experience revenue losses from reductions in livestock and crop yields as well as increased field fires.

Indirect Impacts:

- Loss of income of employees from businesses and industry affected; loss of revenue to support services (food service, suppliers, etc.)
- Lower yields from domestic gardens increasing the demand on purchasing produce and increased domestic water usage for landscaping
- Increased demand on emergency responders and firefighting resources

It is difficult to estimate the potential losses associated with a drought for Allen County because of the nature and complexity of the hazard and the limited data on past occurrences. However, the 2012 Allen County MHMP included a scenario to estimate the potential crop loss and associated revenue lost due to a drought similar to that experienced during the 1988 drought. In 2010, Allen County produced approximately 10.5 million bushels of corn and 4.8 million bushels of soybeans, as reported by the National Agricultural Statistics Service (NASS). This ranked Allen County 39th and 13th of 92 counties in Indiana regarding corn and soybean production respectively in 2010. Using national averages of $3.83 per bushel of corn and $9.97 per bushel of soybeans, the estimated crop receipts for 2010 would be $87.5 million. Using the range of crop yield decreases reported in 1988 and 1989, just after the 1988 drought period (50%-86%) and assuming a typical year, economic losses could range between $43.8 million and $75.3 million; depending on the crop produced and the market demand[vii].

Extreme Temperatures

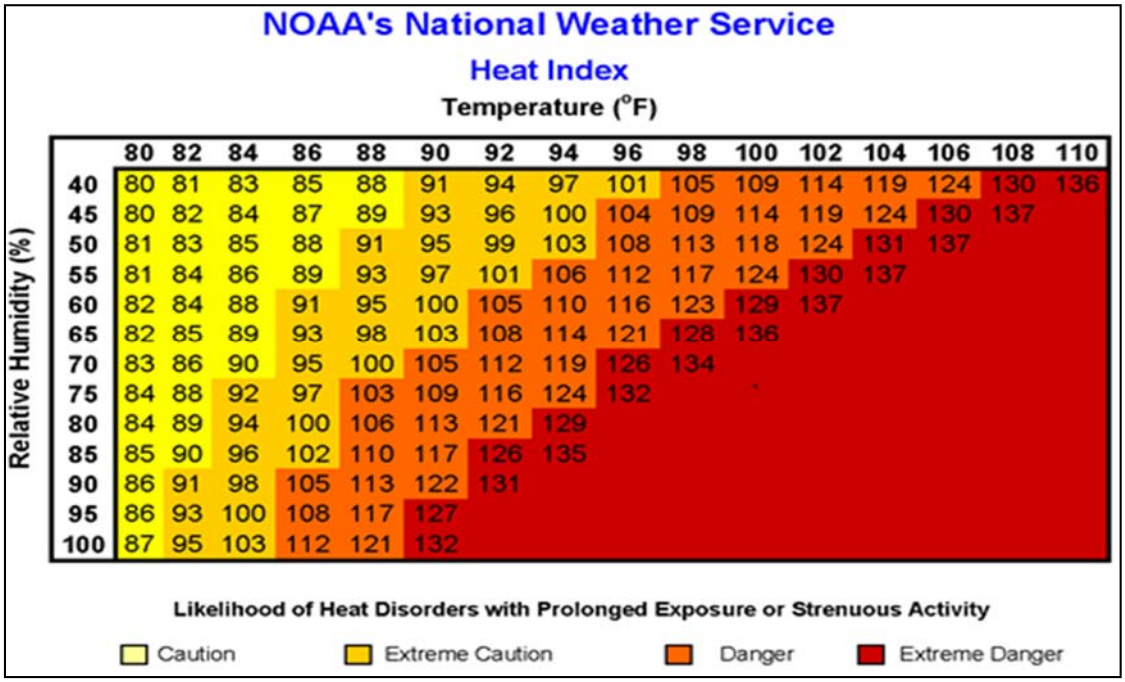
Definition

Extreme temperatures—both hot and cold—can have significant impact on human health and safety, commercial businesses, agriculture, and primary and secondary effects on infrastructure (e.g. burst pipes, power failures, etc.). Weather conditions described as extreme heat or cold vary across different areas of the state, based on the range of average temperatures within the region.

An Extreme Heat Event (EHE) is characterized by temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region and last for several weeks. An extended period of extreme heat of three or more consecutive days is typically referred to as a heat wave.

Heat alert procedures are based primarily on Heat Index Values. The Heat Index—given in degrees Fahrenheit—is often referred to as the apparent temperature and is a measure of how hot it really feels when the relative humidity is factored with the actual air temperature. The National Weather Service Heat Index Chart can be seen below in Figure 30.

Figure 30: National Weather Service Heat Index Chart

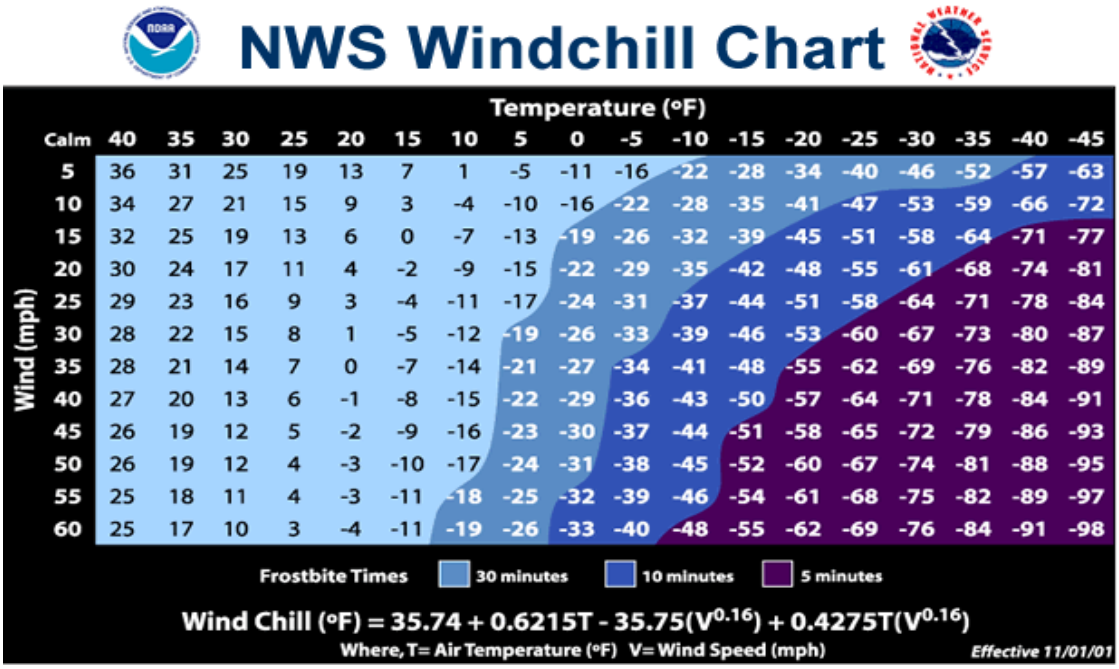


What constitutes an extreme cold event, and its impacts, varies across the United States. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Extreme cold temperatures are typically characterized by the ambient air temperature dropping to approximately 0 degrees Fahrenheit or below.

The magnitude of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. Wind Chill Temperature is the temperature that is felt when outside and is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin's temperature to drop.

The index, shown in Figure 31, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

Figure 31: National Weather Windchill Chart



Previous Occurrences

The NCDC reported four occurrences of extreme temperatures in Indiana since 1995: two were extreme heat events and two were extreme cold events. All four events impacted Allen County.

Both NCDC-reported heat events occurred in 1995, resulting in 15 deaths statewide and more than $1 million. Though not reported to NCDC, local resources recorded an additional two extreme heat events in the past decade. In August 2006, the Community Center in Fort Wayne operated as a cooling station to provide air conditioning and ice water to citizens in need. Additionally Fort Wayne's public pools provided free admission to those seeking relief. Though no power outages were reported in Allen County, the United REMC, a local energy wholesaler, asked customers to conserve energy during the period of high temperatures to mitigate the possibility of heat impacts.

More recently, in July 2011, temperatures hovered steadily around 100°F for nearly a week. The National Weather Service issued a heat advisory for northern Indiana and northwest Ohio, and Fort

Wayne activated two public cooling shelters at the Community Center and Public Safety Academy. These cooling centers reported serving more than 200 residents.

The two recent extreme cold events occurred in January 2014 and January 2015 respectively. The 2014 event resulted in dangerous wind chill values between 30 and 45 degrees below zero, and in Allen County strong winds caused significant snow drifting, leaving roads impassable in areas. A similar event occurred a year later in 2015 when a prolonged period of very cold weather registered wind chill temperatures at 20 to 30 degrees below zero. There were numerous school closings and delays, but no reported injuries or property damage.

Future Probability

On average, extreme heat claims more lives across the country each year than floods, lightning, tornadoes, and hurricanes combined. Although Indiana has recently experienced significant events—a heat event in 2012 and a record 2013-2014 extreme cold event—the probability of future extreme temperatures is still unknown. Global climate change may have an impact on the probability of future events; however, it is unclear as to the extent of this impact.

Potential Impact

The National Weather Service has stated that extreme heat is the number one weather-related killer in the US and results in hundreds of deaths each year. During the 1995 heat wave, it is reported that more than 700 heat-related deaths occurred in Chicago, Illinois. In 2003, a heat wave in Europe resulted in more than 50,000 deaths (Allen County Multi-Hazard Mitigation Plan, 2012). The effects of extreme temperatures typically extend across large regions, affecting many counties, or even states, during a single event.

Special needs populations in Allen County are more vulnerable to extreme temperatures. More than 15% of the county's population is living below the poverty line. Additionally, more than 12% of residents are 65 years of age or older. People within these demographic categories are more susceptible to social and health-related impacted associated with extreme temperatures.

Direct Impacts:

- Health risks to the elderly, infants, people with chronic medical disorder, lower income families, athletes, etc.
- Loss of livestock or domestic animals if not properly sheltered and watered

Indirect Impacts:

- Need to open and staff cooling shelter
- Increased emergency medical response and treatment
- Loss of revenue from livestock losses
- Increased homeowner expenses related to air conditioning, refrigeration, etc.

Unlike other natural hazard events, extreme heat events leave little to no physical damage to communities; however, they can lead to severe short and long-term health conditions, or even death. Extreme heat events can also impact environmental and economic vulnerabilities as a result of water shortages and drought.

Disease Outbreak

Definition

The Centers for Disease Control and Prevention (CDC) characterizes a disease outbreak as a sharp increase in the number of incidences of a disease in the population. When the expected or routine amount of incidences of a disease rapidly grows into a public health threat, public health and emergency management officials and medical care professionals must act swiftly to limit morbidity and mortality. The CDC requires state and local health departments to report 77 different types of infectious diseases. Transmission of infectious diseases may occur through a variety of pathways, including airborne inhalation, food, liquids, bodily fluids, contaminated objects, ingestion, or vector-borne spread. Disease outbreaks pose a particular risk to urban and suburban communities due to the close environments in which people interact.

Previous Occurrences

There have been several reported occurrences of infectious diseases over the past 20 years in Allen County. The Allen County Department of Health provided the following information as documented in its annual reports and other plans.

HIV (2015): In early 2015, the Indiana State Department of Health (ISDH) reported an ongoing investigation into an HIV outbreak in southeastern Indiana, and as of September 1, 2015, there were 181 confirmed cases of the virus. Although the outbreak has been contained within southeastern

Indiana (as of September 2015), the CDC warns that a hepatitis C epidemic and a rise in intravenous drug use nationwide could spark new HIV outbreaks in other regions of Indiana and the US.

West Nile Virus (1999-2013): West Nile virus is commonly found in mosquitos throughout the state each summer. While most cases of the virus are mild, a small percentage can be life-threatening. Since 2002, when Indiana had its first human case of the virus, 44 Indiana residents have died from the illness, six of which occurred in Allen County. Between 1999 and 2013, there were 106 reported human cases of West Nile Virus and 6 deaths. The following table compares the number of human cases and deaths in Allen County to Indiana and the US from 1999 to 2013.

Table 27: Human Cases/Deaths from West Nile Virus (1999-2013)

Year	Allen County (as reported by ISDH)	Indiana (as reported by ISDH)	United States (as reported by CDC)
2013	1 / 0	20 / 1	2,059 / 83
2012	12 / 2	75 / 7	5,387 / 243
2011	1 / 0	9 / 1	712 / 43
2010	2 / 0	13 / 1	981 / 45
2009	0 / 0	3 / 1	395 / 12
2008	0 / 0	3 / 0	1,356 / 44
2007	1 / 0	24 / 1	3,630 / 124
2006	10 / 1	80 / 5	4,269 / 177
2005	2 / 0	23 / 1	3,000 / 119
2004	1 / 0	13 / 1	2,539 / 100
2003	7 / 1	47 / 4	9,862 / 264
2002	69 / 3	293 / 11	4,156 / 284
2001	0 / 0	0 / 0	66 / 10
2000	0 / 0	0 / 0	21 / 2
1999	0 / 0	0 / 0	62 / 7
Total	**106 / 6**	**597 / 32**	**37,759 / 1,558**

Salmonella (2013): Between March and October of 2013, 356 people across 39 states were infected in an outbreak of *Salmonella* Typhimurium. Indiana reported 10 cases. Investigation among CDC, USDA, and state and local public health officials revealed that the outbreak was linked to human contact with chicks, ducklings, and other live baby poultry. Although the outbreak impacted people of all ages, 57% of ill people were children 10 years old or younger. There were no deaths reported.

Future Probability

The probability of future disease epidemics is unknown; however, Allen County should be prepared to address potential public health concerns in the event of any disaster. Disruption of sanitation services and facilities, loss of power, and massing of people in shelters may increase the potential for disease outbreak. In terms of animal disease outbreak, particular concern should be paid to rural areas within Allen County, which represent the largest concentrations of livestock, as well as the Fort Wayne Children's Zoo, which houses the largest concentration of large and exotic animals.

Potential Impact

Disasters occurring in Allen County may often impact community health standards and require a public health response. Wastewater, solid waste, potable water, air quality, health supplies, and public health services are commonly affected, necessitating public health advisories and disease control intervention measures. Following a major disaster, many persons will be left without trusted sources of food and water. Safe supplies of food and water must be identified and obtained and subsequently distributed into areas hard hit by major disasters.

When assessing target capabilities, Allen County officials must consider that in such health-impacted situations, communities may quickly become overwhelmed addressing the medical needs of citizens and/or local care facilities may have reduced or no operability due to direct impacts from a disaster. Additionally, though disease impact can impact any individual, it will likely have a more significant impact on vulnerable populations such as individuals in poverty or over 65 years of age.

The following examples provided by the Allen County Department of Health describe the direct and indirect impacts of historical disease outbreaks.

West Nile Virus (2002): The Allen County Health Department (among many throughout the US) responded to the largest arboviral disease outbreak experienced in the United States. This mosquito-borne illness caused more morbidity and mortality than ever before in world history. Over the course of several months, the health department was able to implement mass chemical adulticide spraying to kill flying mosquitoes at the time of spraying over the course of several months, doing so each night for many hours. This was helpful in the prevention of mosquito breeding stopping the spread of the virus for which no medical treatment or vaccine exists for humans. The health department increased prevention methods and education and partnered with various agencies and schools to change outdoor activities throughout the year to prevent the spread of this massively deadly disease. Some events held outdoors were precluded due to the potential of mosquito activity. Each year since 2002, the cases continue, but the disease has become endemic, so many people have been exposed and less

are sickened each year. The devastating nature of this disease for those who contract it, however, has not waned.

