

Multi-Hazard Mitigation Plan Harrison County, Indiana



August 2015

Multi-Hazard Mitigation Plan

Harrison County, Indiana

Original Adoption Date: 2008
Updated: 2015

Primary Point of Contact:

Harrison County Emergency Management Agency
Greg Reas, Director
245 Atwood NE
Corydon, IN 47112
harrisoncounty.ema@insightbb.com

Prepared by:



Acknowledgments

Harrison County's multi-hazard mitigation plan was developed in 2008 and updated in 2015 by The Polis Center at IUPUI. The Harrison County Emergency Management Agency would like to thank The Polis Center, River Hills Economic Development District and Regional Planning Commission (River Hills EDD & RPC), and the Harrison County Multi-Hazard Mitigation Planning Team for their contributions and assistance in development of the Harrison County Multi-Hazard Mitigation Plan 2015 Update. Through the combined efforts, input and support of these organizations, Harrison County continues to build its capacity to prevent, protect against, respond to, and recover from disasters.

Acronyms

AEGL - Acute Exposure Guideline Levels
ALOHA - Areal Locations of Hazardous Atmospheres
BFE - Base Flood Elevation
CAMEO – Computer-Aided Management of Emergency Operations
CAPI – Community Action Potential Index
CEMP – Comprehensive Emergency Management Plan
CRS – Community Rating System
DEM – Digital Elevation Model
DFIRM – Digital Flood Insurance Rate Map
DHS – Department of Homeland Security
DMA – Disaster Mitigation Act
EAP – Emergency Action Plan
EMA – Emergency Management Agency
EPA – Environmental Protection Agency
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Maps
GIS – Geographic Information System
HazMat – Hazardous Materials
Hazard-MH – Hazards USA Multi-Hazard
HUC – Hydrologic Unit Code
IDEM – Indiana Department of Environmental Management
IDHS – Indiana Department of Homeland Security
INDOT – Indiana Department of Transportation
IDNR – Indiana Department of Natural Resources
IGS – Indiana Geological Survey
ISDA – Indiana State Department of Agriculture
MHMP – Multi-Hazard Mitigation Plan
NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NOAA – National Oceanic and Atmospheric Administration
NSF – National Science Foundation
NWS – National Weather Service
OCRA – Office of Community and Rural Affairs
PPM – Parts Per Million
SPC – Storm Prediction Center
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey

Table of Contents

Executive Summary.....	1
Section 1: Introduction	2
Section 2: Prerequisites	4
2.1 Multi-Jurisdictional Plan Adoption	4
2.2 Jurisdiction Participation	4
Section 3: Planning Process	6
3.1 Planning Team Information	7
3.2 Review of Existing Plans.....	8
3.3 Review of Technical and Fiscal Resources	9
3.4 Public Involvement	9
3.5 Neighboring County and Community Participation	9
Section 4: County Profile.....	11
4.1 Geography, Topography, and Climate.....	13
4.2 Demography	15
4.3 Population Change.....	16
4.4 Special Needs Populations.....	18
4.5 Economy and Industry.....	20
4.6 Commuting Patterns.....	23
4.7 Transportation	24
4.8 Major Waterways and Watersheds	25
4.9 Land-Use and Development Trends	25
Section 5: Risk Assessment	28
5.1 Identifying Hazards	28
5.1.1 Existing Plans	28
5.1.2 Historical Hazards Records.....	29
5.1.3 Hazard-Ranking Methodology.....	33
5.1.4 GIS and Hazus-MH Modeling	37
5.2 Assessing Vulnerability	38
5.2.1 Identify Facilities	39
5.2.2 Building Replacement Costs.....	40
5.3 Profiling Hazards.....	40
5.3.1 Tornadoes.....	40
5.3.2 Flood Hazard	47
5.3.3 Earthquake Hazard	62
5.3.4 Severe Thunderstorm Hazard	75
5.3.5 Winter Storm Hazard	79
5.3.6 Hazardous Material Release Hazard	81
5.3.7 Extreme Temperatures	92
5.3.8 Drought Hazard	97
5.3.9 Dam/Levee Failure Hazard	101
5.3.10 Landslide Hazard/Ground Failure	104
Section 6: Mitigation Strategies.....	109
6.1 Community Action Potential Index (CAPI).....	109
6.2 Plans and Ordinances	111
6.3 Mitigation Goals	112
6.4 Mitigation Actions and Projects	113

6.5 Multi-Jurisdictional Mitigation Strategy and Actions	116
Section 7: Plan Maintenance	129
7.1 Monitoring, Evaluating, and Updating the Plan	129
7.2 Implementation through Existing Programs	130
7.3 Continued Public Involvement	130
APPENDICES	131

Executive Summary

The Harrison County Multi-Hazard Mitigation Plan was developed to 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. The plan is hazard- and community- specific. It documents historical disasters, assesses probabilistic disasters through Hazus-MH and GIS analyses, and addresses specific strategies to mitigate the potential impacts of these disasters.

This plan update was a collaborative effort among the Harrison County Multi-Hazard Mitigation Planning Team, River Hills Economic Development District and Regional Planning Commission and The Polis Center of Indiana University Purdue University-Indianapolis. Harrison County and River Hills EDD & RPC have joined efforts in developing a hazard mitigation plan which protects and supports economic and community development in the county through effective hazard mitigation strategies.

The team updated the following content in the plan:

- Historical hazards: Each hazard section within this plan documents the most current data about NCDC-reported hazards since the 2008 plan.
- Profile Hazards: The planning team revised the hazard priority rankings and plotted each hazard on a risk grid according to probability (y-axis) and potential impact (x-axis). County planning documents, e.g. Risk MAP reports, CEMP, hazard-specific reports, etc., were integrated into the plan update.
- Community profile: Demographics, social, and economic data, as well as existing and future land use descriptions were updated to reflect the current status of the county and its jurisdictions.
- NFIP: The plan includes the effective date of the DFIRM.
- Planning description: The new planning team and updated planning process were described and documented.
- Risk assessment: Hazus-MH and GIS analyses were updated using site-specific data from the county. Updated loss estimation is provided for tornadoes, floods, earthquakes, and hazardous materials releases.
- Mitigation: The team reviewed and updated mitigation goals, objectives, and strategies and also incorporated mitigation strategies identified in the 2013 Risk MAP Resilience meeting.

Section

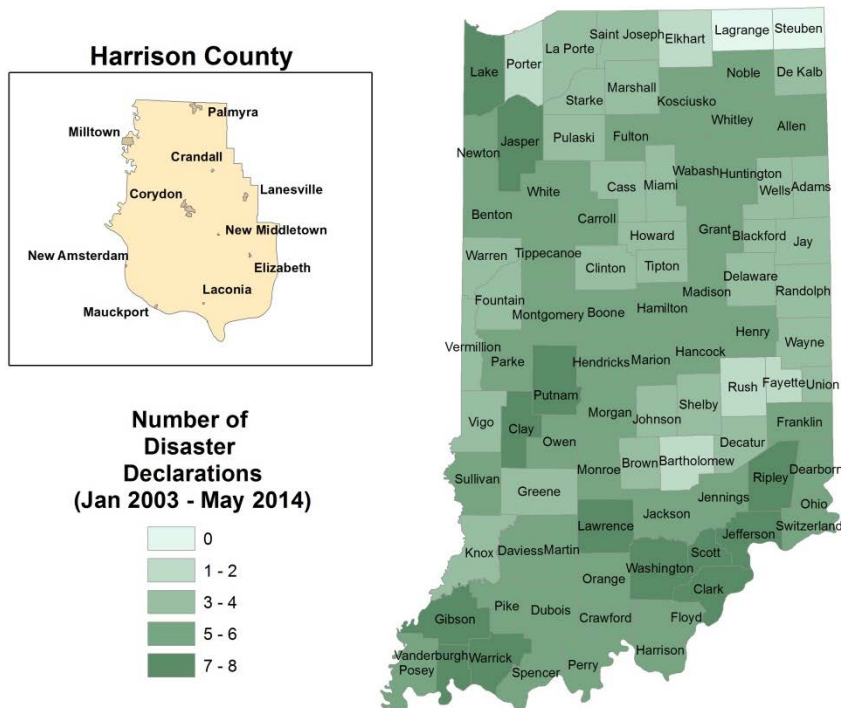
1

Introduction

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

The federal Disaster Mitigation Act of 2000 requires jurisdictions to develop and maintain a Multi-Hazard Mitigation Plan (MHMP) to remain eligible for certain federal disaster assistance and hazard mitigation funding programs. Renewal of the plan every five years is required to encourage the continual awareness of mitigation strategies. In order for National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt the MHMP. In the past decade, FEMA has declared 17 emergencies and disasters for the state of Indiana, as shown in Figure 1-1.

Figure 1-1: FEMA Disaster and Emergency Declarations for Indiana¹



¹ Federal Emergency Management Agency (FEMA), 2014

In the event of a federally declared disaster, individuals, families, and businesses may apply for financial assistance to help with critical expenses. Assistance may be categorized as Individual Assistance (IA), Public Assistance (PA), or Hazard Mitigation Assistance (HM).

The following types of assistance may be available in the event of a disaster declaration.

Individuals & Household Program: Provides money and services to people in presidentially declared disaster areas.

Housing Assistance: Provides assistance for disaster-related housing needs.