Smallpox (2003): For local health departments around the nation, 2003 began with a mandate from the Centers for Disease Control and Prevention (CDC) and the Indiana State Department of Health (ISDH) to participate in the National Smallpox Vaccination Program. In an effort to prepare for potential consequences of another large-scale terrorist attack felt potentially imminent at that time, the federal government strongly recommended that all states and large cities have a healthcare response team prepared to provide medical care to smallpox patients and a public health response team ready to provide smallpox immunizations to the entire community. The teams had to be identified and vaccinated within a very short time frame. The smallpox vaccine, while very effective, is also a very difficult vaccine to administer. Nurses and other healthcare volunteers were required to complete a 6-hour training course to learn how to safely vaccinate smallpox response team members. A limited amount of smallpox vaccine was provided to each health department to vaccinate critical infrastructure people. The idea at that time was to vaccinate "the vaccinators" who would need to be immune in order to provide mass vacations to the community should an attack occur. Developing and implementing complex plans for smallpox response team member identification, education and vaccination was performed quickly and effectively by highly skilled public health nurses.

Tuberculosis Outbreak (2004): From 2003 to 2004, Allen County saw a 50% increase in the number of active TB cases. In March, the Fort Wayne–Allen County Department of Health (DOH) and the Indiana State Department of Health (ISDH) invited the Division of TB Elimination at the Centers for Disease Control and Prevention (CDC) to assist state and local officials with this community TB outbreak. A community TB education campaign was launched by the DOH that included presentations to community providers and city hospitals, emergency TB alerts to area providers, and article submissions to both professional and lay publications. A Regional TB Nurse Consultant from ISDH conducted 5 TST certification classes, resulting in certification of 65 individuals, and TB educational seminars to community providers and volunteer organizations. The DOH collaborated with the Medical Reserve Corp (MRC) of Allen County in activating 40 emergency healthcare volunteers to assist the DOH with TST screening of the public. This took several months and many cases of TB were identified and traced to one entity in Allen County.

Anthrax (2008-2009): During the national crisis where numerous high ranking officials were sickened due to anthrax, the issue became a local crisis. A high number of "white powder" incidences were reported through various ways, such as from letters coming through a local post office as well as other deliveries. This launched a local 24/7 response from the fire department and health department

to attempt to identify, dispel and then potentially contain any findings in homes, businesses, etc. It also resulted in better detection systems in the post offices throughout the United States. One such unit is located in Allen County and conducts large scale drills of the testing system every two years in an effort to prepare for an alarm indicating the presence of anthrax in a letter or package. An anthrax response is one of the largest responses health departments would engage in as the timeline is short for intervention and the demand of medication and/or vaccination would outnumber what would be available in most cases.

H1N1 Influenza Outbreak (2009): A novel H1N1 Influenza Virus spread from Mexico to California to across the nation within weeks. A vaccine was released months later. Local health departments across the country participated in a large-scale effort to conduct mass vaccinations and track H1N1 influenza cases and death tolls. Allen County ceased several general operations in the department of health and devoted all staff and resources for a three-month period to this overwhelming task.

Multi-Drug Resistant Tuberculosis (2012): The Allen County Department of Health tested a citizen for TB (due to high risk factors) who not only tested positive for active TB, but was found to have Multi-Drug Resistant TB (MDR-TB), a very rare and problematic form of TB. As a result, many months were dedicated to testing all contacts this person had been around over the past six months (including interactions at schools, on buses, at work and events, and with friends and family). The costs for this one investigation and medication totaled more than $300,000.

Hepatitis A (2003): The Allen County DOH was notified of a positive case of Hepatitis A in a food service employee who had worked while ill. Because Hepatitis A is very transmissible through food and person-to-person contact, the response requires mass vaccination of all who ate at the establishment or were around the person within the prior month. The window of effectiveness for the vaccine closes every single day as there is only a certain period within which it is effective at preventing illness. As a result, DOH had to establish a mass clinic and vaccinate 2,000 people within 24-72 hours.

Ebola (2014): The US reported its first imported cases of Ebola in Fall 2014. All health departments around the nation were put on alert and required to develop plans for prevention, testing, and decontamination/mitigation to be prepared for additional cases. Daily conference calls occurred with the State Department of Health and CDC for nearly one month in preparation. Grant monies were allotted to all states/locals across the US to purchase personal protective equipment, development training and materials and write plans for response. Local health departments (Allen County included) monitor travelers to the effected regions as they return to the United States. They are required to monitor each visitor returning to the United States every day within a two-week period, and every single day. As of the development of this plan in December 2015, this activity is ongoing.

Invasive Species

Definition

Invasive species are a serious threat to homes, environment, and economy. They include exotic insects, plants, fish, birds, mammals, and many other organisms. The term "invasive species" refers to organisms that establish themselves and out-compete other species, usually severely disrupting the stability of the affected ecosystem[viii]. These non-native species cause negative impacts on communities and do not provide an equivalent or greater benefit to society.

Invasive plants and animals are the second greatest threat to biodiversity after habitat loss. They are often responsible for habitat damage, loss of subsistence resources, and economic loss.

Previous Occurrences

Allen County has confirmed reports of seven invasive species of insects and 25 plants, however, there are no documented reports of crop loss directly linked to invasive species.

Future Probability

The probability that Allen County will continue to have invasive species is highly likely, although the impact is estimated to be fairly minimal.

Potential Impact

Invasive species can have direct impacts on human health, native wildlife, and economies. The impacts of these species on our natural ecosystems and economy cost billions of dollars each year nationally.

Direct Impacts[ix]:

- Preying on native species
- Out-competing native species for food or other resources
- Causing or carrying disease
- Preventing native species from reproducing

Indirect Impacts:

- Changing food webs by destroying or replacing native food sources
- Decreasing biodiversity
- Altering ecosystem conditions, which may result in more intense wildfires

Technological Hazards Analysis

Hazardous Materials Release (Fixed-Site)

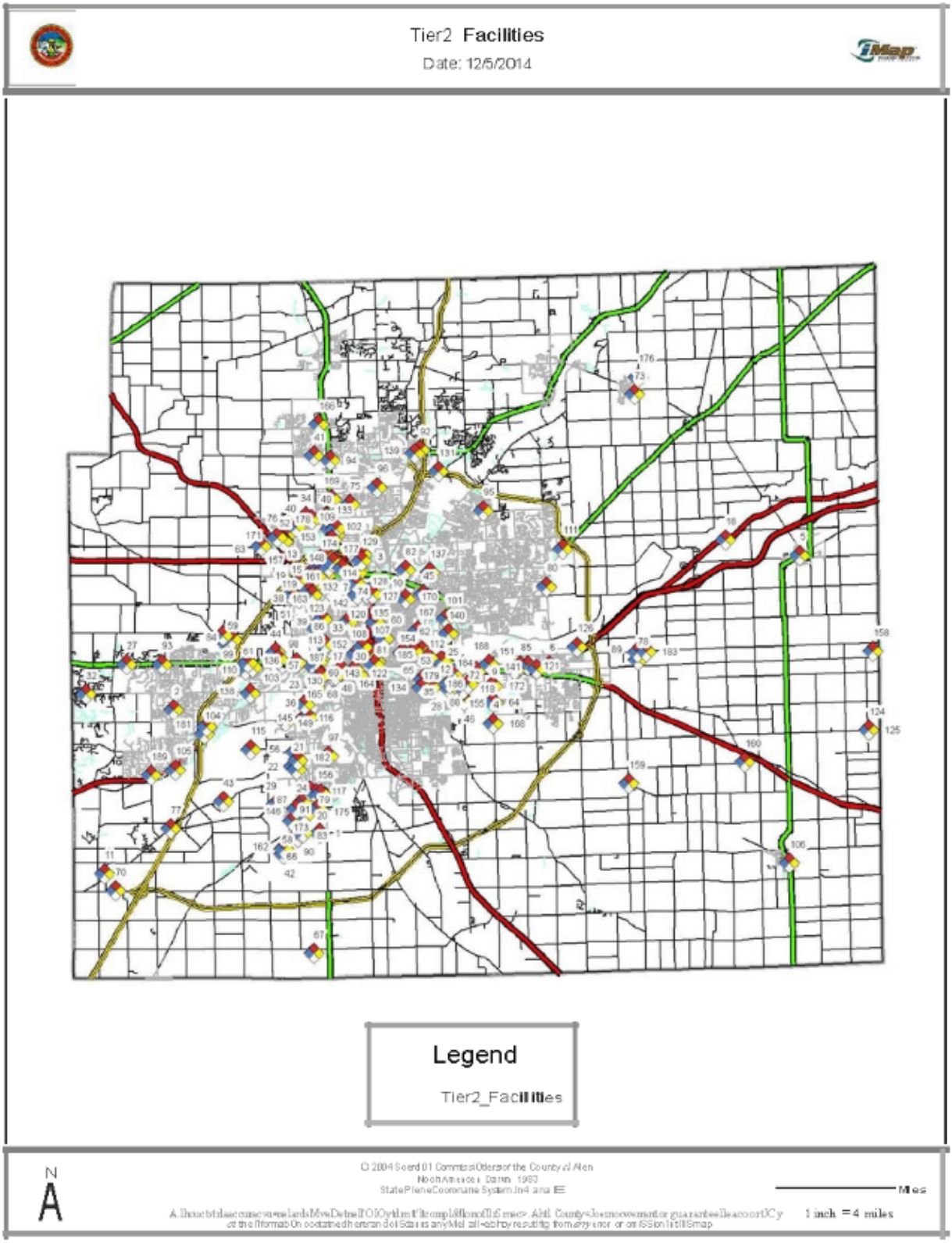
Definition

Hazardous materials are any solid, liquid, or gas that can pose a threat to human health and/or the environment due to being radioactive, flammable, explosive, toxic, corrosive, a biohazard, an oxidizer, an asphyxiant, or capable of causing severe allergic reactions. Hazardous materials are most often released as a result of accidents during transportation or at fixed-site facilities.

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 potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. The release of hazardous materials can also lead to property damage, short and long term health effects, serious injuries, and even death. Emergency response to incidents involving the release of hazardous materials may require fire, safety/law enforcement, search and rescue, and hazardous materials units.

Allen County has a number of extremely hazardous substances (EHS) and non-EHS fixed site facilities reporting hazardous chemical substances. Fixed-site facilities report present levels of inventories via Tier II forms. Analysis of these forms indicate storing and/or processing hazardous materials pose an overall moderate threat to the general population of Allen County. The following map shows the locations of Allen County's Tier II facilities. A complete list is available in the Allen County Hazardous Materials Emergency Response Plan.

Figure 32: Allen County Tier II Facilities



Previous Occurrences

The Allen County Multi-Hazard Mitigation Plan (2012) references several historical occurrences of hazardous materials incidents involving manufacturing facilities. Resulting from poor hazardous material handling and waste disposal practices in the past, the 122nd Tactical Fighter Wing, Indiana Air National Guard (ANG) in Allen County reports four hazardous material sites: Old Fire Training Area, Former Motor Pool, Hazardous Waste Collection Area, and the POL Soil Area.[x] Located in the southwest side of the City of Fort Wayne and immediately east of Baer Field Municipal Airport, the Former Fire Training Area (FTA) contains a contaminated burn area approximately 15 by 90 ft. The burn area was designed to contain fuel and waste oils used during firefighting exercises through the construction of a berm on the western downslope side of the burn area. The burn area was unlined. Approximately ten times a year from 1963 to 1972, the former FTA was used for fire training exercises. During each fire training exercises around 50 to 60 gallons of fuel were used causing a total of 500 to 600 gallons of fuel being dumped per year. The majority of the fuel used was JP-4, Jet Propellant, along with smaller amounts of motor oil and aviation gasoline. The Naval Health Research Institute Detachment- Toxicology found that exposing rats to JP-4 jet fuel vapor at room air control conditions induced changes in neurobehavioral capacity, which was comparable to the neurobehavioral evaluations of European manufacturing personnel chronically exposed to jet fuel vapor.[xi] Because of the hazardous nature of JP-4 and other liquid fuels, the Former Fire Training Area site continues to be observed demonstrating the possible long-term repercussions of hazmat spills.

In February 2007, Fort Wayne fire and hazardous materials teams responded to reports of a vapor cloud at the Raytheon Plant on Production Road. The hazardous cloud developed after about a foot of water mixed with corrosive material. No injuries or monetary damages were reported as a result of this incident.

Another incident occurred in 2009 at Book Construction and involved approximately 800 pounds of liquid asphalt entering a nearby ditch while nearly 5,000 pounds of the material was contained on the property. The cause of the release was human error in operating a back flow valve incorrectly, which resulted in the overflow.

In 2010, there were two separate incidents reported at Dryers/Edy's. The first, in March, resulted in an ammonia release due to an incorrect replacement of a compressor relief valve. The second incident, in May, also involved an ammonia release as a result of an incomplete inspection of recent work completed on the storage unit, refrigeration lines, and valves.

Additionally, on January 23rd of that same year, there was a toxic chemical spill into Saint Mary's River in Fort Wayne.[xii] A machine at the Essex Group plant on Wall Street malfunctioned

causing 300 gallons of hazardous chemicals to enter Saint Mary's River. Officials stated that three chemical spilled into the river: Phenol and Cresylic Acid, both of which can cause severe burns, and petroleum distillates, which is toxic and flammable. Crews contained the spill by cutting and removing chunks of ice where the contamination occurred.

Future Probability

The Allen County planning team ranked the probability of future hazardous materials incidents as highly likely in Fort Wayne and unincorporated areas of Allen County; likely in New Haven; and possible in Grabill, Huntertown, and Monroeville. The higher probabilities are due to the frequency of hazardous materials sites along transportation routes.

Commercial facilities in Allen County that utilize hazardous materials could be targeted by saboteurs, terrorists, and civil unrest. Although Tier 2 facilities in Fort Wayne have not historically been the focus of deliberate malignant interference, fixed site facilities containing potentially hazardous materials could still be vulnerable to the consequences of sabotage. Recommended initiatives for sabotage prevention, counter-terrorism detection and emergency incident response and mitigation include:

- Promote public and employee awareness of occupant emergency, evacuation planning, and familiarity with local, state, and federal employees[xiii]
- Develop citywide and county wide emergency operations contingencies
- Provide emergency response training personnel with hazmat training. The Center for Domestic Preparedness (CDP) offers preparation training for local response forces to protect, prevent, deter, and respond to acts of terrorism or major accidents involving hazardous materials[xiv]
- Install a county and/or city wide emergency public notification system
- Continue to improve the capabilities of Tier 2 facilities to prevent or detect an event, respond to an incident, and mitigates its effects on facilities and the surrounding community

Employees at Tier 2 facilities can be one of the most critical assets in combating and preventing deliberate hazardous material release. Employees at facilities handling hazardous materials should be encouraged to report suspicious incidents or events. Tier 2 facilities should also be aware of the possibility that someone they hire may pose a potential security risk so establishing and confirming applicant information may be vital to ensuring safety.[xv]

Potential Impact

Acute Exposure Guideline Levels (AEGLs) describe the health effects on humans from once-in-a-lifetime or rare exposure to airborne chemicals. Each level is categorized according to the severity of the toxic effects caused by exposure. Level 1 is the least severe and Level 3 is the most severe.

- **AEGL 1 (Least Severe):** Notable discomfort and irritation; however, the effects are not disabling and are reversible upon cessation of exposure.
- **AEGL 2:** Characterized by irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- **AEGL 3 (Most Severe):** Characterized by life-threatening health effects or death.

Allen County has eight hospitals with the capacity to handle a large-scale hazmat incident. Each hospital has a decontamination room beside the ambulance bay for use with the hospital's decontamination team. These hospitals also have staff appropriately trained in admitting and treating patients who have been exposed to hazardous materials. Table 32 lists the eight hospitals.

Table 28: Allen County Hospitals with Hazmat Response Capacity

Hospital	Total Bed Capacity	Hazmat Plan & Location	Personnel Hazmat Training	Hazmat Decon Location
DuPont Hospital 2510 E DuPont Road Fort Wayne, IN 260-416-3002	121	On computers, emergency stations in all depts. and command center	ER Nurses, plan operations, security environmental services. Team of 15 trained	Room adjacent to ambulance bay.
Lutheran Hospital 7950 W Jefferson Fort Wayne, IN 260-435-7001	396[xvi]	In book at ER nurses station on internet	ER staff, security. 20-30 personnel trained	Room adjacent to ambulance bay and 19 portable decon units
Parkview Hospital 2200 Randallia Drive Fort Wayne, IN 260-484-6636	41[xvii]	On computers (intranet)and in ER nurses station	ER nurses and techs, security	Room adjacent to ambulance bay
Parkview Regional Medical Center 11115 Parkview Plaza Drive Fort Wayne, IN 260-672-4600	423	On computers (intranet) and in ER nurses station	ER nurses and techs, security	Room adjacent to ambulance bay
Orthopedic Hospital @ PKV North 11109 Parkview Plaza Drive Fort Wayne, IN 260-266-1000	37	On computers (intranet) and in ER nurses station	ER nurses and techs, security	Room adjacent to ambulance bay

Hospital	Total Bed Capacity	Hazmat Plan & Location	Personnel Hazmat Training	Hazmat Decon Location
Orthopedic Hospital of LHN 7952 West Jefferson Blvd. Fort Wayne, IN 260-435-2999	39			Room adjacent to ambulance bay
Rehabilitation Hospital of LHN 7970 West Jefferson Blvd. Fort Wayne, IN 260-435-6100	36	Dir. Facility Mgr.; Safety Officers Office; online	Hospital leadership, charge nurses, plant ops mgr.; asst. safety officer	No ED/ER at rehab hospital, so minimum equipment available. Equipment stored in two large lockers located in environmental services supply room
VA Northern IN Health Care System- Fort Wayne System 2121 Lake Avenue Fort Wayne, IN 260-426-5431	26[xviii]	Online, safety office	PD, safety, ER staff, security	Fix united next to ER

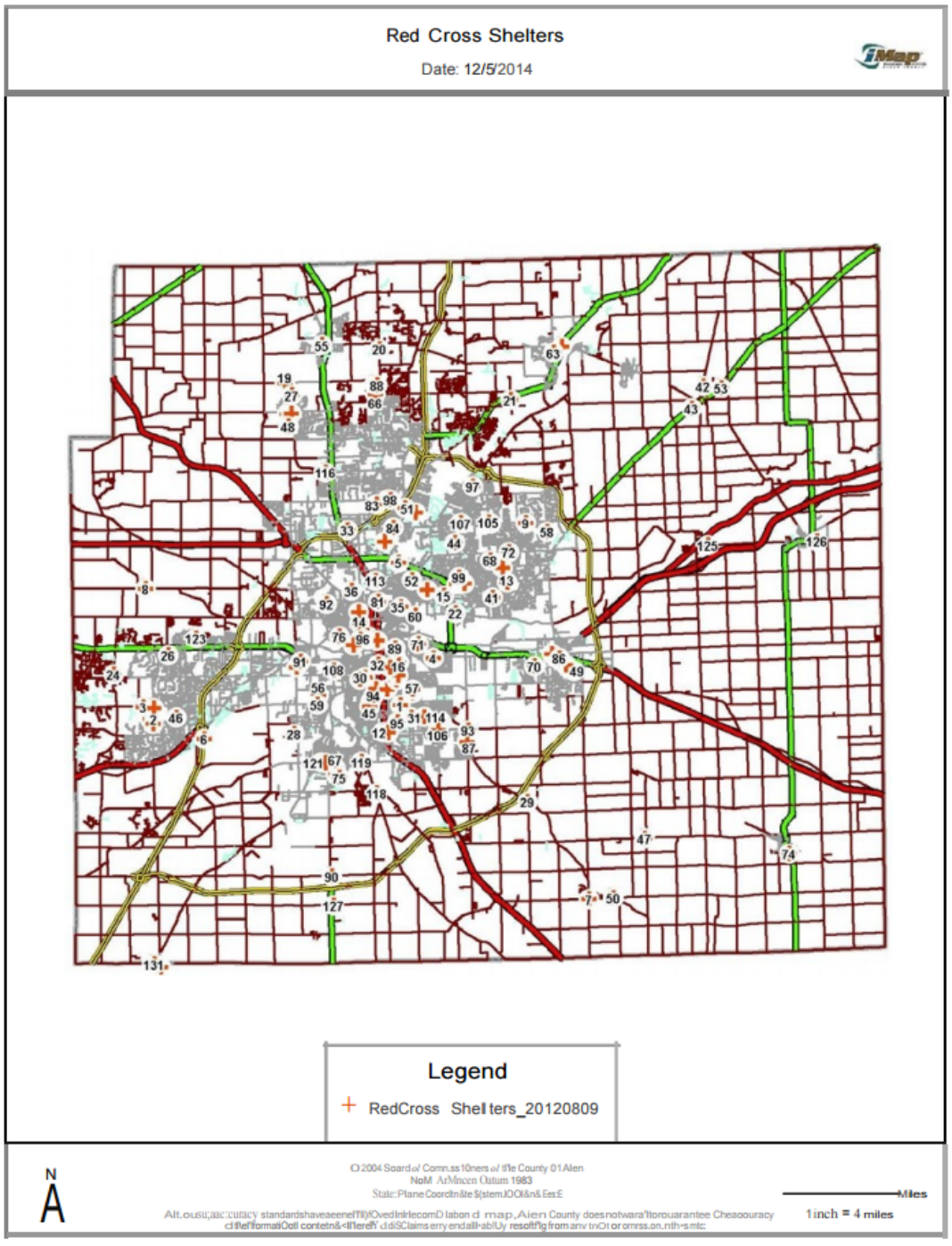
After a hazmat incident, evacuated citizens may require emergency shelter in addition to hospital beds. The Indiana Housing and Community Development Authority lists the emergency shelter facilities in Allen County presented in Table 33. In the event of a large scale hazmat release, Allen County emergency shelters may not possess adequate facilities to provide beds for all the displaced residents seeking shelter.

Table 29: Allen County Emergency Shelters[xix]

Shelter	Address	Shelter Type	Phone Number
Fort Wayne Women's Bureau, Inc.	2440 Bowser, Fort Wayne, IN 46803	Transitional rehab. housing - women & children	260-424-7977
Rescue Mission Ministries, Charis House	533 West Washington Blvd., Ft. Wayne, IN	Emergency homeless shelter- women & children	260-426-8123
Genesis Outreach, Inc.	2812 Gay Street, Fort Wayne, In 46806	Transitional housing - substance abuse - men & women	260-456-1480
Hope House, Inc.	1115 Garden Street, 1129 Garden Street Fort Wayne, IN 46802	Emergency shelter & Transitional housing - women only	260-424-2471, 260 424-3711
Interfaith Hospitality of Greater Ft. Wayne	2605 Gay St, PO Box 13326, Ft. Wayne, IN 46803	Emergency shelter for families	260-458-9772
Premier Palace	317 E. Williams St., Ft. Wayne 46803	Transitional shelter - Women	260-745-3037
Vincent Village, Inc.	2827 Holton Avenue, Fort Wayne, IN 46806	Transitional housing - families	260-456-4172
YWCA - Fort Wayne	Fort Wayne, IN 46805	Domestic violence shelter	260-424-4908 (gen. mailbox), 260-447-7233

In addition to shelters listed by the Indiana Housing and Community Development Authority, Allen County also contains multiple Red Cross shelters. Several of Allen County's shelters may be at risk if a hazmat situation erupted in one of the Tier 2 facilities in Fort Wayne, so before evacuating citizens into nearby shelters, the location and vulnerability of the shelters should be verified.

Figure 33: Location of Red Cross Shelters[xx]



Hazardous Materials Release (Transportation)

Definition

The 2012 Hazardous Materials Economic Survey estimates that 2,580,153 thousand tons of hazardous material was transported across the United States in 2012.[xxi] According to the Allen County Local Emergency Planning Committee's Hazardous Material Emergency Response Plan, the release of hazardous material is more likely to occur from transportation accidents on the highways and/or railroad then from fixed sites.[xxii] The Secretary of the Department of Transportation defines hazardous materials as materials posing an unreasonable threat to the public and the environment and includes but is not limited to the following in the description of hazardous materials: (1) Hazardous Substances, (2) Hazardous Wastes, (3) Marine Pollutants, (4) Elevated Temperature Material, (5) Materials identified in 172.101 (which covers Alkali metal acids, alloys, some pesticides, corrosive liquids, toxins, etc.).[xxiii] The Federal Motor Carrier Safety Administration requires motor carriers to obtain a Hazardous Materials Safety Permit (HMSP) before transporting the following materials:

- Class 7 radioactive material
- Explosive material
- More than 1 liter (1.08 quarts) per package of a material poisonous by inhalation
- A shipment of compressed or refrigerated liquefied methane or liquefied natural gas, or other liquefied gas with a methane content of at least 85 percent, in a bulk packaging having a capacity equal to or greater than 13,248 L (3,500 gallons)

Previous Occurrences

On June 10, 2009, Allen County experienced a spill involving at least 500 gallons of a liquid petroleum material, which was intended for use as part of the County's dust control program.[xxiv] As a semi-tanker truck pumped the petroleum material into a county owned tank, a malfunctioning valve caused the leak. According to Tony Burrus, the County's Safety and Environmental Affairs Director, an undetermined amount of the petroleum material drained into a nearby ditch. Using piles of dirt, sand, and pumps, responders removed the material from the ditch and contained the spread. Reportedly, no one was harmed as a result of the spill and its effect on the environment was minimized by rapid containment and remediation.

While Eastbound on U.S. 24 between Fort Wayne and Roanoke on July 24, 2015, a fuel-tanker knocked into a road sign causing gasoline to spill out of the tank and onto the surrounding area.[xxv] The hazmat situation was quickly dealt with and no one was harmed.

The county has also endured potentially hazardous incidents. During September 2014, thirty-one freight train cars were derailed on the railroad line in New Haven.[xxvi] Five tankers usually transporting chemicals were empty at the time of derailment. The Norfolk Southern crews that cleared the line announced that the investigation into the train derailment would look into both human and mechanical factors.

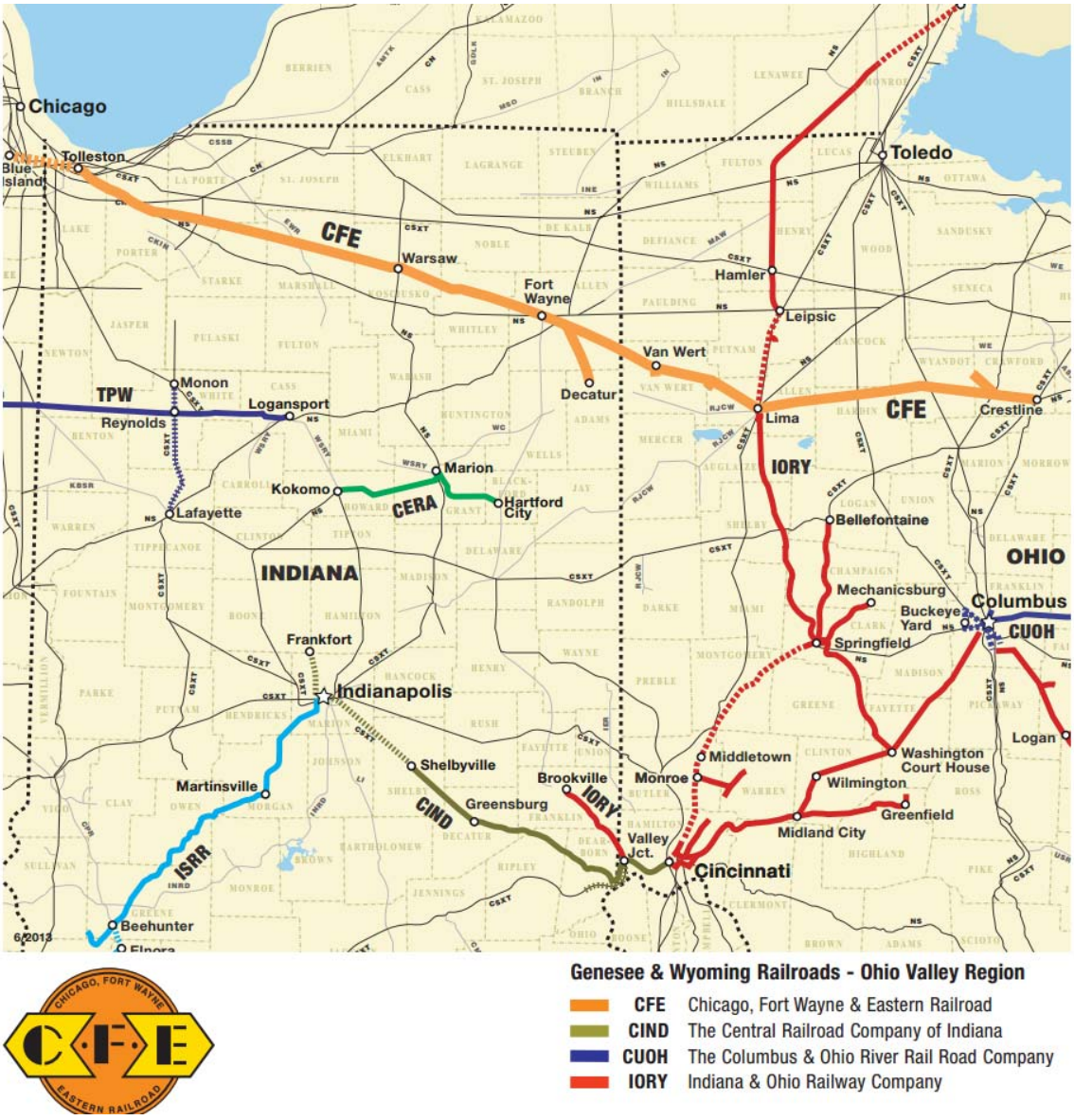
Future Probability

Tanker trucks carrying potentially hazardous materials such as chemicals, human waste, oil, etc. pass through Allen County. Although Hazmat tanker truck drivers undergo careful training, hazardous material can still be vulnerable to wrecks and spills during transportation and therefore pose a significant risk. Automobile accidents are frequently unpredictable and can occur through no fault of the tanker truck driver.

Trains frequently transport tankards of crude by rail across northeast Indiana. The Chicago, Fort Wayne and Eastern Railroad (CFE) owns the elevated rail line that travels behind the Baker Street Station in Fort Wayne. According to Dan Pavick, general manager of CFE, on average, four Norfolk Southern engines transporting approximately 110 cars of crude oil stop on the line going through Fort Wayne every day.[xxvii] Although the probability of an oil spill downtown may be small, preparation is still vital should an incident occur.