Other Needs Assistance: Provides assistance for other disaster-related needs such as furnishings, transportation, and medical expenses.

Public Assistance: Disaster grants assistance available for communities to quickly respond to and recover from major disasters or emergencies declared by the president.

Emergency Work (Categories A-B): Work that must be performed to reduce or eliminate an immediate threat to life, to protect public health and safety, and to protect improved property that is significantly threatened due to disasters or emergencies declared by the president.

Permanent Work (Categories C-G): Work that is required to restore a damaged facility, through repair or restoration, to its pre-disaster design, function, and capacity in accordance with applicable codes and standards.

Hazard Mitigation Assistance: Provides assistance to states and local governments through the Hazard Mitigation Grant Program (HMGP) to implement long-term hazard mitigation measures after a major disaster declaration.

Harrison County has received federal aid for one declared emergency and six disasters in the past 10 years, listed in Table 1-1: FEMA-Declared Disasters and Emergencies for Harrison County (2004-2014). Three disasters have been declared since the last Harrison County MHMP was adopted in 2008.

Table 1-1: FEMA-Declared Disasters and Emergencies for Harrison County (2004-2014)

Incident	Date Declared	Disaster Description	Type of Assistance
EM-3197 December 21 – 23, 2004	Jan 11, 2005	Indiana Snow	PA, HM
DR-1520 May 24 – June 25, 2004	June 3, 2004	Indiana Severe Storms, Tornadoes, Flooding	IA, PA, HM
DR-1542 July 3 – 18, 2004	Sept 1, 2004	Indiana Tornadoes, Flooding	PA, HM
DR-1573 January 1 – February 11, 2005	Jan 21, 2005	Indiana Winter Storm, Flooding	IA, HM
DR-1795 September 12 – October 6, 2008	Sept 23, 2008	Indiana Severe Storms, Flooding	IA, PA, HM
DR-1828 January 26 – 28, 2009	March 5, 2009	Indiana Windstorm	PA, HM
DR-1997 April 11 – June 6, 2011	June 23, 2011	Indiana Severe Storms, Tornadoes, Flooding	PA, HM

PA – Public Assistance program

IA – Individual Assistance program

HM – Hazard Mitigation Assistance (Hazard Mitigation Grant Program)

Section

2

Prerequisites

The Harrison County MHMP update meets the requirements of the Disaster Mitigation Act of 2000, which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act to require state, local, and tribal entities to closely coordinate mitigation planning and implementation efforts. It also meets the requirements of the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) grant program, Pre-Disaster Mitigation (PDM) grant program, and other National Flood Insurance Program (NFIP) grants.

2.1 Multi-Jurisdictional Plan Adoption

This plan represents a comprehensive description of Harrison County's commitment to significantly reduce or eliminate the potential impacts of disasters through planning and mitigation. Adoption by the local governing bodies within the county legitimizes the plan and authorizes responsible agencies to implement mitigation responsibilities and activities. To be eligible for federal mitigation funding, each participating jurisdiction must adopt the plan. After thorough review, the Harrison County Commissioners adopted the plan on <insert date adopted>. Additional adoptions are included in Appendix E.

2.2 Jurisdiction Participation

Table 2-1 lists each jurisdiction and describes its participation status in the 2008 process and 2015 update of the multi-hazard mitigation plan (MHMP). Note, Milltown also participated in the 2006 and 2015 Crawford County Multi-Hazard Mitigation Plan.

Table 2-1: Participating Jurisdictions

Jurisdiction Name	Type	Participated in 2008 MHMP	Participated in 2015 MHMP Update
Harrison County	County	Yes	Yes
Corydon	Town	Yes	Yes
Palmyra	Town	Yes	Yes
Milltown	Town	No	Yes
Lanesville	Town	Yes	Yes
Elizabeth	Town	Yes	Yes
Crandall	Town	Yes	Yes
New Middletown	Town	Yes	No
Mauckport	Town	Yes	Yes
Laconia	Town	Yes	Yes
New Amsterdam	Town	Yes	Yes

The county also invited representatives from local businesses and organizations to participate in the plan. The organizations which were invited included the American Red Cross, COADs/VOADs, health departments, major businesses, REMC operations and local media, among others. Table 2-2 lists additional team members with a description of their participation. The invitation to participate is included in Appendix A.

Table 2-2: Organizations Invited to Participate

Organization Name	Organization Type	Organization Representative Name	Description of Participation
Harrison REMC	Energy/Utility	Jon Wernert	Attended public meeting
Harrison REMC	Energy/Utility	David Lett	Attended public meeting
River Hills EDD & RPC	Economic Development	Chelsea Crump	Attended/coordinated meetings, provided data, community liaison

Section**3****Planning Process**

The Harrison County Emergency Management Agency (EMA), River Hills Economic Development District and Regional Planning Commission (EDD & RPC) and The Polis Center (Polis) have joined efforts to develop this multi-hazard mitigation plan update. The planning process consisted of the following tasks:

Task 1: Organize Resources

The Harrison County EMA created a planning team to attend meetings, gather data and historical information, and participate in mitigation brainstorming sessions.

Task 2: Risk Assessment

The planning team identified the natural and technological hazards to include in this plan, and Polis developed hazard event profiles to address the possible magnitudes and severities associated with each hazard. The team then used local resources to inventory the county's assets and estimate losses.

Task 3: Public Involvement

The public was invited to attend a public input meeting and open house to learn about county emergency and disaster preparedness and review the hazard mitigation planning process in Harrison County. During the public input meeting, the public had the opportunity to review risk assessment results, and discuss and provide input on mitigation strategies. The EMA posted an announcement for the public input meeting on the county government website and distributed the announcement to jurisdictions, media outlets and other organizations which serve the public. Appendix A includes meeting minutes and the public meeting notice.

Task 4: Develop Mitigation Strategies

During the public input meeting, the 2008 MHMP and mitigation strategies or actions were reviewed. Important changes in the county, including population trends, growth of minority and special needs populations, and land development and usage were also discussed as these factors relate to hazard mitigation planning. The second half of the meeting was devoted to reviewing the status of 2008 mitigation actions and developing new mitigation strategies for the 2015 update with input from the public.

Task 5: Complete the Plan

Polis compiled all of the planning team documentation and research with the risk assessment and mitigation strategies to produce a draft plan for review. The Harrison County planning team had multiple opportunities to review and revise the plan before submitting to the Indiana Department of Homeland Security (IDHS) and FEMA for approval.

Task 6: Plan Adoption

The Harrison County EMA coordinated the effort to collect adoptions from each participating jurisdiction.

3.1 Planning Team Information

The planning team is headed by the Harrison County EMA. Other members of the planning team include representatives from various county departments, cities and towns, and public safety and other organizations which respond to emergencies and disasters. Table 3-1 identifies the planning team members, organizations and jurisdictions represented.

Table 3-1: Multi Hazard Mitigation Planning Team Members

Name	Title	Organization	Jurisdiction
Betsy Blocker	Clerk-Treasurer	Town of Lanesville	Lanesville
Hugh Burns	Clerk-Treasurer	Town of Elizabeth	Elizabeth
Scott Byrum	Council Member	Town Council	Laconia
Robert Crosier	Council President	Town of Mauckport	Mauckport
Chelsea Crump	Charitable Financial Specialist	River Hills EDD & RPC	Harrison and Surrounding Counties
Regina Glass	Council Member	Town of New Amsterdam	New Amsterdam
Debra Jones	Clerk-Treasurer	Town of Palmyra	Palmyra
Treggie King	Clerk-Treasurer	Town of Corydon	Corydon
Holly Kingsley	Council Member	Town of Mauckport	Mauckport
Virginia Kirkham	Council President	Town of Palmyra	Palmyra
Greg Reas	EMA Director	Harrison County EMA	Harrison County
Melissa Shaffer	Clerk-Treasurer	Town of New Amsterdam	New Amsterdam
Linda Smith	Council Member	Town of Lanesville	Lanesville
Peggy Stilger	Clerk-Treasurer	Town of Crandall	Crandall
Fred Wattula	Council Member	Town of Crandall	Crandall

All members of the planning team were actively involved in attending the MHMP meetings, providing available geographic information systems (GIS) data and historical hazard information, reviewing and

providing comments on the draft plans, coordinating and participating in the public input process, and coordinating the county's formal adoption of the plan.

The planning team held three meetings to support the Harrison County MHMP Update process. The dates and goals of the meetings are highlighted below:

Meeting 1, November 13, 2014 (Planning Team Meeting):

- Introduce/overview of project
- Review and update facility data
- Review and prioritize hazards
- Determine modeling scenarios
- Distribute 2015 mitigation strategies

Meeting 2, June 3, 2015 (Planning Team and Public Input Meeting):

- Introduction and overview for new attendees
- Review risk assessment
- Review draft plan
- Discuss 2008 and 2015 mitigation strategies
- Solicit public input

Meeting 3, August 12, 2015 (Planning Team Meeting):

- Review final draft plan

3.2 Review of Existing Plans

Harrison County and the local communities utilize land use plans, emergency response plans, municipal ordinances, and building codes to direct community development. The planning process also incorporated the existing natural hazard mitigation elements from these previous planning efforts. The development of the plan utilized the following plans, studies, reports, and ordinances. The planning team and Polis reviewed the 2008 MHMP to determine which areas of the plan required updating. A description of updated sections is available in the Executive Summary. Table 3-2 below lists the plans, studies, reports, and ordinances utilized in the development of the MHMP 2015 Update.

Table 3-2: Documents Utilized in the MHMP 2015 Update

Document Title	Year	Description	2015 Update Sections
Harrison County 2008 Multi-Hazard Mitigation Plan	2008	Federal Disaster Mitigation Act requirement	All sections
Harrison County, Indiana 2008 Comprehensive Plan Update	2008	Outlines vision and goals for future land development in the context of historical conditions and trends.	Sec 4: County Profile, Transportation Sec 5: Risk Assessment Section 6: Mitigation Strategies
Harrison County Zoning Map	2013	Official zoning guide for existing and future land usage.	Sec 5: Risk Assessment Section 6: Mitigation Strategies

Document Title	Year	Description	2015 Update Sections
Harrison County Zoning Ordinance	2014	Description of zoning ordinances in the county	Sec 4: County Profile Sec 6: Mitigation Strategies
Eight-Year License Renewal: Caesars Indiana	2006	An assessment of the economic and fiscal activities of the Caesars property	Sec 4: County Profile
Indian Creek Watershed Management Plan	2008	Watershed management plan	Sec 5: Risk Assessment

3.3 Review of Technical and Fiscal Resources

The 2015 planning team identified representatives from key federal, state and county agencies to assist in the planning process. Technical data, reports and studies were obtained from these agencies. A list of technical and fiscal resources and sources are summarized in Table 3-3. Organizations contributing data, reports and other valuable resources included various federal, state and county departments and agencies.

Table 3-3: Technical and Fiscal Resources and Sources

Resources	Sources
Repetitive loss information	FEMA Region V
Digital flood maps, dam and levee information	FEMA Region V
GIS data, digital elevation models (DEM), earthquake modeling scenarios	Indiana Geological Survey
Critical Facility GIS data and GIS basemap data	Harrison County GIS Department
Community Action Potential Index (CAPI) data	FEMA
Buyout/Retrofitting information and planning data	Indiana Department of Homeland Security (IDHS)

3.4 Public Involvement

The planning team invited the public to a meeting on June 3, 2015 to encourage the public to actively participate in the planning process. Appendix A includes minutes from the meeting and a copy of the public meeting notice that encouraged community representatives and the public to participate in the hazard mitigation planning process.

3.5 Neighboring County and Community Participation

The Harrison County planning team invited neighboring counties and communities to review the draft plan and provide input on content, including mitigation strategies. Details of neighboring stakeholders' participation in the planning process are summarized in Table 3-4.

Table 3-4: Neighboring County Participation

Participant Name	Neighboring County/Community	Organization	Participation Description
Desi Alexander	Washington County, IN	Washington County EMA	Received a draft of plan for review, comment
Terry E. Herthel	Floyd County, IN	Floyd County EMA	Received a draft of plan for review, comment
Larry Allen	Crawford County, IN	Crawford County EMA	Received a draft of plan for review, comment

Section

4

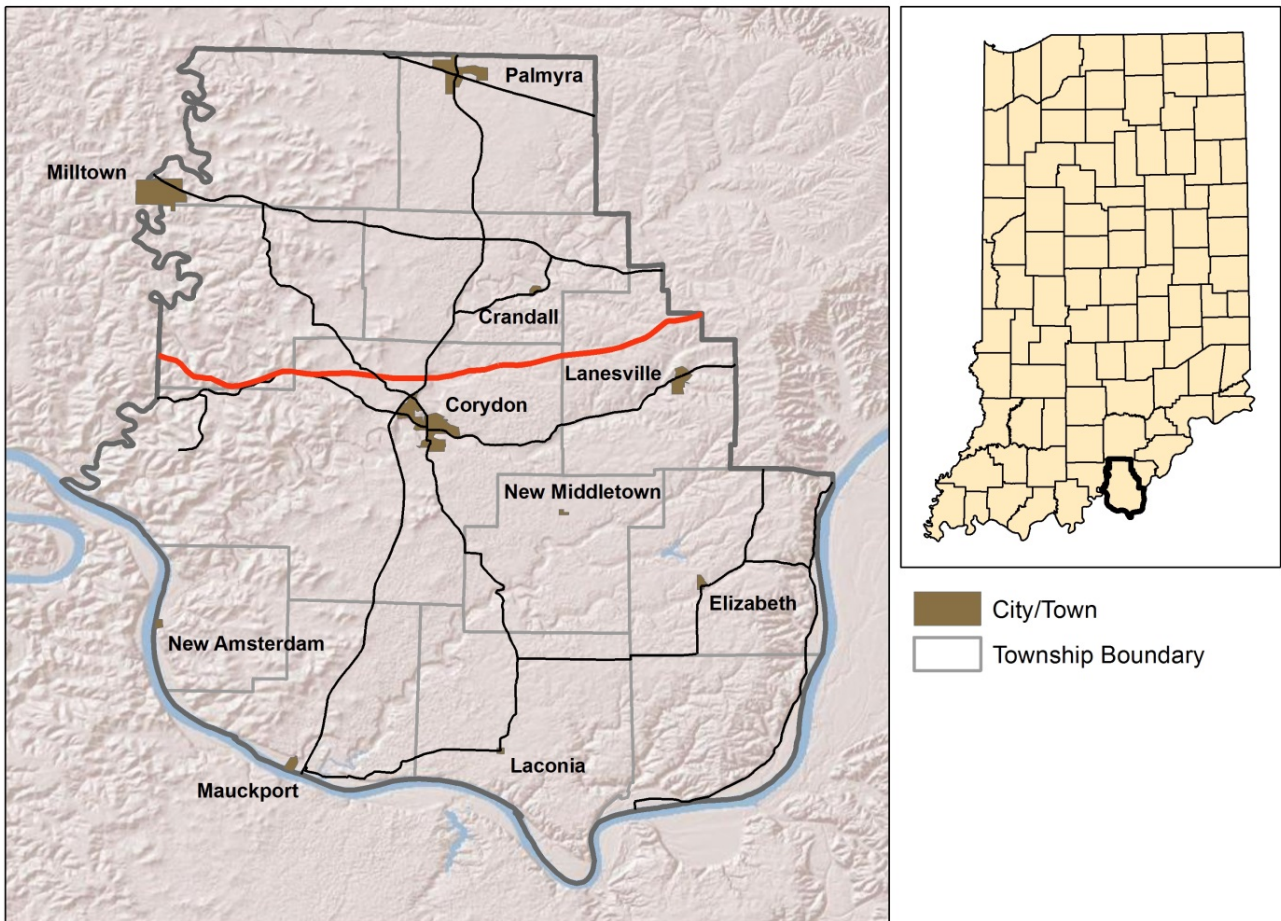
County Profile

Located along more than 40 miles of Ohio River shoreline, Harrison County has played a prominent role in the state's history. It was organized in 1808 as the fourth county in the Indiana Territory and by 1813 Corydon was named the territorial capitol. The county was named after a Harrison County resident, William Henry Harrison, who was the first territorial governor and later, ninth President of the United States.

Today, along with its important role in the early history of Indiana, Harrison County is recognized for its abundant natural resources, including limestone, forested hills, and many karst physiographic features, such as sinkholes and caves. It is characterized as a scenic setting of rolling hills, woodlands and farmland with a distinctive rural, small-town lifestyle.

With 485 square miles in land area and 1.7 square miles of water, Harrison County is among the state's largest counties in land area. Indiana's average county is 396 square miles. According to 2013 US Census Bureau estimates, Harrison County's population is 39,163, below the average county population of 65,712, and ranking the county 37 in population among the state's 92 counties. The largest town is Corydon, the county seat, with a 2013 population of 3,119.

Harrison County also contains several unincorporated or formerly-incorporated communities, including: Bradford, Byrneville, Central, Depauw, New Salisbury, Ramsey, Rosewood, Sennville, and White Cloud. Below, Figure 4-1 shows the incorporated jurisdictions or towns in the county, as well as Indiana counties which adjoin Harrison County. Three counties, Crawford, Washington, and Floyd, adjoin Harrison for a combined four-county area population of 153,448.