The path of the Chicago, Fort Wayne and Eastern Railroad (CFE) through Allen County and the heart of Fort Wayne is highlighted in orange below in Figure 35.

Figure 34: Chicago, Ft. Wayne & Eastern Railroad[xxviii] (CFE)



Potential Impact

Hazardous material release can act as a catalyst for further hazards particularly if the material released is highly flammable, presents a health hazard, or can chemically react with other materials at the site of release.

Strong oxidizing agents like nitric acid, which is employed in fertilizers, the production of explosives, nylon precursors, and specialty organic compounds, may react with asphalt and

create charring followed by ignition of unreactive material and any nearby combustibles.[xxix] Since most roads are paved with asphalt, any spill or crash involving a tanker transporting a strong oxidizing agent will likely ignite the asphalt creating a fire that can rapidly spread across the road and to the surrounding area.

Any significant train derailment involving a crude oil spill or fire will likely require a large scale and multi-agency response.[xxx] In case of a small crude oil spill that does not involve fire, the Office of Fire Prevention and Control recommends isolating the area 150 ft. in all directions and securing any possible ignition sources. If the oil spill is large, the area at least 1,000 ft. below wind should also be evacuated. If a fire erupts along with the oil spill, a one half mile circumference should be isolated, the general population evacuated, and blockades set up downwind from the spill. The Office of Fire Prevention and Control provides further strategic and tactical guidance for fire department operations at http://www.dhses.ny.gov/ofpc/alerts-bulletins/information/documents/2014/crude-oil.pdf.

I-69 connects Allen County to Indianapolis from the south and is one of the primary roadways that carry hazardous materials through Fort Wayne. The EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for an ammonia release on I-69 in Fort Wayne. ALOHA is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. It is the hazard modeling program for the CAMEO software suite used by the Allen County LEPC program.

The modeling scenario is based on a transportation-related hazardous materials release that assumes a tanker truck leaks anhydrous ammonia onto I-69 in Fort Wayne. The location was targeted due to its proximity to densely populated areas.

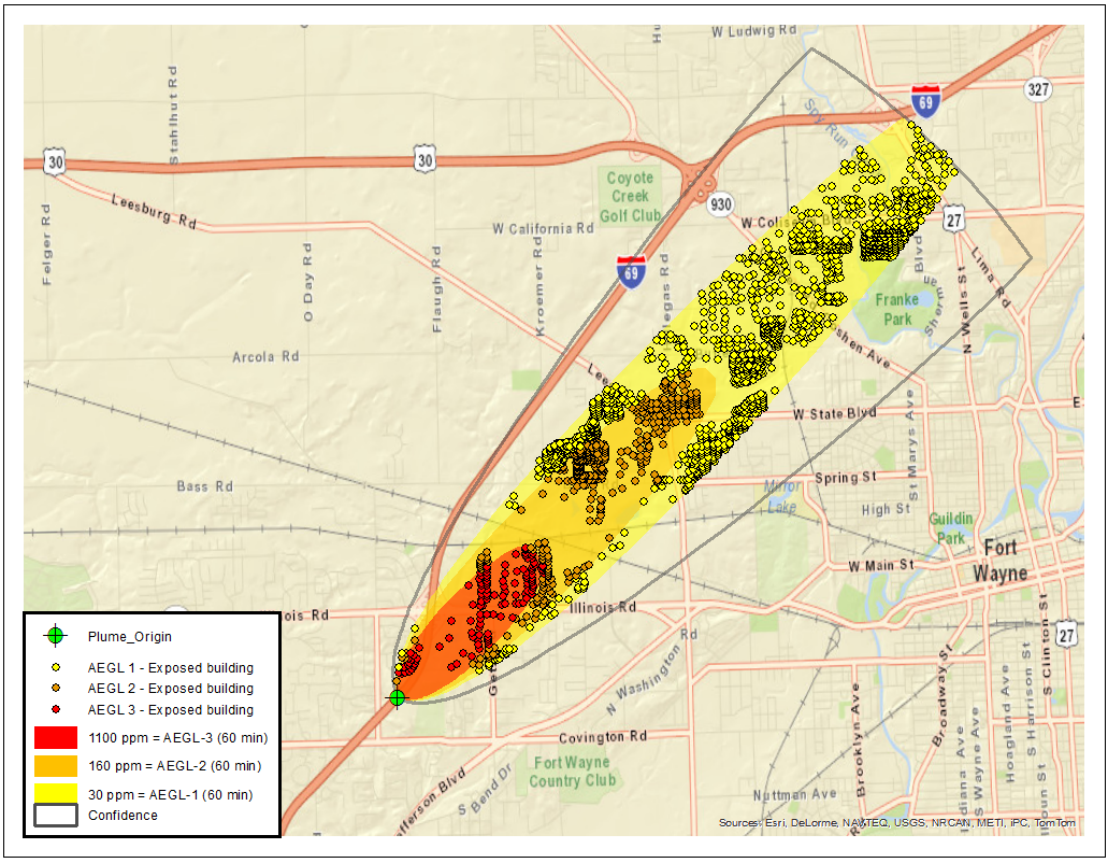
For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the west were assumed, and the ALOHA atmospheric modeling parameters were based on the actual conditions at the location when the model was run including wind speed of 10 mph. The temperature was 69°F with 55% humidity and clear skies.

This modeled release was based on a leak from 2.5 feet-diameter hole in the tank. According to the ALOHA parameters, approximately 4,390 pounds of material would be released per minute. Figure 35 on the following page shows the location of the release.

Anhydrous ammonia is generally used as a fertilizer, a refrigerant, and in the manufacture of other chemicals and is commonly hauled by rail and truck tankers to and from facilities. It is a clear colorless gas with a strong odor. Contact with the unconfined liquid can cause frostbite, and inhalation of the vapors can have adverse health effects.

To estimate exposure, the Allen County building inventory was added to ArcMap and overlaid with the plume footprint. The building inventory was then intersected with each of the three AEGL exposure areas (Figure 35).

Figure 35: Allen County Building Inventory Classified By Plume Footprint



Each AEGL zone in the above figure is color-coded to illustrate the differing levels of substance concentration. As the substance moves away from the source, the concentration decreases.

- AEGL 3 (the most severe level) is depicted in the red buffer. It extends approximately 3.5 miles from the point of release after one hour.
- AEGL 2 is depicted in the orange buffer. It extends more than 6 miles from the point of release after one hour.
- AEGL 1 (the least severe level) is depicted in the yellow buffer. It extends more than 6 miles from the point of release after one hour.
- The confidence boundary in Figure 33 depicts the level of confidence in which the exposure will be contained. The ALOHA model is 95% confident that the release will stay within this boundary.

The GIS overlay analysis predicts that as many as 1,881 buildings and 3,827 people could be exposed in this modeled scenario. The population is estimated based on 2.5 people per residence within Allen County.

NOTE: Population counts only include estimates of residential population. The estimates do not include counts of employees within businesses located in the plume.

Table 28 lists the residential population, by zone, that would be exposed to the hazardous material.

Table 30: Estimated Residential Population Exposure

Zone	Population Exposed
AEGL 3 (most severe)	215
AEGL 2	962
AEGL 1 (least severe)	2,650
Total	3,827

The direct impact of a hazardous materials spill is the adverse impact on human health. However, there are several indirect impacts, too, including fires and explosions, which may also damage infrastructure. Tables 29 and 30 list the number of vulnerable buildings by occupancy type within each of the AEGL zones.

Table 31: Number of Vulnerable Buildings by Zone

	Number of Buildings within the HazMat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	0	2	5
Commercial	39	21	131
Education	0	0	4
Government	0	0	1
Industrial	0	4	128
Religious	2	1	12
Residential	86	385	1,060
Total	127	413	1,341

Table 32: Replacement Cost of Vulnerable Buildings by Zone

	Replacement Cost of Buildings within the HazMat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	$0	$318,331	$824,559
Commercial	$77,661,621	$27,361,880	$80,432,054
Education	$0	$0	$3,279,303
Government	$0	$0	$796,923
Industrial	$0	$1,977,281	$147,806,267
Religious	$2,487,716	$2,092,818	$9,814,797
Residential	$11,065,718	$45,028,032	$146,784,115
Total	$91,215,055	$76,778,342	$389,738,018

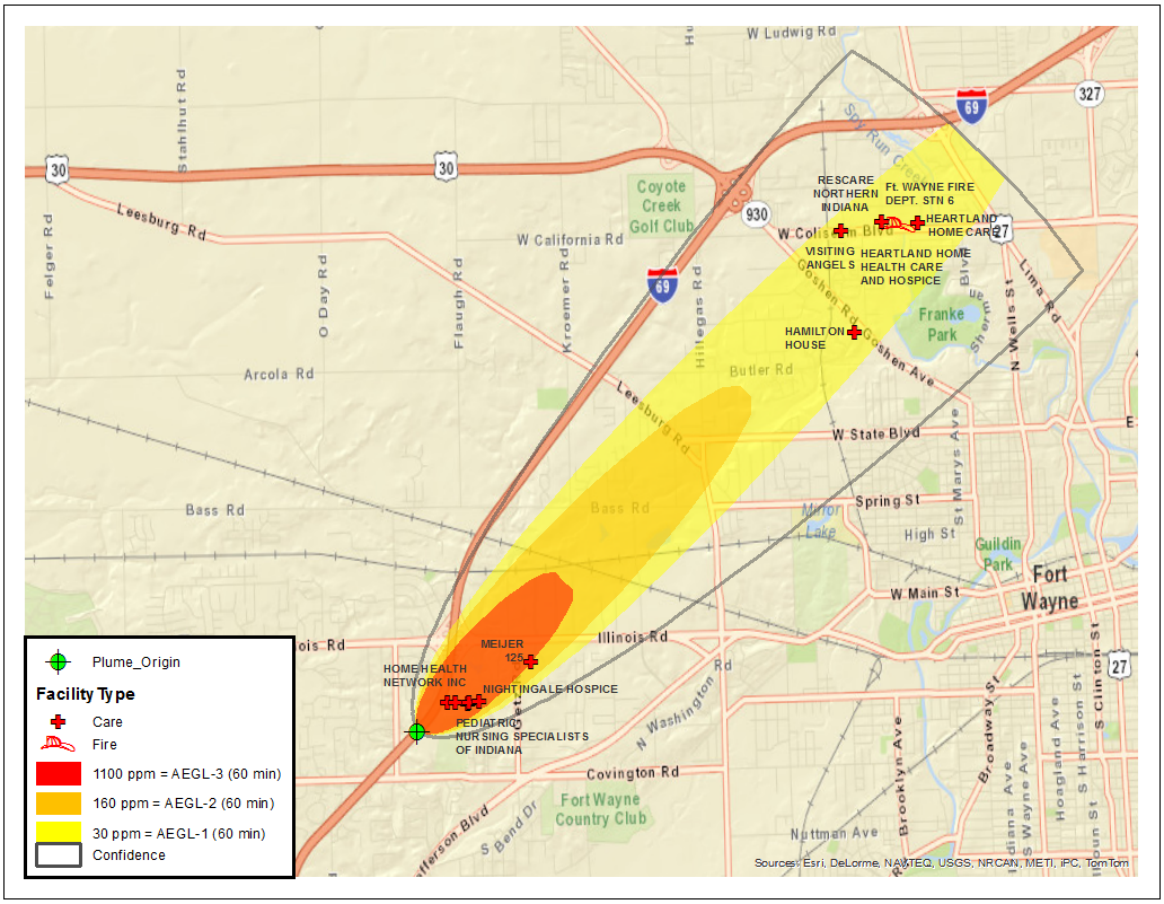
Essential Facilities Exposure

There are 12 essential facilities within the limits of the chemical spill plume, 10 of which are health care facilities. In the event of a hazmat spill, these care facilities may need to evacuate to other county hospitals. Table 31 lists the essential facilities within the plume as well as number of beds for each care facility. The table also includes in which AEGL zone each facility is located. Note that Table 31 and Figure 34 show that of the ten care facilities within the hazmat plume, five of them are located within AEGL 3, the most severe zone.

Table 33: Essential Facilities within Plume Footprint

Type	Name	Number of Beds	AEGL Zone
Care Facility	Nightingale Hospice	150	AEGL 3
Care Facility	Universal Home Health Of Indiana	0	AEGL 3
Care Facility	Pediatric Nursing Specialists Of Indiana	0	AEGL 3
Care Facility	Home Health Network Inc The	0	AEGL 3
Care Facility	Home Care Services Inc	0	AEGL 3
Pharmacy	Meijer 125	0	AEGL 2
Care Facility	Hamilton House[xxxi]	47	AEGL 1
Care Facility	Visiting Angels	150	AEGL 1
Care Facility	Rescare Northern Indiana	0	AEGL 1
Care Facility	Heartland Home Care	0	AEGL 1
Care Facility	Heartland Home Health Care And Hospice	150	AEGL 1
Fire Station	Ft Wayne Fire Department Station 6	0	AEGL 1
NOTE: Several of the listed care facilities are home health care providers and, therefore, have zero beds available.			

Figure 36: Essential Facilities at Greatest Risk



Dam / Levee Failure

Definition

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 and below the dam creates large amounts of 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 1) water heights or flows above the capacity for which the structure was designed or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fail, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, false sense of security often 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 the maximum is exceeded by more than the design safety margin, the levee will be overtopped or otherwise fail, inundating communities in the land previously protected by that levee. It has been suggested that climate change, land-use shifts, and some forms of river engineering may be increasing the magnitude of large floods and the frequency of levee failure situations.

In addition to failure that results from extreme floods above the design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require constant monitoring and regular maintenance to assure their integrity. Many structures across the US have been under-funded or otherwise neglected, leading to the recognition that certain structures are unsafe or, rarely, can lead to actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

The IDNR Division of Water assigns the hazard potential for dams based on the federal classification system described below.

- **High Hazard:** Probable loss of life, serious hazard to health, serious damage to homes, businesses, and industrial structures, infrastructure, and public utilities
- **Significant Hazard:** Damage to low value, non-residential structures, local agricultural crops, and livestock
- **Low Hazard:** Losses restricted mainly to the dam

Both population and infrastructure located downstream are at risk in the event of dam or levee failure. Developing an Incident and Emergency Action Plan (IEAP) and updated inundation maps is the first step toward highlighting the areas of greatest vulnerability in each community. Table 33 lists Allen County's dams, their hazard classification, and whether they have an IEAP. Figure 35 illustrates the locations of the dams, and Figure 36 illustrates the locations of the levees.