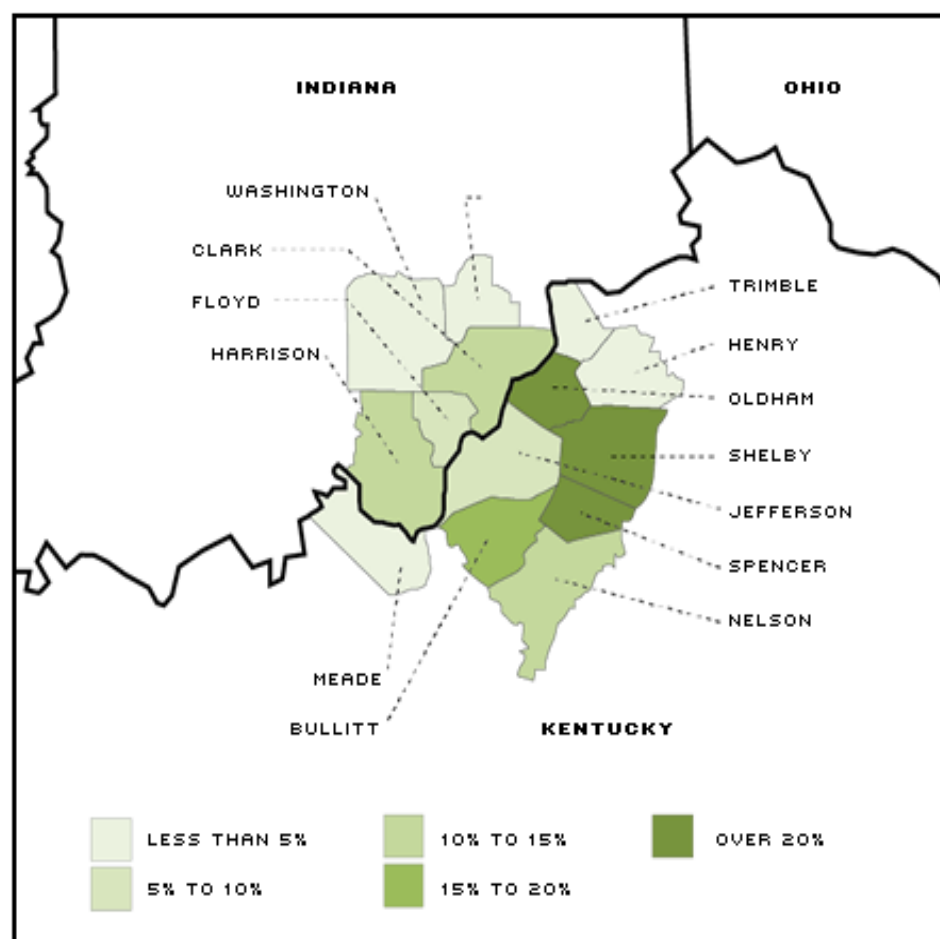
Figure 4-1: Harrison County Incorporated Jurisdictions and Townships

Harrison County has 12 townships, including: Blue River, Boone, Franklin, Harrison, Heth, Jackson, Morgan, Posey, Spencer, Taylor, Washington, and Webster. The largest township is Harrison where Corydon is located. According to 2013 US Census Bureau estimates, the population of Harrison Township is 12,447, accounting for 31.8% of the county's total population.

The smallest township is Washington where the incorporated community of New Amsterdam is located. In 2013, Washington Township recorded a population of 465.

Harrison County is 15 miles west of Louisville, which is on the south side of the Ohio River and a major northern Kentucky metro area of 741,096, according to the 2010 US Census. Harrison County and four other Indiana counties are included in the US Census Bureau's Louisville-Jefferson County, KY-IN Metropolitan Statistical Area (MSA), as shown below in Figure 4-2. Commonly known as Kentuckiana or Louisville Metro, the MSA spans 14 counties in two states.

Figure 4-2: Louisville-Jefferson County, KY-IN Metropolitan Statistical Area (MSA) and Population Growth by County, 2002-2012



4.1 Geography, Topography, and Climate

Harrison County is located in an unglaciated portion of Indiana where its most notable physiographic features are the Ohio River Valley and extensive karst topography. Caves, sinkholes and underground water channels are karst features and found primarily in the eastern two-thirds of the county. With 76 caves, Harrison County has the most of any county in the nation.

Most of the county's terrain is rolling and hilly and a mix of farmland and woodlands. The most notable landform is the Knobstone escarpment. The escarpment or ridge extends 150 miles from central Indiana southward to the Ohio River and Kentucky and features steep hills or "knobs." Escarpment elevations in southeastern Harrison County range from 600 to 800 feet. The county's highest elevation is 972 feet above

mean sea level (msl) and lowest 375 feet along the Ohio River. The 24,000-acre Harrison-Crawford State Forest spans the two counties along the Ohio River and contains the 2,000-acre O'Bannon Woods State Park. Blue River, a major Ohio River tributary, forms most of the county's western border.

Harrison County's climate is typical of southern Indiana along the Ohio River Valley. Long-term climatic data for Harrison County is shown on the next page in Table 4-1 as reported by the National Climatic Data Center (NCDC), 1981-2010. The variables of temperature, precipitation, and snowfall can vary greatly from one year to the next. Winter temperatures can fall below freezing starting in November and extend through March. Air temperatures can reach a high point in July with a monthly average of 75.5 °F and dip to an average of 28.2 °F in January. Annual precipitation averages 36.8 inches a year.

Table 4-1 Harrison County Average Temperatures and Precipitation²

Month	Precipitation (in)	Min Temp (°F)	Avg Temp (°F)	Max Temp (°F)
January	3.29	18.4	28.2	37.9
February	3.10	21.9	32.9	43.8
March	4.37	31.0	42.8	54.5
April	4.84	40.4	52.9	65.4
May	5.14	50.1	62.7	75.2
June	4.19	59.7	71.4	83.0
July	4.46	63.8	75.5	87.1
August	4.17	61.5	73.5	85.4
September	3.26	52.8	66.0	79.2
October	2.90	40.1	54.1	68.1
November	4.22	32.0	43.5	54.9
December	3.64	22.7	32.7	42.7

² Source: <http://www.ncdc.noaa.gov/cdo-web/datatools/normals>

4.2 Demography

With a land area of approximately 485 square miles and population of 39,163, Harrison County's population density is approximately 81 persons per square mile. The county's predominantly rural population is illustrated by the combined population of the 10 incorporated, 5,999 people, or 15.23% of the county's total population. Table 4-2 below shows the population of Harrison County's incorporated jurisdictions from the 2010 US Census.

Table 4-2: 2010 Population of Harrison County Jurisdictions

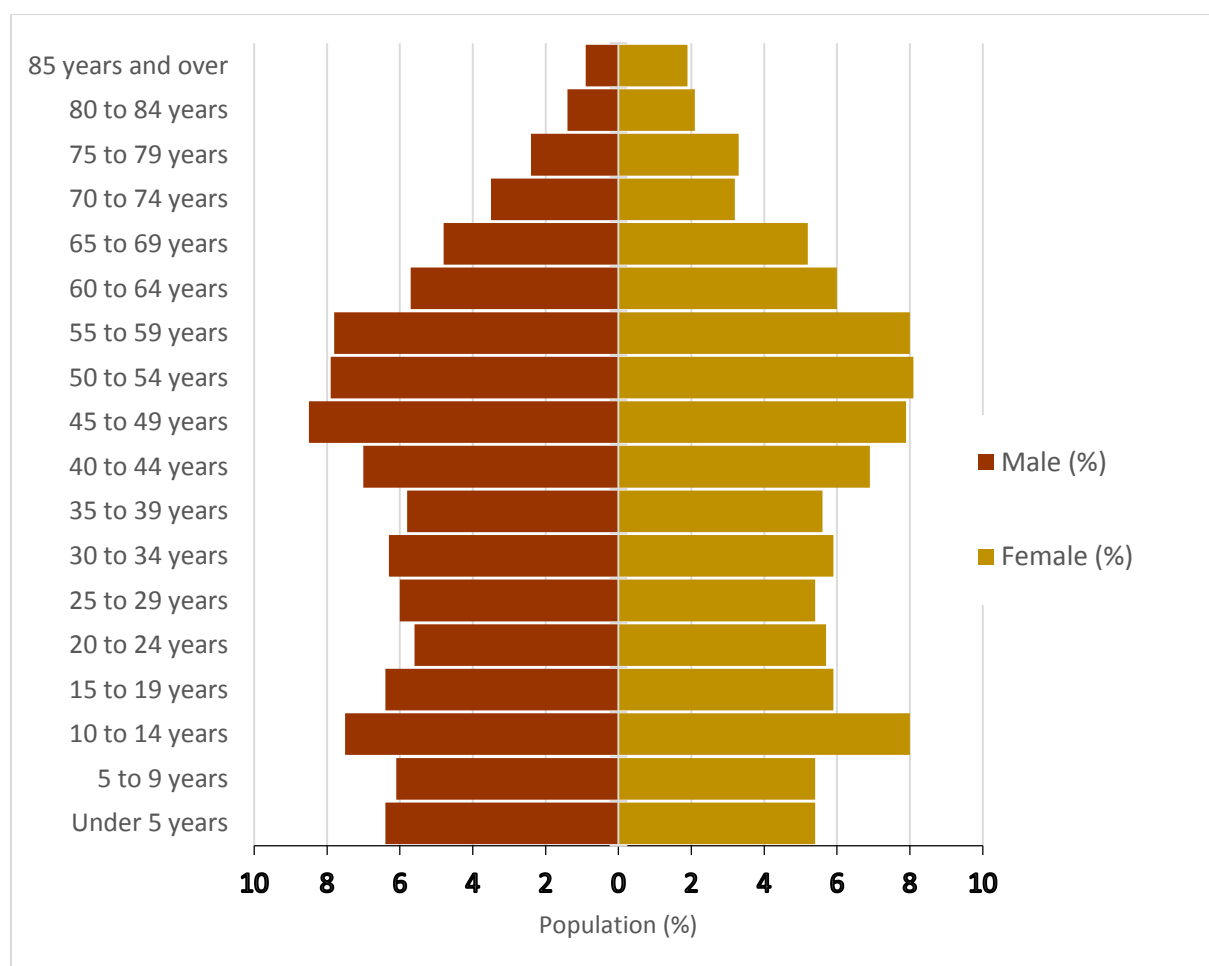
Jurisdiction	2010 Population³
Corydon	3,122
Crandall	152
Elizabeth	162
Laconia	50
Lanesville	564
Mauckport	81
Milltown	818
New Amsterdam	27
New Middletown	93
Palmyra	930
Jurisdictions Total	5,999
Harrison County Total	39,364

In 2013, the median age of the state of Indiana's population was 37.1 years, compared to 41 years in Harrison County. Nearly half of the county's population (45.5%) is age 45 and over, according to 2013 US Census Bureau figures.

Figure 4-3 below shows Harrison County's population pyramid which details the population by age segments and gender. The increase in population for the 45 to 59 age groups 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 this population segment ages. Higher percentages in the 70 to 79 age segments usually reflect the increase in life expectancy. Along with mortality rates, the population pyramid is useful in depicting fertility rates, and thus population growth, by looking at the percentage of the population in the age 5 and under and other younger age segments.

Harrison County's population pyramid shows relatively stable growth for the county with long life expectancy and low infant mortality. It reflects the same general shape as the population pyramids for Indiana and the United States.

³ 2010 Census, US Census Bureau

Figure 4-3: Harrison County Population Pyramid⁴

4.3 Population Change

Populations grow or decline through migration and natural increase, and often these two components offset each other. Because international migration data was not as consistent as domestic migration data, this plan only references net domestic trends. In the most recent census estimate (2013), Harrison County registered a positive natural increase (more people were born than died) and a negative net in-migration (more people moved out of the county than into the county).

Since the 2010 US Census, Harrison County's population has declined slightly by -0.5%, according to 2013 estimates by the US Census Bureau. However, according to US Census data, between 2000 and 2010, Harrison County's population increased 14.68% from 34,325 to 39,364.

Table 4-3 on the following page illustrates population change over time among Harrison County's 10 incorporated communities. During the same period, the state of Indiana's population increased just 6.63%, from 6,080,485 in 2000 to a total state population of 6,483,802 in 2010.

⁴ US Census Bureau, 2009-2013 estimates

Table 4-3: Population Change by Community

Incorporated Community	Township	2000 Population⁵	2010 Population⁶	Increase 2000-2010	2013 Population⁷	Increase 2010-2013
Corydon	Harrison	2,715	3,122	14.99%	3,119	-.10%
Crandall	Jackson	131	152	16.03%	151	-.66%
Elizabeth	Posey	137	162	18.28%	161	-.62%
Laconia	Boone	29	50	72.41%	50	--
Lanesville	Franklin	614	564	-8.14%	565	.18%
Mauckport	Heth	83	81	-2.40%	81	--
Milltown	Blue River	932	818	-12.2%	807	-1.34%
New Amsterdam	Washington	1	27	2600%	27	--
New Middletown	Webster	77	93	20.17%	92	-1.08%
Palmyra	Morgan	633	930	46.9%	929	-.11%

By 2020, Harrison County's population is expected to grow to 43,254 or 9.9% over the 2010 population. US Census Bureau population projections show a 16.8% increase to 45,988 by 2030.

Migration trends inform hazard mitigation by highlighting areas of population growth and decline, revealing immigration and emigration patterns, and informing public officials of changes in net adjusted gross income (AGI) as a result of migration.

The map in Figure 4-4 was generated with the Forbes American Migration Map tool. The map shows Harrison County's migration patterns between 2005 and 2010 in terms of inbound and outbound domestic migration.

⁵ 2000 Census, US Census Bureau

⁶ 2010 Census, US Census Bureau

⁷ US Census Bureau, 2013 estimates

Figure 4-4: Harrison County Migration Patterns⁸

Harrison County (Corydon), Ind.

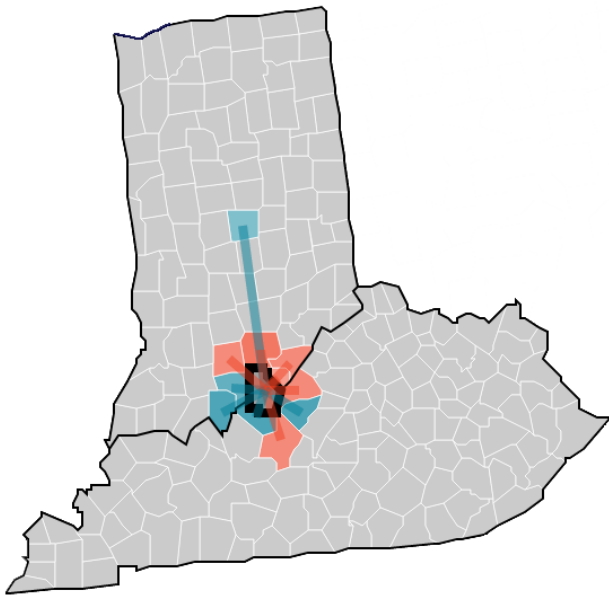
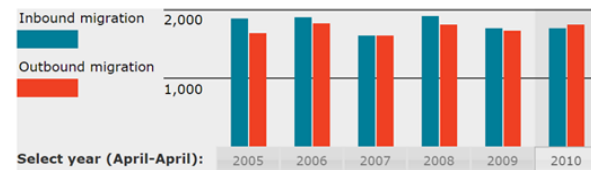
Population (2010): 39,364

Population (2005): 37,354

Inbound income per cap. (2010): \$16,900

Outbound income per cap. (2010): \$17,500

Non-migrant income per cap. (2010): \$21,000



4.4 Special Needs Populations

Certain populations require special attention in mitigation planning because they may suffer more severely from the impacts of disasters. It's important to identify these populations and develop mitigation strategies to help the population groups become more disaster resilient. Although there are numerous types of vulnerable populations, Harrison County has identified five significant population groups with special needs: those with a non-English language spoken at home, those below poverty level, those with a disability, those age 65 years and over, and the population group with less than a ninth grade education.

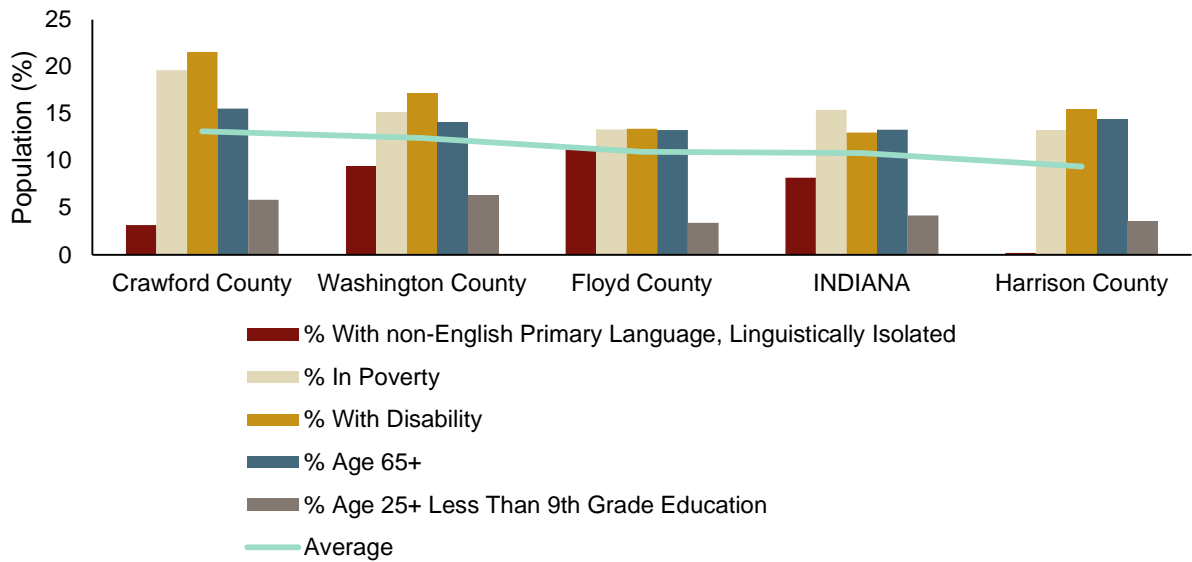
⁸ <http://www.forbes.com/special-report/2011/migration.html>

We compared Harrison County to nearby counties, as well as Indiana, by averaging the percent population of each special needs category within the county/state. Of the five geographies we compared (four counties and one state), Harrison County ranks fifth, although all regions are fairly comparable.

Figure 4-5 shows how each county/state compares overall and per special needs indicator. The purpose of the comparison is to highlight special needs populations for further analysis. It does not necessarily mean that those communities are the most vulnerable.

The special needs indicators most significant in Harrison County are the population with a disability (15.5%), the population aged 65 and older (14.4%), and the population whose income in the past 12 months is below poverty level (13.2%). In the event of a disaster, these groups have particular challenges and concerns. They may require life-sustaining medication, electricity-operated medical equipment, and assistance meeting basic human needs. They may also require special temporary housing needs that can accommodate physical disabilities/limitations and varied levels of income. Harrison County emergency management and personnel can help to mitigate these vulnerabilities by participating in specialized training to deal effectively with these populations or offering resources to the public, public assistance facilities, health care institutions and elderly care facilities to empower them with knowledge and tools that could help them save their own lives.

- Evacuation exercises for communities and elder-care facilities.
- Public materials on when and how to shelter in place.
- Training for emergency shelter staff.
- Development of resource guides for seniors containing information on housing, medical, and basic needs services.
- Development of accessible media announcements and alerts.