Table 33: List of Allen County Dams

Name	Hazard Classification	IEAP
Cedarville Dam	High	YES
Foxwood Lake Dam	High	NO
Kekionga Lake Dam	High	NO
Hurshtown Reservoir Dam	High	YES
Rich Lake Dam	Significant	NO
Poe Lake Dam	Significant	NO
Daus Addition Lake Dam	Significant	NO
St. Joseph River (In-Channel) Dam	Significant	NO
Covington Lake Dam	Significant	NO
Coventry Dry Dam	Significant	NO
Spy Run Dam (In-Channel)	Low	NO
Hosey (Maumee River) Dam (In-Channel)	Low	NO
Bittersweet Moors Lake Dam	Low	NO
Beedy Lake Dam		NO

Figure 35: Location of Allen County Dams

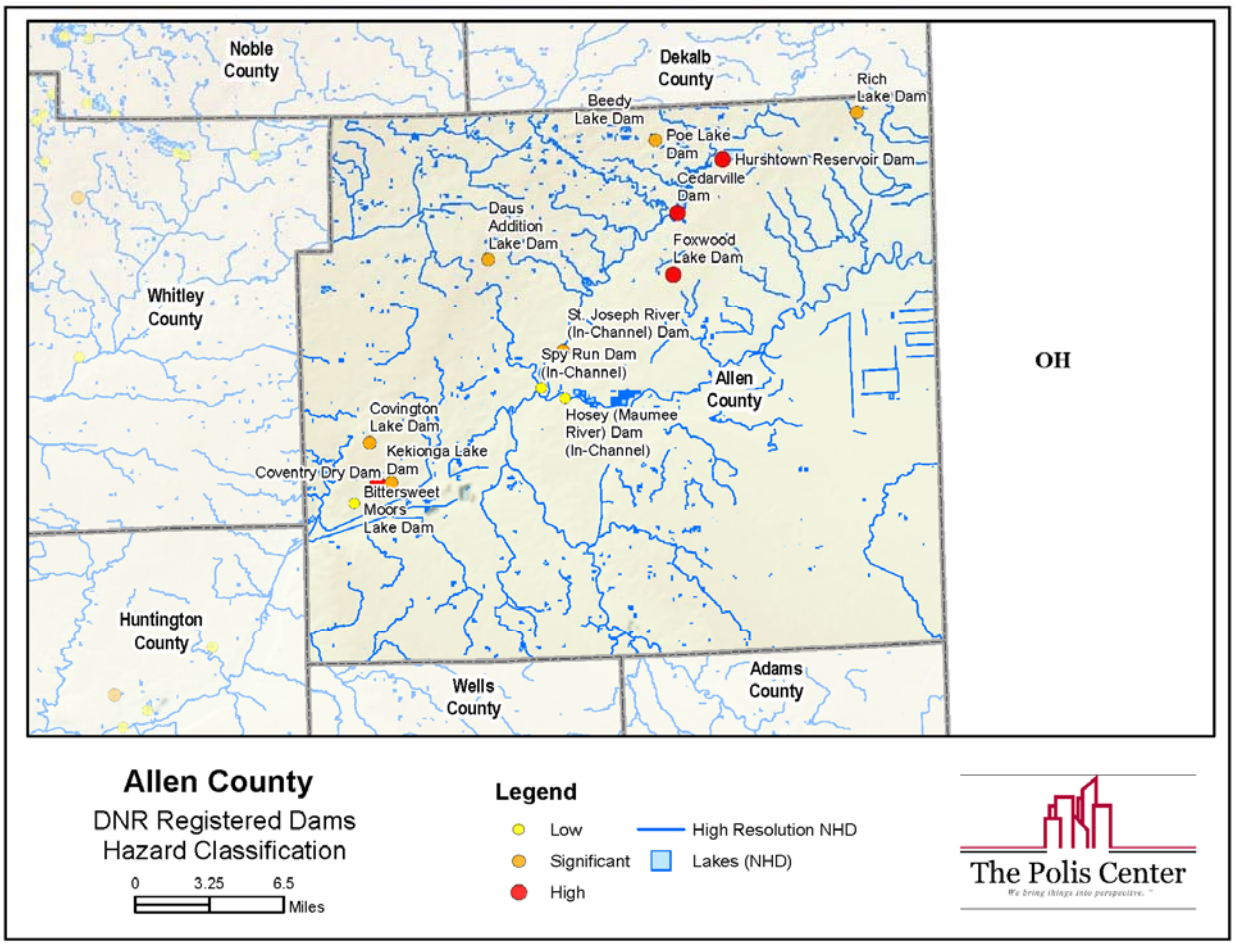
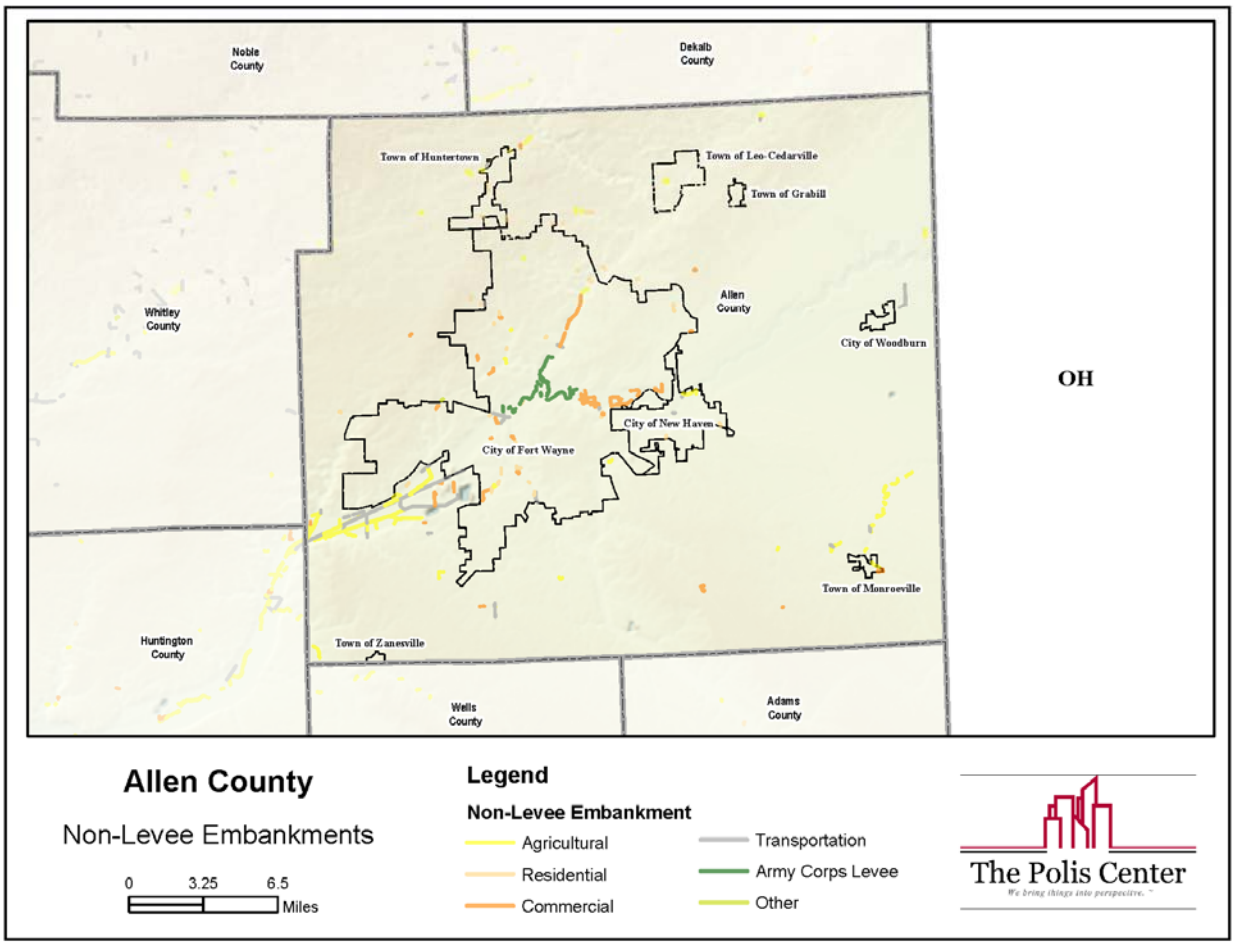


Figure 36: Location of Allen County Levees



Previous Occurrences

Allen County has 12 dams: 4 high hazard, 6 significant hazard, and 2 low hazard dams. There are also 5 accredited levees in the county: St. Joseph River Levee, St. Joseph River-Maumee River Levee, Maumee River North Levee, St. Mary's-St. Joseph-Spy Run Creek Levee, and St. Mary's Levee. There are no records of historical dam or levee failure in Allen County.

Future Probability

The Allen County planning team ranked the probability of dam failure as possible in those communities that have dams. Estimating future probability is difficult because there are many unforeseen structural problems that can cause failure. Examples include vandalism, negligence, and natural forces. Two of the four high hazard dams have Incident and Emergency Action Plans (IEAPs) with detailed dam failure inundation maps, which are helpful in mitigation both probability and impact of failure.

The planning team ranked the probability of levee failure as likely in Fort Wayne due to the presence of levees on several rivers. As the Fort Wayne, Leo-Cedarville, New Haven, and unincorporated areas continue to grow, it can be expected that the number of structures in downstream communities will increase.

Potential Impact

Within Allen County, impacts from a dam failure or a levee failure may include the following:

Direct Impacts:

- Loss of life and serious damage to downstream homes, industrial and commercial buildings, public utilities, major highways, or railroads

Indirect Impacts:

- Loss of land (crop or general property) in the immediate scour area
- Increased response times due to damaged or re-routed transportation routes and/or bridges

The Allen County MHMP (2012) estimated potential losses from dam failure by overlaying dam inundation areas with aerial photography to identify the number of buildings that could be impacted by the failure of Cedarville Dam, Hurshtown Reservoir, Kekionga Lake Dam, and Foxwood Dam. The estimation does not account for actual magnitude and extent of damage, which depends on the type of break, volume of water released, and width of the floodplain valley through which the flood wave would flow. Table 34 includes estimated damages to Allen County structures in the event of dam failure.

Table 34: Estimated Damages for Dam Failure

	Cedarville Dam	Foxwood Dam	Hurshtown Reservoir	Kekionga Lake Dam
Structures (>400 sq. ft.)	192	60	842	40
Outbuildings (<400 sq. ft.)	44	23	343	5
Total Structures	**236**	**83**	**1,185**	**45**
Total Damages	**$26,000,000**	**$5,900,000**	**$132,200,000**	**$7,400,000**

The Cedarville Dam failure inundation area includes two critical structures: St. Joseph River Dam and Grace Point Nazarene Church and Kiddie Prep. Additionally, the Hurshtown Reservoir

inundation area includes the Maple Lane Amish School. It is not anticipated that any critical structures will be affected should a breach of the Kekionga Lake Dam occur.

To estimate losses from levee failures, Christopher B. Burke Engineering Ltd. (CBBEL) calculated damages for structures located behind the five accredited levees and within the area of the 0.2% annual chance flood hazard. The actual magnitude and extent of damage depends on the timing and severity of the levee failure as well as the volume of water released. Table 35 includes estimated damages to Allen County structures in the event of levee failure.

Table 35: Estimated Damages for Levee Failure

	St. Joseph River – Maumee River/Maumee River North Levee	St. Mary's River – St. Joseph River-Spy Run Creek	St. Mary's River
Structures (>400 sq. ft.)	1,639	380	1,311
Outbuildings (<400 sq. ft.)	406	92	289
Total Structures	**2,045**	**472**	**1,600**
Total Damages	**$190,600,000**	**$568,300,000**	**$271,000,000**

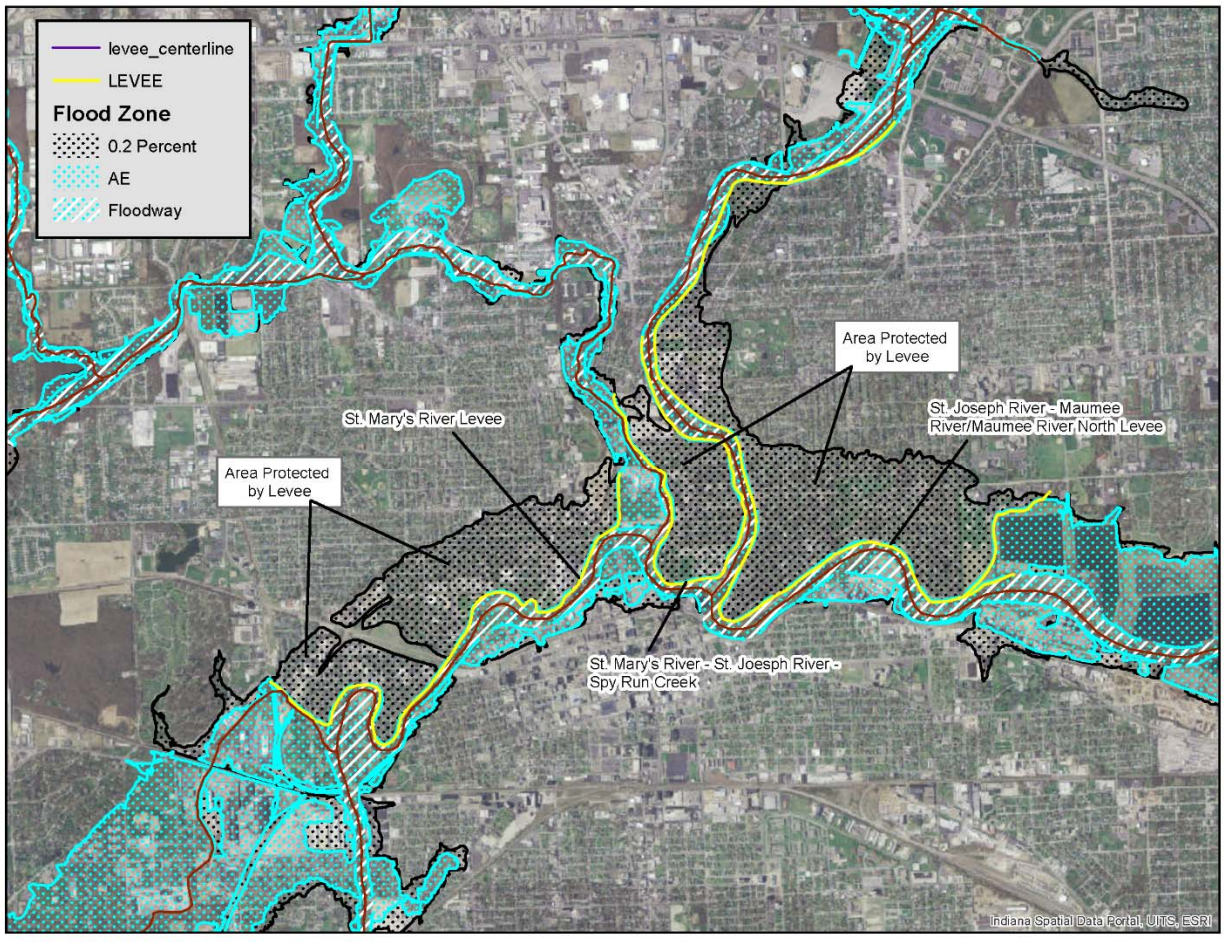
The second methodology CBBEL used to estimate damages was Hazus-MH. In order to estimate the amount of damage that would potentially be caused without the presence of the five accredited levees in Allen County, Hazus generated the flood depth grid for a 100-year return period by clipping the IGS 1 ArcSecond (approximately 30 meters) Digital Elevation Model (DEM) to the 0.2% annual chance flood zones that lie behind the accredited levees. Next, Hazus utilized a general building stock analysis of Allen County with site-specific parcel data provided by the county.

Hazus estimates that without the presence of the levees, a 1% annual chance flood event would damage 2,397 of the 4,117 buildings that are protected by the levees. The estimated damages to structures, contents, and inventory would total $314.4 million. The total estimated numbers of damaged buildings are given in Table 36. Figure 37 depicts the location of the levees and the approximate areas they protect.