Figure 4-5: Special Needs Population Percentages**Explanation of Special Needs Indicators:**

Percent population speaking language other than English at home

Percent of all people whose income in the last 12 months is below poverty level

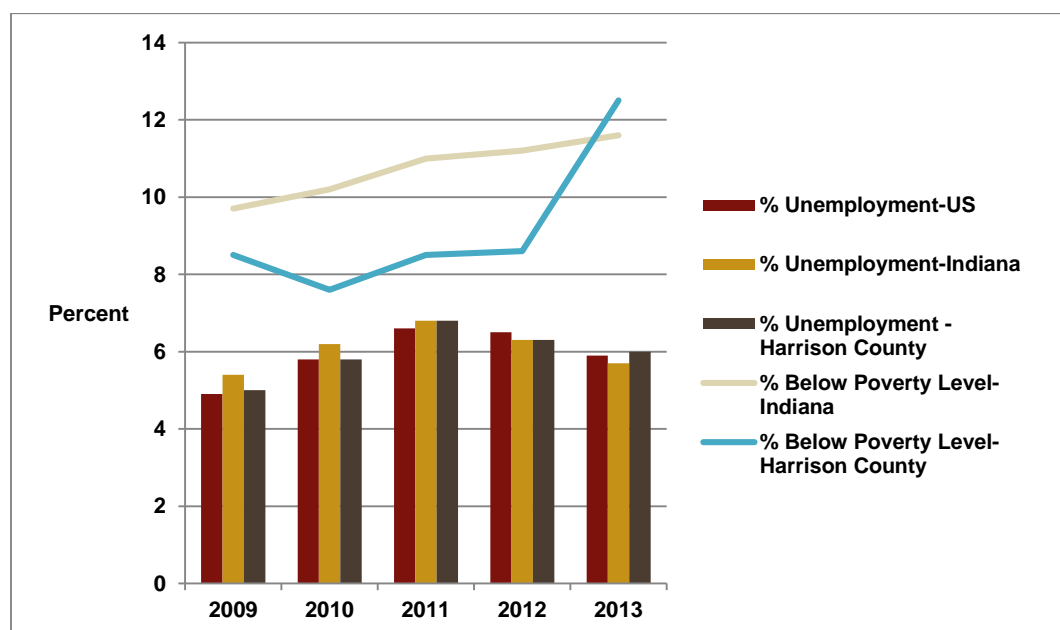
Percent of population within the civilian non-institutionalized population with a disability

Percent of population age 65 and over

Percent of population with less than 9th grade educational attainment

4.5 Economy and Industry

The financial crisis of 2007-2008 had a similar impact in Harrison County as it did in Indiana and the US, although the unemployment rate in Harrison County has historically been less than the state and comparable to the nation. Figure 4-6 illustrates key economic indicators over time, including unemployment and poverty levels in Harrison County, Indiana and in the US. From 2010 to 2013, Harrison County's unemployed population (age 16 years and over) has closely reflected national rates. In 2010 according to US Census Bureau figures, both the US and Harrison County reported 5.8% of the population were unemployed compared to 6.2% in the state. Three years later by 2013, Harrison County's unemployed population increased slightly to 6% as did the US to 5.9%, while the state's unemployment rate dropped to 5.7%.

Figure 4-6: Population Unemployed and Below Poverty Level (2009-2013)⁹

Note: Employment data is for the civilian labor force. Poverty level includes all families whose income is below the poverty level in the past 12 months. Poverty level guidelines are issued by the US Department of Health and Human Services.

Unemployment in Harrison County has been decreasing since 2011 when the rate was 6.8%, the highest year in the five-year period from 2009 to 2013. However, according to US Census Bureau estimates, Harrison County's 6% unemployment still surpassed both the state of Indiana (5.7%) and the US (5.9%) in 2013. While the below poverty level population has been increasing over the last five years in both the state of Indiana and Harrison County, Harrison County's rate of increase is nearly double the state's rate of increase during the same period. In 2009, Harrison County's below poverty level population was 8.5% of the county's total population, compared to 9.7% in Indiana. By 2013, Harrison County's below poverty level population rose to 12.5%, a 4 % increase since 2009 while the state of Indiana increased by 1.9% during the same period to 11.6% in 2013.

Harrison County's economy is diverse with no single industry sector employing more than 22% of the civilian workforce (age 16 years and over). The top five industry sectors are: education, healthcare and social services which employs 21.5%, manufacturing (17.4%), arts, entertainment, accommodation and food services (11.2%), retail trade (11%), and transportation, warehousing and utilities which employs 6.7% of the workforce. These figures are based on 2013 US Census Bureau population estimates. Complete employment by industry sector information is listed below in Table 4-5.

⁹ American Community Survey, US Census Bureau, 2009-2013

Table 4-5: 2013 Harrison County Employment by Industry Sector

Industry Sector	Number of Employees*	% Employed in Sector
Agriculture, forestry, fishing hunting, and mining	385	2.10%
Construction	1,129	6.30%
Manufacturing	3,124	17.40%
Wholesale trade	439	2.40%
Retail trade	1,998	11.10%
Transportation and warehousing, and utilities	1,201	6.70%
Information services	268	1.50%
Finance, insurance, and real estate	1,047	5.80%
Professional and Administrative	1,076	6.00%
Education services, health care, and social assistance	3,866	21.50%
Arts, entertainment, recreation, accommodation, and food services	2,002	11.20%
Other services, except public administration	602	3.40%
Public administration	807	4.50%
Total Employees*	17,944	

*Civilian employed population 16 years and over

The Ohio River casino, Horseshoe Southern Indiana (Formerly Caesar's Indiana) is Harrison County's largest employer with more than 2,100 employees. Tyson Foods which processes poultry is the second largest employer with 525 employees.

Healthcare and rehabilitation services in Harrison County together have a workforce of more than 500 employees. Increasingly, tourism is playing a significant role in the economy as an employer and through retail sales. Table 4-6 below lists employers in Harrison County with 100 employees or more.

Table 4-6: Harrison County's Largest Employers¹⁰

Employer	Description	Location	Number of Employees
Blue River Services Inc.	Rehabilitation Services	Corydon	125
Daramic LLC	Storage-Batteries Manufacturer	Corydon	115
Harrison Health & Rehab Center	Nursing and Convalescent Home	Corydon	120
Indian Creek Health & Rehab	Nursing and Convalescent Home	Corydon	125
Norstam Veneers Inc.	Plywood & Veneers-Manufacturer	Mauckport	100
North Harrison Community Schools	Schools	Ramsey	137
Blue River Services Inc. Housing	Service	Corydon	400
Tyson Foods Inc.	Poultry Processing Plant	Corydon	525
Horseshoe Southern Indiana Casino	Casino	Elizabeth	2,100
Lucas Oil	Automotive Industry	Corydon	

¹⁰ Indiana Department of Workforce Development

In mitigation planning, it's important to consider a variety of employment characteristics, such as the proportion of employed to unemployed populations in the county. Also, the number of employees located at a business, organization or facility's site is crucial to developing effective strategies for such measures as evacuation and sheltering in place. Another factor that is critical to planning is the number, as well as the demographic characteristics of the customer, patient and other populations served or located at a site. In 2013, the civilian-employed population age 16 years and over totaled 17,944 or 57.72% of Harrison County's adult (16 years and over) population. The data in Table 4-7 below shows the percentage of the civilian population (16 years and older) employed in various occupations.

Table 4-7: Harrison County Employment by Occupation¹¹

Occupation	Number of Employees	% Employed by Occupation
Management	5,412	30.2%
Service	3,009	16.8%
Sales and office	4,099	22.8%
Natural resources, construction, and maintenance	1,883	10.5%
Production, transportation, and material moving	3,541	19.7%
Total Employees	17,944	

In 2013, Harrison County had an estimated 14,609 households and an average household income of \$58,767. Estimated per capita income however reflects a slight increase from \$22,810 in 2010 to \$22,944 in 2013.

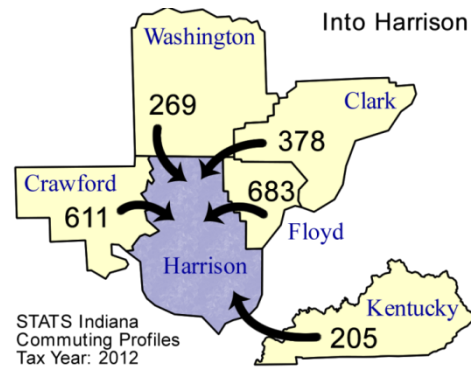
4.6 Commuting Patterns

County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities. The US Census reports that over 27% of US workers travel outside their residential county to work. According to STATS Indiana 2012 data, there are 25,773 people who live in Harrison County and are in the workforce. Of these residents, 9,319 or 36.15% work outside the county. An additional 2,478 people live in another county and commute to work in Harrison County. Figure 4-7 below illustrates the inbound and outbound migration of the workforce in Harrison County and nearby counties.

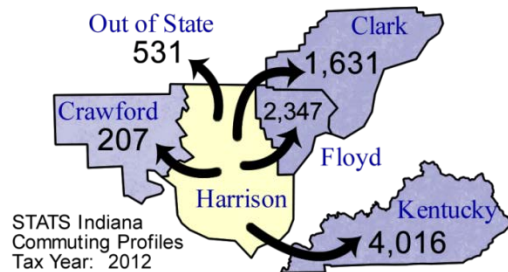
¹¹ American Community Survey, US Census Bureau, 2013 estimate

Figure 4-7: Harrison County Inbound and Outbound Commuting Patterns¹²**Top Five Areas Sending Workers to Harrison County**

Floyd County	638
Crawford County	611
Clark County	378
Washington County	269
Kentucky (state)	205
Total of above	2,146
(11.3% of Harrison County workforce)	

**Top Five Areas Receiving Workers from Harrison County**

Kentucky (state)	4,016
Floyd County	2,347
Clark County	1,631
Other states	531
Crawford County	655
Total of above	8,732
(33.9% of Harrison County workforce)	

Out of Harrison

In 2013, the average travel time to work in Harrison County was 29.4 minutes, higher than the state average of 23.3 minutes and the 23.2-minute average for other commuters in the Louisville Metro MSA. Commuter safety is an important consideration in disaster mitigation and planning. Employers can help their employees prepare by encouraging the development of Commuter Emergency Plans, such as the template developed by FEMA are available for download at <http://www.fema.gov/media-library/assets/documents/90370>.

4.7 Transportation

Among the factors critical to both Harrison County's growth and development, as well as effective mitigation planning is the transportation network. Harrison County is served by an interstate highway, I-64, US-150, and state highways, SR-111, SR-62, SR-64, and SR-135. Approximately 18 miles of I-64 is located in Harrison County. Currently, two I-64 interchanges at Lanesville Road and Corydon (SR-135) are located in the county. Based on recommendations from long-range transportation studies by the county, the Indiana Department of Transportation (INDOT) has included a proposed new interchange 2.3 miles

¹² STATS Indiana, 2012

west of the Corydon at Gethsemane Road/SR-337 in its Statewide Transportation Improvement Program and granted the project partial funding.

According to INDOT vehicular traffic volume data, annual average daily traffic (AADT) for 2013, approximately 27,100 vehicles a day, a 5% decline since 2011, traveled I-64 near the Lanesville exit, east of Corydon. The 2013 Harrison County's SR-111 near Elizabeth serves Horseshoe Southern Indiana casino, a major employer and tourist attraction, and it also recorded a decline by 1% in 2013. Near Lanesville, SR-62 traffic volume declined by 1% in 2013 to 4,044 AADT.

Although the Ohio River Scenic Byway along SR-62 in Harrison County might not be considered a strategic transportation artery for mitigation planning purposes, the route is an important cultural and historic asset, as well as an economic and tourism resource. The county's segment is part of a designated National Scenic Byway that spans 967 miles, from Illinois to Ohio.

Two railroads operate in the county. Lucas Oil Rail Line is a 7-mile long shortline railroad which begins in downtown Corydon and travels northward through the industrial park where Lucas Oil's bottling facilities are located and to the New Salisbury intersection with the east-west rail line, Norfolk Southern Railway. The Norfolk Southern spans the entire state, traveling through northern Harrison County and the communities of Crandall, Ramsey, and Depauw.

4.8 Major Waterways and Watersheds

The surface water drainage of Harrison County lies within the Indiana water-management basin of the Ohio River Basin. Harrison County also crosses two watersheds, Blue-Sinking and Silver-Little Kentucky. Harrison County's major tributaries of the Ohio River are Blue River, Indian Creek, Buck Creek, and Mosquito Creek. Blue River, the largest stream, flows north to south along the county's western border to its confluence with the Ohio River.

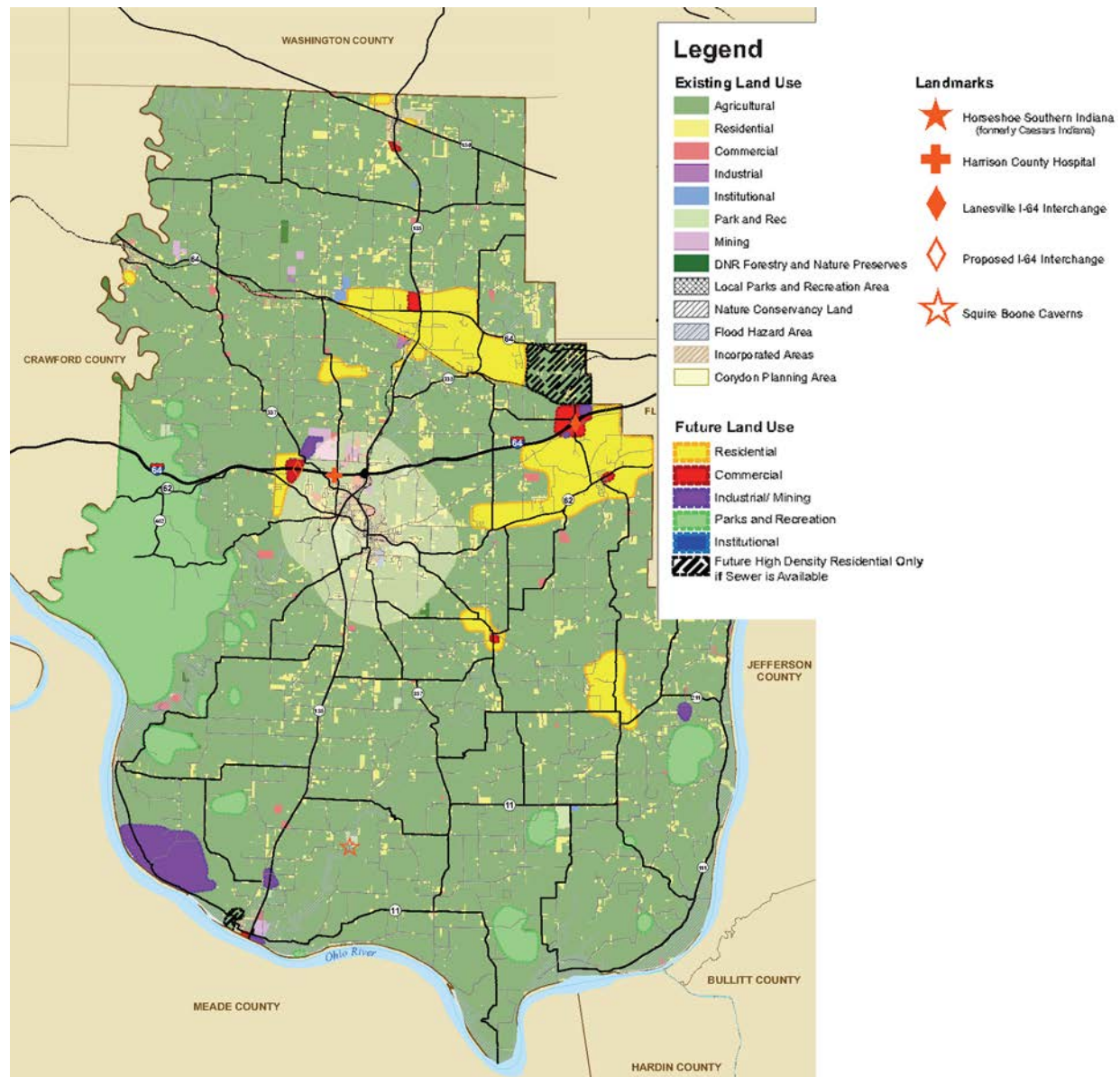
The Ohio River Outwash, Blue River and Sanders Group Aquifers are the primary aquifer systems which supply the county's public water systems. Most of the county's water supply originates with the prolific Ohio River Outwash Aquifer System where wells report 24-hour flows of 1,000 gallons per minute (gpm). In the northwestern part of the county, ground water is available in sufficient quantities within limestone fractures and cavities of the Blue River and Sanders Group Aquifer Systems which supply several high-capacity wells for the public water supply. Blue River and Sanders Group wells report flow from 80 to 300 gpm. In other areas of the county, bedrock aquifers are utilized for the most part by individual households and farms, where public water supply systems are inaccessible. Yields from bedrock wells are difficult to predict. More than 95% of the wells in Harrison County are bedrock wells which are also highly vulnerable to contaminants.

4.9 Land-Use and Development Trends

Since the early settlement of Harrison County, farming and agricultural land have been valuable natural resources. Not only has agriculture contributed significantly to the economy, it has shaped the county's identity and distinctive rural lifestyle which continue today. According to the 2012 Census of Agriculture by the USDA, Harrison County has a total of 967 farms totaling 134,995 acres or 43% percent of the county's

land area. Figure 4-8 shows existing and possible future land use from the Harrison County, Indiana 2008 Comprehensive Plan Update.

Figure 4-8: Existing and Future Land Use in Harrison County¹³



Today, just under half of the county's land is devoted to farming and agricultural operations. In addition, the farming industry employs approximately 2.1% of the population according to 2013 US Census Bureau estimates. In addition to agricultural usage, increasingly land in Harrison County is being used for commercial and industrial development, particularly in the areas surrounding I-64 and the two Harrison County interchanges. In the last five years, the Corydon interchange (105) has become a major retail hub for the county with merchants there serving both county residents and highway travelers. In 2012, the county created an addendum to its 2008 Comprehensive Plan to address development in the "fringe area"

¹³ Harrison County, Indiana 2008 Comprehensive Plan Update

northwest of Corydon and in the proposed new I-64 interchange area. The addendum study area includes 17,700 acres in portions of Harrison, Webster, and Jackson Townships.