Table 36: Estimated Damages of Structures Protected by Accredited Levees

Occupancy Type	Buildings Damaged	Building Damages
Residential	2,347	$195,300,000
Commercial	31	$49,100,000
Industrial	10	$49,400,000
Agricultural	0	0
Religious	3	$16,800,000
Government	4	$2,800,000
Education	2	$1,000,000
Total	**2,397**	**$314,400,000**

Figure 37: Location of Structures Protected by Downtown Levees



Within the approximated areas impacted by a potential levee failure of the St. Joseph River-Maumee River/Maumee River North Levee, there are 3 Healthcare & Public Health facilities: Shepherd's House, YMCA Northeast Indiana, and the Life Care Center.

Additionally, in the potentially impacted area during a failure of the St. Marys River-St Joseph River-Spy Run Creek levee, there are 2 Educational facilities: Lakeside Middle School and Northside High School; 1 Ag & Food: Fort Wayne Parks and Recreation; and 3 Healthcare & Public Health facilities: Caring About People, Community AIDS Action Team, and The Village of Indiana.

Within the St. Marys River levee failure area are 2 Ag & Food facilities: Third Street Church of God and United Faith Presbyterian Church; 1 Chemical: Pepsi Beverage Company; 1 Defense Industrial Base: Excellon Technical Defense; 1 Healthcare & Public Health: Center for Behavioral Health; and 3 Educational facilities: Nebraska Elementary, Central Lutheran, and Bloomingdale Elementary.

Large Fire / Conflagration

Definition

Structural fires are uncontrolled fires in populated areas that threaten life and property. Structural fires have many causes, including smoking, arson, industrial accidents, electrical malfunctions, damage to utility lines, laboratory accidents, lightning, and explosive or combustible materials. Arson, the malicious burning of another's house or property, is often for financial gain or fraud.

Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to the Federal Emergency Management Agency's National Fire Data Center, residential fires represent 78% of all structural fires and cause 80% of all fire fatalities. Tragically, over 40% of residential fires and 60% of residential fatalities occur in homes with no smoke alarms.

Previous Occurrences

There are no recorded incidents of significantly large fires in Allen County; however, there are many historical occurrences of smaller-scale fires.

From January 2008 through December 2013, the Fort Wayne Fire Department responded to an average of 53 emergency runs per day. Approximately 45% of these runs were associated with structural fires[xxxii]. Almost 300 of these incidents were eventually classified as arson. Arson is often an act of revenge, fraud or just maliciousness.

The Snyderman House of Fort Wayne was architecturally advanced home built in 1972. The house burned to the ground on July 30, 2002, the result of suspected arson. The home had previously been purchased by a development company intending to tear down the house to build a large housing development. Fort Wayne government repeatedly blocked the development. After the fire, evidence clearly led to arson, however no one was ever charged with the crime.

Future Probability

Structural fires occur in virtually every community and are the most common hazard facing most communities in Indiana and across the country. Major, uncontrolled events in Allen County are a possibility, but have rarely occurred.

Potential Impact

Approximately 83% of fire-related fatalities occur in single-family homes and duplexes.[xxxiii] In addition to injuries, death, and economic losses, structural fires can cause poverty, displacement and homelessness.

Multiple or major structures such as hotels, college campus, senior residence facilities, major employers and community facilities (such as schools and hospitals) are also at risk. The potential impact of a large fire can be significantly mitigated by the level of preparedness.

Public Utility Failure

Definition

Public utility failure refers to short- or long-term disruptions to electrical power, water, and/or gas. There are two types of electrical failures: brownouts and blackouts. Brownouts occur when there is a brief drop in voltage due to excessive demand for power (e.g. during heat waves). Brownouts may last for a few minutes or few hours and cause lights to dim, appliance motors to slow, equipment to reset, and less heat/air to be generated. Blackouts occur when there is widespread loss of power as a result of a natural hazard, equipment failure, sabotage, or accident.

In the event of an electrical failure, numerous community functions may be affected, including information technology, communication, and emergency services. Additionally, public buildings could lose climate control, posing health risks during extreme heat or cold.

Water failure occurring from water pipe breaks can result in flood damage to buildings and infrastructure. Additionally, the loss of water usage may occur due to contamination of the water supply. Prolonged water failure can prevent or hinder daily operations and could affect the health and safety of the population.

Gas failure occurs as a result of a broken valve or ruptured pipeline and typically results in the release of natural gas into the environment or structure. The release of natural gas can ignite a fire or explosion, and prolonged exposure can lead to serious health risks, including loss of consciousness or death.

Previous Occurrences

Utility failure is often the result of natural disasters. In June of 2012, Fort Wayne experienced a severe wind storm that resulted in over 550 calls (average daily call volume in 2012 was 56 incidents per day) to local fire departments in a 24-hour period. The majority of these calls were associated with utility outages.

Future Probability

Unlike roads and bridges, it is difficult to predict the deterioration of gas lines, valves, water storage facilities and power lines. As public utility failures are often associated with other disasters, a comprehensive mitigation plan should include utility outages as the potential result of most natural hazards including floods, tornados, winter storms, earthquakes and severe thunder/wind storms.

Potential Impact

As entities that sustain the local economy, public utilities stoppages can result in long-term power outages (a particular concern in extreme weather), gas leaks (increasing the potential for explosions), unsafe drinking water and sewer stoppage (hygiene and health concerns), lack of communication (reduced phone service) and network shut downs (economic impact). The vulnerable populations of Allen County, e.g. the elderly and those living in poverty, are more likely to be significantly impacted by loss of public utilities.

Pipeline Transportation Incidents

Definition

In the context of mitigation and preparedness, pipeline transportation refers to the movement of goods or materials through a pipe. Transportation pipelines are generally designed to move products between cities, states and countries. Pipelines are particularly useful for transporting large quantities over long distances where evaporation, pollution, or environmental concerns are a factor. Pipelines exist for the transport of crude and refined petroleum, fuels—such as oil, natural gas and biofuels—and other fluids including sewage, and water. Liquids and gases are frequently transported in pipelines, along with many other chemically stable substances. Hazardous materials may also be transported via pipeline. Highly toxic ammonia is theoretically the most dangerous substance to be transported through long-distance pipelines, but accidents have been rare.

Previous Occurrences

Pipeline incidents can occur anywhere, and at any time, resulting in minor repairs or loss of life. Often times the majority of damages are caused by explosion. There are no reported incidents of major pipeline transportation accidents in Allen County; however, there have been historical occurrences regionally and across the US.

On June 7, 2000, a weld failed on a Wolverine Pipeline Company line, causing a rupture that released 75,000 gallons of gasoline into the environment and requiring the evacuation of more than 500 houses in and around Blackman Charter Township, Michigan. The failure caused the shutdown of 30% of Michigan's gasoline supplies for nine days, contaminated a creek that flows into the Grand River and a railroad track near the failure site was shut down for a week.

There have also been several reported pipeline incidents in Indiana. Most recently, diesel fuel was detected to be leaking from a Marathon pipeline in Indianapolis, Indiana on May 9, 2013. Although there were no injuries, over 20,000 gallons of diesel leaked, at a slow rate that was not initially detected. Cleanup took five days and caused a nearby major road to be temporarily shut down.

Future Probability

Throughout the world, various strategies and technologies have been implemented to monitor the safety and security of pipelines. The US Department of Transportation, Pipeline and Hazardous Materials Safety Administration sponsors projects focused on providing near-term solutions that will increase the safety and reliability of the Nation's pipelines and hazardous materials transportation. Analyses of data for U.S. petroleum product pipelines indicate that short-to-moderate pipelines are likely to have at least one reportable spill within a 20-year period. Longer lines (as much as 1,000 miles) may suffer a reportable spill within one year.

Potential Impact

The nature of a pipeline carrying volatile or hazardous materials infers the possibility of leaks and cascading secondary effects including fire, explosion, contamination and/or inhalation hazards. In Allen County, all facilities within the county are at risk. The types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. 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 potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response.

Air Transportation Incidents

Definition

Air transport is the movement of people or goods from one location to another by air via airplane, helicopter, airship, etc. Air transport includes fixed installations, such as airport terminals, which are necessary for the interchange of passengers, cargo, and maintenance. An air transportion incident or accident is an occurrence associated with the operation of an aircraft which could negatively affect the safety of operations.

Fort Wayne International Airport features an 11,981 ft. long 5-23 runway, which is one of the longest runways in the US and is long enough to handle any type aircraft including the Space Shuttle, A380s, 747s and Military Tankers. Therefore, the possibility of the airport being targeted by saboteurs or terrorists should not be overlooked.[xxxiv] In addition, air transportation can unintentionally transport diseases that pose a risk to both aviation workers and passengers and may require quarantine measures.

Air transport incidents and accidents include but are not limited to the following:

- **Malfunction and human error:** engine failure, traffic control error, fuel exhaustion, air collision, fire, and explosion
- **Malignant intent:** sabotage, hijacking, bombing, and terrorist activities
- **Natural disasters:** severe storms, tornadoes, earthquakes

Previous Occurrences

Since 2000, the National Transportation Safety Board has reported 10 airplane incidents in Allen County, one of which resulted in a fatality (see Table 37). On November 9, 2000, shortly after takeoff, an airplane was destroyed on impact with trees and terrain, and a post-impact fire ensued. The pilot was the sole fatality. As a direct result of this fatal accident, the operator transitioned from having a single pilot operation of their Fairchild Metroliner to the inclusion of a first officer for added safety.[xxxv]

The most recent plane crash in Fort Wayne occurred on September 26, 2015. A Cessna 150, a small single-engine plane, clipped treetops before hitting a powerline and crashing into a house. One of the plane's occupants was treated for minor injuries while a second person aboard the plane fled the scene.[xxxvi] Tony Molinaro, a spokesman for the Federal Aviation Administration, said that the airplane's registration had expired and that the plane had departed from Smith Field.[xxxvii]

Table 37: Allen County Aviation Accidents (2000- 2015)[xxxviii]

Event Date	Location	Make/ Model	Regist. Number	NTSB No.	Event Severity
9/26/2015	Fort Wayne, IN	CESSNA 150F	N6922F	CEN15LA433	Nonfatal
2/24/2009	Fort Wayne, IN	CESSNA 152	N94626	CEN09CA200	Nonfatal
8/31/2007	Fort Wayne, IN	MOONEY M20K	N231BQ	CHI07LA287	Nonfatal
8/10/2007	Fort Wayne, IN	Cessna 210 D	N3794Y	CHI07CA261	Nonfatal
11/18/2006	Fort Wayne, IN	Piper PA-46-500TP	N4185L	CHI07IA067	Incident
4/10/2006	Fort Wayne, IN	Cessna 182 RG	N2878W	CHI06CA108	Nonfatal
2/11/2005	Fort Wayne, IN	Twin Commander Acft. Corp. 680V	N688TM	CHI05LA071	Nonfatal
10/28/2001	Fort Wayne, IN	Piper PA-28-180	N4879L	CHI02LA014	Nonfatal
11/9/2000	Fort Wayne, IN	Swearingen SA226TC	N731AC	CHI01FA032	Fatal(1)
7/1/2000	Fort Wayne, IN	McCann Wheeler Express/ FT	N521MC	CHI00LA219	Nonfatal

Future Probability

Over the last decade, loss of control has become the leading cause of commercial jet fatal accidents worldwide. The Controls and Dynamics Branch at NASA Dryden Flight Research Center reported that over half of the loss of control accidents since 2000 have included at least one fatality, and approximately half of all aviation fatalities were caused by loss of control.

Aside from their frequency of occurrence, accidents resulting from loss of aircraft control seize the public's attention by yielding a large number of fatalities in a single event. Since human errors like loss of control can occur anywhere, both Fort Wayne International Airport and Smith Field Airport are at risk. Since hazardous materials are sometimes transported by air, Allen County airports could also be vulnerable to hazmat spills. Natural and technological disasters and sabotage can be unpredictable, but proper safety precautions can diminish the extent of the disaster.

Potential Impact

Disruption of aviation systems due to severe storms, flooding, earthquakes, tornadoes, hazardous material spills, sabotage, or accidents would result in major safety and economic impacts to the city, county, and possibly the state. The extent of the impact of an air transport incident on city, county, and state functions would be characterized by the nature of the disruption and the duration of the interruption to normal aviation procedures. Extended interruption of services at the Smith Field Airport and the Fort Wayne International Airport would negatively impact Allen County's economy since the airports' operations are linked to the facilitation of regional, national, and international commerce.

Structural Collapse

Definition

Structural collapse, or structural failure, is the inability of a structure to support a designed load without breaking, or collapsing. Structural failure is initiated when the building materials are stressed beyond limit, causing fracture. A localized fracture may progress to eventual collapse. Larger structures are more often associated with structural failure. The collapse of a large, multi-story building can occur at any time causing multiple casualties and fatalities. Non-building structures, like bridges, can also collapse causing injuries and interrupted services.

Previous Occurrences

There are no reported incidents of large-scale structural collapse in Allen County; however, there are several historical occurrences in the state. On August 13, 2011, an outdoor concert at the Indiana State Fairgrounds was interrupted when strong winds from an approaching storm struck the temporary stage and causing it to collapse. The structure landed in the crowd of concert-goers killing 7 and injuring 58 others.

Future Probability

Construction defects, water infiltration, storm damage, winter storms, fire, explosion damage and construction site accidents can all be underlying causes of structural collapse. Because these factors are difficult to monitor, the probability of a structural collapse will remain a threat to Allen County residents. Building code enforcement can help minimize the impact of structural collapse.

Potential Impact

Allen County has many roads and bridges that were constructed prior to current building standards. These structures will continue to become more of a threat as they continue to age. In many situations, a timely, well planned evacuation can help save lives.

Radiological Incident

Definition

The International Atomic Energy Agency (IAEA) defines a radiation event as "a radiological event that has led to significant consequences to people, the environment or the facility." Examples include large radioactivity releases to the environment, or reactor core melt. These events have potentially lethal effects to individuals and have been a concern since nuclear reactors were first constructed in 1954.

Previous Occurrences

There are no reported incidents of significant radiological incidents in Allen County. Worldwide there have been numerous radiological accidents. An unprecedented radiological accident occurred in Costa Rica in1996 when a radiotherapy unit at a local hospital was mis-calibrated, causing an accidental overexposure of patients. While this is not a common occurrence, it is a good example of unintended radiation exposure.

Future Probability

Indiana has not built a nuclear power plant since efforts in the 1980s failed. Indiana is one of the few Midwest states with no nuclear plants, however neighboring Illinois has 11, Michigan has 4 and Ohio has 2. Allen County could experience secondary effects from radiological incidents at these locations as residents are forced to migrate away from the incident.

Recent regulatory improvements have been mandated, however nuclear power plants are still susceptible to radiation release. The materials released will negatively impact populated areas, surface waters and local flora and fauna. Recent terrorist attacks have prompted fears that radioactive (dirty) bombs could be released at any time.

Potential Impact

Epidemiological studies consistently document the probability of serious illness, cancer and death from radiation exposure. Health-related impacts could have a broad reach and impact nearby communities. Such an incident could result in mass casualties and overwhelm the county health care system. Aside from the impact to human life, cleanup after a radiological incident can be timely and costly.

Mass Casualty Event

Definition

A mass casualty incident is any event in which emergency medical service resources, such as personnel and equipment, are overwhelmed by the number and severity of casualties. Overall, injuries may exceed the normal response capabilities of emergency care providers. A mass casualty incident is often the result of another threat or hazard. Mass casualties can result from terrorism, natural disasters, chemical or radiation emergencies and disease. They can also include contamination from, or exposure to hazardous materials.

Previous Occurrences

There are no reported incidents of significant mass casualty events in Allen County; however, there are several documented incidents across the US. Some of the most significant mass casualty events in recent years have been caused by active shooters, such as the event in Aurora, Colorado where a shooter killed 12 people and wounded 58 in a movie theater.

Another example of a recent mass casualty event was the 2011 tornado outbreak in the southeastern US. From April 25-28, 2011, more than 200 tornadoes were spotted across Mississippi, Alabama, Tennessee, Virginia, and Georgia, resulting in a total of 348 deaths. An additional 24 deaths occurred in the same time period as a result of thunderstorm-related incidents such as straight-line winds and flash flooding.

Future Probability

The future probability of a mass casualty event is high. A mass casualty incident can occur at any time, any place. Preparedness, diligence and security are often insufficient to eliminate the possibility of a mass casualty event, however communities should be ready to locate the resources needed.

Potential Impact

Mass casualties are magnified when public resources are overwhelmed. Hospitals and health care facilities may run out of beds and medical supplies, requiring the transportation of injured people to other locations. Communities should be prepared to coordinate with neighboring communities to develop collaborative recovery efforts.

Explosion

Definition

Accidental explosions may result from a variety of incidents, including but not limited to: fire, hazardous materials release, and failure of or damage to public utility lines. Accidental explosions can lead to property damage, short and long term health effects, serious injuries, and event death. Emergency response to incidents involving accidental explosions may require fire, safety/law enforcement, search and rescue, and hazardous materials units.

On October 10, 1933, a Boeing 247 Propliner, operated by United Airlines and registered as NC13304, crashed near Chesterton, Indiana. The transcontinental flight, carrying three crew and four passengers, originated in Newark, New Jersey with a final destination in Oakland, California. It exploded en route between stops in Cleveland, Ohio and Chicago, Illinois. All aboard died in the

crash, which was proven to have been deliberately caused by an on-board explosive device. This was the first known intentional downing of a domestic airliner in the US.

Previous Occurrences

There are no reported incidents of significant explosions in Allen County; however, there are several documented incidents across the state and the US. In October of 1963, the Indiana State Fairgrounds Coliseum exploded when a propane gas leak was ignited. A second explosion magnified the disaster, which resulted in 54 deaths, an additional 24 died shortly after and over 400 others with injuries requiring hospitalization. Rescue and recovery required many agencies including local government, law enforcement, fire personnel, Red Cross and Salvation Army.

Future Probability

Future explosions will continue to have the potential to affect large populations. Updated building codes may protect newer construction, but much of the population will remain vulnerable because of the unpredictable nature of explosions. Industrial explosions are also possible in Allen County.

Potential Impact

Potential impacts from an explosion in Allen County may include, but are not limited to, loss of life, bodily injury, limited access to health care, structural damage to surrounding facilities, impassable roads and inaccessible public utilities.

Communications System Failure

Definition

Communications failure can include telecommunications failure, radio communications failure, and information technology (IT) failure.

Telecommunications assets consist of any electronic device—operated by a privately- or publicly-owned entity—used for the purposes of message delivery.

Telecommunications failure may have a significant impact on a community since nearly every aspect of modern life is dependent on digital infrastructure. Economic and national security, as well as emergency response and recovery, relies on the assets and operations of telecommunications infrastructure. Disruption to telecommunications systems, whether as a result of terrorist or other malicious attacks, natural disasters, or human failure to adhere to best practices, can lead to technological and financial losses, or even loss of life.

Radio communication failure is the severe interruption or loss of private and/or public radio communications systems. The disruption may be caused by equipment failure, deliberate or unintentional human acts, or as a result of a natural, technological, or human-induced disaster. The most common associated problems can range from minor, for example, brief public inconvenience, to severe losses of production and revenues for businesses and institutions and command and control at the government level.

Information technology (IT) infrastructure consists of all state government computers and servers, as well as Ethernet and Internet connectivity. The Indiana Office of Technology (IOT) manages IT operations for all state facilities, providing tools and services to support the regulatory, administrative, and daily operations of the state, including high-speed network with wireless access, central web hosting, free and low-cost software for individual use, tools and support for instruction and research, and supercomputers for data analysis and visualization.

An IT infrastructure failure may consist of a localized, statewide, or nationwide disruption of the hardware, programs, Ethernet, and/or Internet. Failure of any one of these elements can impact the entire IT system.

Failure can result from the following exposures:

- Physical- consists of possible physical damage to server equipment and critical hardware caused by either natural hazards or intentional destruction
- Capacity- consists of possible overload of available resources resulting in services slowing or shutting down
- External- consists of an attack of the university network from either an external IP address or a computer with direct network access. External attacks undermine the confidentiality, integrity, and/or availability of hardware and the information on it.

Previous Occurrences

Communications failure in Allen County has been limited to small-scale outages associated with natural hazard events such as severe storms. These failures have mainly affected landline and mobile phone telecommunication capabilities.

Nationally, Hurricane Katrina represents an example of communication failure resulting from a natural hazard. Immediately following the storm, radio and cell phone towers were inoperable, resulting in an inability to control the situation. Many unofficial sources were dictating direction with no clear unity of command. Lack of preparedness for an event of this magnitude complicated the recovery process.

Future Probability

All areas of Allen County are susceptible to communications failure. With increasing dependence on cell phone and electronic communications, communities will continue to be vulnerable to such failures.

Potential Impact

Hurricane Katrina remains a solid example of communication failure amplifying the impact of a disaster. Communication failure can be restricted to a small area (phone lines downed in a wind storm), or can impact a significant portion of the population (critical network failure). As in the Hurricane Katrina example, many of the residents were forced to migrate away from their homes. This migration of victims can impact communities as far from New Orleans as Allen County.

Human-Caused Hazards Analysis

Active Shooter

Definition

An active shooter is a person who appears to be actively engaged in killing or attempting to kill people in a populated area — typically employing the use of firearms. In some cases, active shooters use other weapons and/or improvised explosive devices (IED) to cause additional victimization and act as an impediment to law enforcement and emergency services responders. There may be no pattern or method to their selection of victims.

These situations are dynamic and evolve rapidly, demanding immediate deployment of law enforcement resources to stop the shooting and mitigate harm to innocent victims. The average active shooter incident lasts approximately 12 minutes, while 37 percent last less than five minutes. In 57 percent of active shooter incidents, police arrive while the shooting is still underway[xxxix].

Previous Occurrences

There are no reported events of an active shooter in Allen County; however several college campuses and schools throughout the US have had active shooting incidents in recent years. The Sandy Hook Elementary School shooting on December 14, 2012 is the result of an active shooter. In this incidence, a single man shot and killed 20 children, age six and seven, and six staff at the school. Additionally, on October 1, 2015 a gunman opened fire at a rural Oregon community college, killing 10 people and wounding 7 others.

Future Probability

As in the above previous occurrence, an active shooter could occur at any place, any time. Local law enforcement will generally be the first responder and should maintain trained personnel to handle these situations.

Potential Impact

These situations have the potential to be deadly and happen quickly. In a crowded environment or public event an active shooter could strike multiple time, injuring many. Witnesses to these types of events may sustain long term emotional impacts.

CBRNE Attack

Definition

CBRNE refers to chemical, biological, radiological, nuclear, or explosive attacks. There is a growing threat of terrorism incidents employing biological, chemical, and radiological agents. A biological agent is a naturally occurring substance that can cause harm to living organisms and can be adapted for use as a weapon (i.e., anthrax, cholera, and tularemia.) It is estimated that there are over 1,200 biological agents that can be found or modified into liquid droplets, aerosols, or dry powders. Chemical agents are primarily produced with the purpose to incapacitate or kill. Chemical agents can be found in liquid, gas, or solid form and are disseminated by using heat to evaporate the agent, exploding munitions, or a mechanical spray device. Radiological agents can be naturally occurring or manmade and may be weaponized using an explosive device. Exposure to radiological agents can cause changes in cell growth and functioning, resulting in significant health issues, or death.

Previous Occurrences

There are no reported incidents of significant CBRNE attacks in Allen County; however, there are several documented incidents across the US. The 2001 anthrax attacks occurred over a period of several weeks, just seven days after the September 11 attacks to the World Trade Center. Letters containing anthrax spores were mailed to several news media offices and two Senators. Five deaths and numerous infections were documented.

Future Probability

CBRNE weapons have rarely been used due to the difficulty of obtaining the materials and the complexity of using them effectively. Large terrorist groups are more apt to use CBRNE weaponry. The likelihood of a terrorist CBRNE attack in Allen County remains low at this time.

Potential Impact

As with other terrorist attacks, there may not be prior warning of a CBRNE incident, and the exact nature of an incident may not be immediately obvious. With little advance warning of a CBRNE attack, the potential for bodily harm is significant. CBRNE impacts may be reduced through the implementation of safe rooms.

Terrorism

Definition

There is no universally accepted definition of terrorism, even among US government agencies. The Code of Federal Regulations (CFR) defines terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives (28 C.F.R. Section 0.85). Acts of terrorism can occur in many forms, depending on technological means available to the terrorist, the motivation behind the act, the points of weakness of the target, and the terrorist's ingenuity.

Sabotage is the destruction of property or an obstruction of normal operations in order to defeat, hinder, or subvert a cause or endeavor. Acts of sabotage may be carried out by an individual or group, for the purpose of terrorism or in the course of a public disturbance. Sabotage can take many forms, including: bombings; organized extortion; use of biological, chemical, and radiological agents; pre-meditated plans of attack on institutions of public assembly; information technology disruptions; ethnic/religious/gender intimidation; and disruption of legitimate scientific research or resource-related activities.

Previous Occurrences

There are no recorded incidents of terrorism in Allen County; however a number of incidents have occurred across the US. The most significant terrorism event occurred on September 11, 2001 when Al Qaeda extremists hijacked commercial airplanes to damage the Twin Towers of the World Trade Center in New York City and the Pentagon near Washington, D.C. The attacks resulted in the deaths of 2,996 people.

On April 15, 2013, two bombs detonated near the finish line of the Boston Marathon, killing 3 and injuring more than 180 people. The attack was motivated by extreme Islamist beliefs and the wars in Iraq and Afghanistan.

On November 8, 2014, a right-wing, anti-government extremist set a fire at the Mexican Consulate in Austin, Texas. The attack caused significant damage to the Austin Police Headquarters, the Mexican Consulate, and a downtown area bank.

Future Probability

Terrorism will continue to be a potential occurrence for Allen County and everywhere. With improving technology, the prevalence of terrorism will continually increase from both domestic and international entities.

Potential Impact

Since terrorism incidents may involve a variety of elements including biological, chemical, and radiological agents, the potential impact of terrorism is very broad. It can be limited to a specific group of people, or a specific location or event.

Establish Core Capabilities

The National Preparedness Goal describes 31 core capabilities (Appendix A) that address the greatest risks to a community. These capabilities are categorized into one or more of the following mission areas:

1. Prevention: Prevent, avoid, or stop an imminent, threatened, or actual act of terrorism.
2. Protection: Protect our citizens, residents, visitors, and assets against the greatest threats and hazards in a manner that allows our interests, aspirations, and way of life to thrive.
3. Mitigation: Reduce the loss of life and property by lessening the impact of future disasters.
4. Response: Respond quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of a catastrophic incident.
5. Recovery: Recover through a focus on the timely restoration, strengthening and revitalization of infrastructure, housing and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by a catastrophic incident.

Each capability is also tied to a capability target, which describes what Allen County wants to achieve as an outcome for each capability and is based on the vulnerability assessment completed in the previous section of this plan.

"Essential Seven" Core Capabilities and Targets

The Indiana Department of Homeland Security has identified a subset of the 31 capabilities as the "Essential Seven." These are the seven capabilities that are foundational to every county in the state. Once a county demonstrates that it is fully capable in all of the "Essential Seven," it can begin to assess the remaining capabilities.

1. Planning

Mission Areas: Prevention ☒ Protection ☒ Mitigation ☒ Response ☒ Recovery ☒

Description: Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.

Capability Target: Review and update all county plans within the timelines established for each plan.

2. Public Information and Warning

Mission Areas: Prevention ☒ Protection ☒ Mitigation ☒ Response ☒ Recovery ☒

Description: Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.

Capability Target: Provide timely, prompt, and actionable communication to the entire county during emergency situations.

3. Operational Coordination

Mission Areas: Prevention ☒ Protection ☒ Mitigation ☒ Response ☒ Recovery ☒

Description: Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.

Capability Target: Establish and maintain a Unified Command structure to coordinate effective response activities during response operations.

4. Intelligence and Information Sharing

Mission Areas: Prevention ☒ Protection ☒ Mitigation ☐ Response ☐ Recovery ☐

Description: Provide timely, accurate, and actionable information resulting from the planning, direction, collection, exploitation, processing, analysis, production, dissemination, evaluation, and feedback of available information concerning physical and cyber threats to the United States, its people, property, or interests; the development, proliferation, or use of WMDs; or any other matter bearing on US national or homeland security by local, state, tribal, territorial, Federal, and other stakeholders. Information sharing is the ability to exchange intelligence, information, data, or knowledge among government or private sector entities, as appropriate.

Capability Target: Develop procedures to facilitate the exchange of threat information and data among federal, state, regional, and local agencies.

5. Threats and Hazard Identification

Mission Areas: Prevention ☐ Protection ☐ Mitigation ☒ Response ☐ Recovery ☐

Description: Identify the threats and hazards that occur in the geographic area; determine the frequency and magnitude; and incorporate this into analysis and planning processes so as to clearly understand the needs of a community or entity.

Capability Target: Develop and maintain a single comprehensive THIRA for Allen County.

6. Operational Communications

Mission Areas: Prevention ☐ Protection ☐ Mitigation ☐ Response ☒ Recovery ☐

Description: Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available, among and between affected communities in the impact area and all response forces.

Capability Target: Establish and maintain interoperable emergency communications with key stakeholders during response operations.

7. Situational Assessment

Mission Areas: Prevention ☐ Protection ☐ Mitigation ☐ Response ☒ Recovery ☐

Description: Provide all decision makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.

Capability Target: Establish a Common Operating Picture to provide decision makers with relevant information during response.

Apply the Results

In this step of the planning process, the Allen County planning team applied the results of the THIRA to evaluate the county's ability to meet capability targets and identify gaps in resources requirements, as well as areas of improvement. Table 38 describes the criteria used to rate the county's current capabilities across the five solution areas of planning, organization, equipment, training, and exercise. The scores are assigned using a scale of 0 (no capability) to 5 (fully capable).

Table 38: Core Capabilities Evaluation Criteria

	0	1	2	3	4	5
	No Capability	**Limited Capability**		**Moderate Capability**		**Fully Capable**
Planning	No plans/annexes exist	Some plans/annexes are in development	Some plans/annexes exist	Plans/annexes are complete but require update	Plans/annexes are complete and have been updated within 5 years	Plans/annexes are complete, up to date, and verified through either exercises or real world events
Organization	No required organization/ personnel exists	0-20% of required organization/ personnel exists	20-40% of required organization/ personnel exists	40-60% of required organization/ personnel exists	60-80% of required organization/ personnel exists	80-100% of required organization/ personnel exists
Equipment	No required equipment exists	0-20% of required equipment exists	20-40% of required equipment exists	40-60% of required equipment exists	60-80% of required equipment exists	80-100% of required equipment exists
Training	No required training exists	0-20% of required training exists	20-40% of required training exists	40-60% of required training exists	60-80% of required training exists	80-100% of required training exists
Exercise	No exercises/real-world demonstration have occurred in the jurisdiction	No exercises/real-world demonstration have occurred in the last five years	Exercises/real-world demonstration have occurred; many mission critical findings exist	Exercises/real-world demonstration have occurred; few mission critical findings exist	Exercises/real-world demonstration have occurred; some areas for improvement exist	Exercises/real-world demonstration have occurred; no areas for improvement exist

Using the criteria described in Table 38, the Allen County planning team rated its current capabilities in each of the "Essential Seven" capabilities and across the solution areas. It also identified gaps in each capability and advances/improvements that have occurred within the past three years.

Table 39: Allen County Preparedness Assessment

	Core Capability	Priority	Solution Areas					Average Score	Areas of Improvement
			Planning	Organization	Equipment	Training	Exercise		
Common	Planning	High	2	3	4	2	2	2.6	• Plans should be more functional • Need all agencies and departments to submit SOPs • Plans need to be more easily accessible, i.e. online
Common	Public Information and Warning	Low	4	4	4	4	4	4	Allen County is close to fully capable across all solution areas.
Common	Operational Coordination	Normal	4	4	5	3	2	3.6	County needs regularly scheduled exercises.
Prevention & Protection	Intelligence and Information Sharing	High	1	1	2	1	2	1.4	Not enough personnel are designated to this function. With more personnel should come more training, planning, and exercises.
Mitigation	Threats and Hazard Identification	Normal	3	4	4	4	1	3.2	• THIRA needs to be updated on an annual basis • Need to develop exercises to regularly test capabilities
Response	Operational Communications	Normal	3	4	3	3	2	3	County needs regularly scheduled exercises.
Response	Situational Assessment	High	2	3	2	2	2	2.2	County has basic capability but can improve across all solution areas.

Appendix, Notes, and References

Appendix A: Core Capabilities

PLANNING

- **Mission Areas**: All
- **Description**: Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or community-based approaches to meet defined objectives.

PUBLIC INFORMATION AND WARNING

- **Mission Areas**: All
- **Description**: Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.

OPERATIONAL COORDINATION

- **Mission Areas**: All
- **Description**: Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.

FORENSICS AND ATTRIBUTION

- **Mission Area**: Prevention
- **Description**: Conduct forensic analysis and attribute terrorist acts (including the means and methods of terrorism) to their source, to include forensic analysis as well as attribution for an attack and for the preparation for an attack in an effort to prevent initial or follow-on acts and/or swiftly develop counter-options.

INTELLIGENCE AND INFORMATION SHARING

- **Mission Areas**: Prevention, Protection
- **Description**: Provide timely, accurate, and actionable information resulting from the planning, direction, collection, exploitation, processing, analysis, production, dissemination, evaluation, and feedback of available information concerning threats to the United States, its people, property, or interests; the development, proliferation, or use of WMDs; or any other matter bearing on U.S. national or homeland security by Federal, state, local, and other stakeholders. Information sharing is the ability to exchange intelligence, information, data, or knowledge among Federal, state, local, or private sector entities, as appropriate.

INTERDICTION AND DISRUPTION

- **Mission Areas**: Prevention, Protection
- **Description**: Delay, divert, intercept, halt, apprehend, or secure threats and/or hazards.

SCREENING, SEARCH, AND DETECTION

- **Mission Areas**: Prevention, Protection
- **Description**: Identify, discover, or locate threats and/or hazards through active and passive surveillance and search procedures. This may include the use of systematic examinations and assessments, sensor technologies, or physical investigation and intelligence.

ACCESS CONTROL AND IDENTITY VERIFICATION

- **Mission Area**: Protection
- **Description**: Apply a broad range of physical, technological, and cyber measures to control admittance to critical locations and systems, limiting access to authorized individuals to carry out legitimate activities.

CYBERSECURITY

- **Mission Area**: Protection
- **Description**: Protect against damage to, the unauthorized use of, and/or the exploitation of (and, if needed, the restoration of) electronic communications systems and services (and the information contained therein)

.

PHYSICAL PROTECTIVE MEASURES

- **Mission Area**: Protection
- **Description**: Reduce or mitigate risks, including actions targeted at threats, vulnerabilities, and/or consequences, by controlling movement and protecting borders, critical infrastructure, and the homeland.

RISK MANAGEMENT FOR PROTECTION PROGRAMS AND ACTIVITIES

- **Mission Area**: Protection
- **Description**: Identify, assess, and prioritize risks to inform Protection activities and investments.

SUPPLY CHAIN INTEGRITY AND SECURITY

- **Mission Area**: Protection
- **Description**: Strengthen the security and resilience of the supply chain.

COMMUNITY RESILIENCE

- **Mission Area**: Mitigation
- **Description**: Lead the integrated effort to recognize, understand, communicate, plan, and address risks so that the community can develop a set of actions to accomplish Mitigation and improve resilience.

LONG-TERM VULNERABILITY REDUCTION

- **Mission Area**: Mitigation
- **Description**: Build and sustain resilient systems, communities, and critical infrastructure and key resources lifelines so as to reduce their vulnerability to natural, technological, and human- caused incidents by lessening the likelihood, severity, and duration of the adverse consequences related to these incidents.

RISK AND DISASTER RESILIENCE ASSESSMENT

- **Mission Area**: Mitigation
- **Description**: Assess risk and disaster resilience so that decision makers, responders, and community members can take informed action to reduce their entity's risk and increase their resilience.

THREATS AND HAZARD IDENTIFICATION

- **Mission Area**: Mitigation
- **Description**: Identify the threats and hazards that occur in the geographic area; determine the frequency and magnitude; and incorporate this into analysis and planning processes so as to clearly understand the needs of a community or entity.

CRITICAL TRANSPORTATION

- **Mission Area**: Response
- **Description**: Provide transportation (including infrastructure access and accessible transportation services) for response priority objectives, including the evacuation of people and animals, and the delivery of vital response personnel, equipment, and services into the affected areas.

ENVIRONMENTAL RESPONSE/HEALTH AND SAFETY

- **Mission Area**: Response
- **Description**: Ensure the availability of guidance and resources to address all hazards including hazardous materials, acts of terrorism, and natural disasters in support of the responder operations and the affected communities.

FATALITY MANAGEMENT SERVICES

- **Mission Area**: Response
- **Description**: Provide fatality management services, including body recovery and victim identification, working with state and local authorities to provide temporary mortuary solutions, sharing information with mass care services for the purpose of reunifying family members and caregivers with missing persons/remains, and providing counseling to the bereaved.

INFRASTRUCTURE SYSTEMS

- **Mission Area**: Response, Recovery
- **Description**: Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.

MASS CARE SERVICES

- **Mission Area**: Response
- **Description**: Provide life-sustaining services to the affected population with a focus on hydration, feeding, and sheltering to those who have the most need, as well as support for reunifying families.

MASS SEARCH AND RESCUE OPERATIONS

- **Mission Area**: Response
- **Description**: Deliver traditional and atypical search and rescue capabilities, including personnel, services, animals, and assets to survivors in need, with the goal of saving the greatest number of endangered lives in the shortest time possible.

ON-SCENE SECURITY AND PROTECTION

- **Mission Area**: Response
- **Description**: Ensure a safe and secure environment through law enforcement and related security and protection operations for people and communities located within affected areas and also for all traditional and atypical response personnel engaged in lifesaving and life-sustaining operations.

OPERATIONAL COMMUNICATIONS

- **Mission Area**: Response
- **Description**: Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available, among and between affected communities in the impact area and all response forces

PUBLIC AND PRIVATE SERVICES AND RESOURCES

- **Mission Area**: Response
- **Description**: Provide essential public and private services and resources to the affected population and surrounding communities, to include emergency power to critical facilities, fuel support for emergency responders, and access to community staples (e.g., grocery stores, pharmacies, and banks) and fire and other first response services.

PUBLIC HEALTH AND MEDICAL SERVICES

- **Mission Area**: Response
- **Description**: Provide lifesaving medical treatment via emergency medical services and related operations and avoid additional disease and injury by providing targeted public health and medical support and products to all people in need within the affected area.

SITUATIONAL ASSESSMENT

- **Mission Area**: Response
- **Description**: Provide all decision makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.

ECONOMIC RECOVERY

- **Mission Area**: Recovery
- **Description**: Return economic and business activities (including food and agriculture) to a healthy state and develop new business and employment opportunities that result in a sustainable and economically viable community.

HEALTH AND SOCIAL SERVICES

- **Mission Area**: Recovery
- **Description**: Restore and improve health and social services networks to promote the resilience, independence, health (including behavioral health), and well-being of the whole community.

HOUSING

- **Mission Area**: Recovery
- **Description**: Implement housing solutions that effectively support the needs of the whole community and contribute to its sustainability and resilience.

NATURAL AND CULTURAL RESOURCES

- **Mission Area**: Recovery
- **Description**: Protect natural and cultural resources and historic properties through appropriate planning, mitigation, response, and recovery actions to preserve, conserve, rehabilitate, and restore them consistent with post-disaster community priorities and best practices and in compliance with appropriate environmental and historical preservation laws and executive orders.

[i] US Census Bureau/American FactFinder (2014).
[ii] US Department of Commerce, Bureau of Economic Analysis (2012); NAICS Association, LLC
[iii] Allen County Office of Homeland Security, & Christopher B. Burke Engineering, LLC. (2012). Allen County Multi-Hazard Mitigation Plan Update.
[iv] NOAA Storm Prediction Center. Enhanced F Scale for Tornado Damage. Retrieved from http://www.spc.noaa.gov/faq/tornado/ef-scale.html
[v] Allen County Multi-Hazard Mitigation Plan Update
[vi] Indiana Geological Survey (2002). Earthquakes – Seismic Risks in Indiana. Retrieved from http://igs.indiana.edu/Earthquakes/Risk.cfm
[vii] Allen County Multi-Hazard Mitigation Plan Update
[viii] Purdue University Entomology Department. Indiana's "Most Unwanted" Invasive Plant Pests. Retrieved from http://extension.entm.purdue.edu/CAPS/browseDistribution.html
[ix] National Wildlife Federation. Invasive Species. Retrieved from https://www.nwf.org/Wildlife/Threats-to-Wildlife/Invasive-Species.aspx
[x] Indiana Department of Environmental Management. "Fort Wayne Air National Guard- Fort Wayne, IN." Land Quality in Indiana. http://www.in.gov/idem/landquality/2454.htm. Web. 2016.

[xi] Nordholm A.F., J. Rossi 3rd, G.D. Ritchie, S. McInturf, M.E. Hulme, C. Mc Cool, L. Narayanan, K.L. MacMahon, J. Eggers, H.F. Leahy, R.E. Wolfe. "Repeated exposure of rats to JP-4 vapor induces changes in neurobehavioral capacity and 5-HT/5-HIAA levels." J Toxicol Environ Health A. Apr 1999. ncbi.nlm.nih.gov/pubmed/10201635. Web. 2016.

[xii] Clabaugh, Eric. "Hazardous Chemical Spill into Mary's River." ABC 21Alive. www.21alive.com. 18 Jun. 2010. Web. 2016.
[xiii] U.S. Department of Homeland Security. "CBRNE Program." www.dhs.gov/hazardous-response-program. Web. 2016.
[xiv] FEMA Center for Domestic Preparedness. "Hazardous Materials Preparedness: Training for All-Hazards Response." cdp.dhs.gov. Web. 2016.
[xv] U.S. Department of Transportation Pipeline and Hazardous Material Safety Administration. "Hazardous Materials Transportation Security Requirements." hazmatonline.phmsa.dot.gov. Web. 2016.
[xvi] Lutheran Health Network. "Lutheran Hospital." lutheranhospital.com. Web. 2016.
[xvii] LTC Facility Directory for Allen County. http://www.in.gov/isdh/reports/QAMIS/ltcdir/ctyfac01.htm. 29 Oct. 2015. Web. 2016.
[xviii] U.S. Department of Veterans Affairs. "VA Northern IN Health Care System- Fort Wayne Campus." http://www.northernindiana.va.gov/locations/Directions.asp. Web. 2016.

[xix] Indiana Housing and Community Development Authority. "Emergency Shelter List by County." Dec. 2008. http://www.in.gov/ihcda/files/Emergency_Shelter_List(1).pdf. Web. 2016.
[xx] Allen County Local Emergency Planning Committee. "Hazardous Material Emergency Response Plan." allencounty.us/homeland. Dec 2014. Web. 2016.

[xxi] U.S. Department of Transportation and U.S. Department of Commerce. "United States: 2012 Hazardous Materials." www.fmcsa.dot.gov. Feb. 2015. Web. 2016.
[xxii] Allen County Local Emergency Planning Committee. "Hazardous Material Emergency Response Plan." Pg. 4. Dec. 2014. Print.
[xxiii] Federal Motor Carrier Safety Administration (FMCSA). "How to Comply with Federal Hazardous Materials Regulations." www.fmcsa.dot.gov. Web. 2016.
[xxiv] Allen County Government. "Hazardous Material Spill at County Garage Contained." allencounty.us. 10 Jun. 2009. Web. 2016.
[xxv] Hoover, Ian, Tracy Medsker. "Traffic Flowing Again on U.S. 24 after Morning Hazmat Situation." ABC 21 Alive. 21alive.com. 24 Jul. 2015. Web. 2016.
[xxvi] WTHR Channel 13. "Cause of Monday's Train Derailment near Fort Wayne Still Unknown." wthr.com. 15 Sept. 2014. Web. 2016.
[xxvii] Widener, Adam. "More Oil Trains Stopping on Downtown Railroad." Wane.com. 7 Apr. 2015. Web. 2016.
[xxviii] Genesee & Wyoming Inc. "Chicago, Ft. Wayne & Eastern Railroad (CFE)." http://www.gwrr.com/operations/railroads. Web. 2016.
[xxix] Cameo Chemicals. "Asphalt." http://cameochemicals.noaa.gov. Web. 2016.
[xxx] The Office of Fire Prevention and Control. "Strategic and Tactical Guidance for Rail Incidents Involving Crude Oil." OFPC Information Bulletin. http://www.dhses.ny.gov/ofpc/alerts-bulletins/information/documents/2014/crude-oil.pdf. 8 Oct. 2014. Web. 2015.
[xxxi] LTC Facility Directory for Allen County. http://www.in.gov/isdh/reports/QAMIS/ltcdir/ctyfac01.htm. 29 Oct. 2015. Web. 2016.
[xxxii] CityRating.com (2015). Fort Wayne Crime Rate Report. Retrieved from http://www.cityrating.com/crime-statistics/indiana/fort-wayne.html
[xxxiii] http://www.usfa.fema.gov/data/statistics/
[xxxiv]Fort Wayne International Airport. fwairport.com. Web. 2016.
[xxxv] National Transportation Safety Board. "Probable Cause." CHI01FA032_Brief.pdf. Web. 2016.
[xxxvi] Associated Press. "Police: Small Plane Crashed into Fort Wayne, Passenger Fled the Scene." http://fox59.com. 26 Sept. 2015. Web. 2016.
[xxxvii] Showgo, Ron, Frank Gray. "Crash of Airplane Heavy on Mystery." The Journal Gazette. journalgazette.net. 30 Sept. 2015. Web. 2016.
[xxxviii] National Transportation Safety Board. "Aviation Accident Database & Synopsis." ntsb.gov. Web. 2016.
[xxxix] Federal Bureau of Investigation (2013). A Study of Active Shooter Incidents in the United States between 2000 and 2013. Retrieved from https://www.fbi.gov/news/stories/2014/september/fbi-releases-study-on-active-shooter-incidents/pdfs/a-study-of-active-shooter-incidents-in-the-u.s.-between-2000-and-2013