The area south of the interchange includes retail and commercial development and to the north industrial development. The interchange is approximately 25 miles west of downtown Louisville and a primary entry point to the county for many residents, visitors, business traffic, and the workforce. Another concentration of retail business and tourism-related services is in downtown Corydon. The Comprehensive Plan Update also recommends a small amount of residential and commercial development near several of the small towns.

In addition, limestone and sand mining operations are located northwest of Corydon and along the Ohio River and are projected locations of future mining and industrial development. Future land use and development is focused on the county's eastern areas, according to the Comprehensive Plan Update. The I-64 Interchange Master Plan indicates an extension of industrial development north of I-64 and adjacent to existing industrial uses. The Lanesville Interchange Plan outlines commercial and industrial usage adjacent to the interchange. Residential usage would extend south and west along SR-64. North of Lanesville, along the Floyd County border is designated for high-density residential usage if public sewer utilities become available. A mixture of commercial, industrial and residential usage is also planned in the area of the proposed new I-64 interchange west of Corydon.

As the Louisville MSA grows, Harrison County can expect to see increased development pressures. Similarly, Harrison County will be determining the best course for land development and growth particularly in eastern Harrison County and the I-64 interchange areas. Ultimately, the planning ideal is a sound balance of the county's natural assets and authentic rural character and the community, business and industrial development that is necessary to economically sustain the county.

Section

5

Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.

This assessment identifies the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of three components: 1) Hazard Identification, 2) Vulnerability Assessment, and 3) Risk Analysis and Hazard Profiling.

5.1 Identifying Hazards

5.1.1 Existing Plans

To facilitate the planning process, the planning team reviewed existing plans and data including the 2008 Harrison County Multi-Hazard Mitigation Plan and the current effective FEMA Flood Insurance Flood Maps (FIRMs).

The 2008 Harrison County Multi-Hazard Mitigation Plan ranked the top five hazards as:

- 1) Tornado
- 2) Flooding
- 3) Winter Storms
- 4) Severe Storms
- 5) Earthquake

In 2014, the planning team updated the county's top hazard rankings to:

- 1) Flooding
- 2) Severe Storms
- 3) Tornado
- 4) Winter Storm
- 5) Hazardous Material Release

5.1.2 Historical Hazards Records

To assist the planning team, historical storm-event data was compiled from the National Climatic Data Center (NCDC) between 2008 (the adoption year of the previous plan) and 2014. The NCDC Storm Events Database includes events related to tornadoes, severe storms, floods, winter storms, droughts, and extreme temperatures. NCDC records are estimates of damage reported to the National Weather Service from various local, state, and federal sources. These estimates, however, are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events. The NCDC data included 100 reported events (Table 5-1) in Harrison County between January 1, 2008 and December 31, 2014.

Table 5-1: NCDC Events in Harrison County (2008-2014)

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
WHITE CLOUD	1/29/2008	Thunderstorm Wind	0	0	\$ -	\$ -
MOBERLY	2/5/2008	Thunderstorm Wind	0	0	\$ -	\$ -
ELIZABETH	2/6/2008	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	2/11/2008	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	2/21/2008	Ice Storm	0	0	\$ -	\$ -
HARRISON COUNTY	3/7/2008	Heavy Snow	0	0	\$ -	\$ -
LACONIA	3/19/2008	Flash Flood	0	0	\$ 500,000	\$ -
CORYDON	3/19/2008	Flood	0	0	\$ -	\$ -
FRENCHTOWN	4/4/2008	Flood	0	0	\$ -	\$ -
HILLGROVE	6/27/2008	Tornado	0	0	\$ 1,000	\$ -
CENTRAL BARREN	6/27/2008	Tornado	0	0	\$ -	\$ -
CENTRAL BARREN	6/27/2008	Tornado	0	0	\$ 25,000	\$ 1,000
CORYDON	6/27/2008	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	7/8/2008	Thunderstorm Wind	0	0	\$ -	\$ -
CRANDALL	7/20/2008	Thunderstorm Wind	0	0	\$ -	\$ -
KINGS STORE	7/20/2008	Hail	0	0	\$ -	\$ -
CORYDON	7/20/2008	Hail	0	0	\$ -	\$ -
CORYDON	7/20/2008	Hail	0	0	\$ -	\$ -
NEW AMSTERDAM	7/20/2008	Hail	0	0	\$ -	\$ -
CORYDON	7/21/2008	Thunderstorm Wind	0	0	\$ -	\$ -

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
HARRISON COUNTY	9/14/2008	High Wind	0	0	\$ -	\$ -
HARRISON COUNTY	1/27/2009	Winter Storm	0	0	\$ -	\$ -
NEW SALISBURY	2/11/2009	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	2/11/2009	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	2/11/2009	High Wind	0	0	\$ -	\$ -
CENTRAL	4/10/2009	Hail	0	0	\$ -	\$ -
ELIZABETH	4/10/2009	Hail	0	0	\$ -	\$ -
CENTRAL	4/10/2009	Hail	0	0	\$ -	\$ -
BRIDGEPORT	4/10/2009	Hail	0	0	\$ -	\$ -
ELIZABETH	4/10/2009	Funnel Cloud	0	0	\$ -	\$ -
CENTRAL	4/13/2009	Hail	0	0	\$ -	\$ -
RAMSEY	6/2/2009	Hail	0	0	\$ -	\$ -
PALMYRA	6/2/2009	Hail	0	0	\$ -	\$ -
NEW MIDDLETOWN	6/11/2009	Flash Flood	0	0	\$ -	\$ -
CORYDON	6/18/2009	Thunderstorm Wind	0	0	\$ -	\$ -
NEW SALISBURY	6/22/2009	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	6/22/2009	Thunderstorm Wind	0	0	\$ -	\$ -
LANESVILLE	8/4/2009	Flash Flood	0	0	\$ -	\$ -
ELIZABETH	8/4/2009	Flash Flood	0	0	\$ -	\$ -
CRANDALL	8/4/2009	Flood	0	0	\$ -	\$ -
CORYDON	9/6/2009	Thunderstorm Wind	0	0	\$ 2,000	\$ -
CORYDON	9/20/2009	Heavy Rain	0	0	\$ -	\$ -
TITUS	9/20/2009	Flood	0	0	\$ -	\$ -
NEW SALISBURY	9/20/2009	Flash Flood	0	0	\$ -	\$ -
DEPAUW	9/20/2009	Flash Flood	0	0	\$ -	\$ -
DEPAUW	10/9/2009	Flash Flood	0	0	\$ -	\$ -
HARRISON COUNTY	1/7/2010	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	2/9/2010	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	2/14/2010	Heavy Snow	0	0	\$ -	\$ -
LANESVILLE	6/15/2010	Thunderstorm Wind	0	0	\$ -	\$ -

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
DOGWOOD	6/15/2010	Thunderstorm Wind	0	0	\$ -	\$ -
BYRNEVILLE	10/26/2010	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	12/15/2010	Ice Storm	0	0	\$ -	\$ -
HARRISON COUNTY	1/20/2011	Heavy Snow	0	0	\$ -	\$ -
WHITE CLOUD	4/19/2011	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	4/19/2011	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	4/19/2011	Tornado	0	0	\$ -	\$ -
CORYDON	4/19/2011	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	4/23/2011	Flood	0	0	\$ -	\$ -
CORYDON	4/23/2011	Flood	0	0	\$ -	\$ -
HILLCREST	5/2/2011	Flood	0	0	\$ -	\$ -
HILLCREST	5/2/2011	Flood	0	0	\$ -	\$ -
DEPAUW	5/2/2011	Flood	0	0	\$ -	\$ -
EVANS LNDG	5/23/2011	Thunderstorm Wind	0	0	\$ -	\$ -
NEW MIDDLETOWN	5/23/2011	Hail	0	0	\$ -	\$ -
RAMSEY	5/23/2011	Hail	0	0	\$ -	\$ -
RAMSEY	5/25/2011	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	5/25/2011	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	6/19/2011	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	6/22/2011	Tornado	0	0	\$ 5,000	\$ -
LANESVILLE	7/19/2011	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	8/13/2011	Thunderstorm Wind	0	0	\$ -	\$ -
LANESVILLE	8/13/2011	Thunderstorm Wind	0	0	\$ -	\$ -
WHITE CLOUD	11/14/2011	Thunderstorm Wind	0	0	\$ -	\$ -
	3/4/2012	Heavy Snow	0	0	\$ -	\$ -
RAMSEY	4/28/2012	Hail	0	0	\$ -	\$ -
PALMYRA	4/28/2012	Hail	0	0	\$ -	\$ -
NEW SALISBURY	4/28/2012	Thunderstorm Wind	0	0	\$ -	\$ -

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
NEW SALISBURY	4/28/2012	Hail	0	0	\$ -	\$ -
CRANDALL	4/28/2012	Hail	0	0	\$ -	\$ -
BRADFORD	4/28/2012	Thunderstorm Wind	0	0	\$ -	\$ -
CRANDALL	4/28/2012	Hail	0	0	\$ -	\$ -
HANCOCK	5/4/2012	Thunderstorm Wind	0	0	\$ -	\$ -
NEW SALISBURY	7/8/2012	Thunderstorm Wind	0	0	\$ 5,000	\$ -
ELIZABETH	7/8/2012	Thunderstorm Wind	0	0	\$ 10,000	\$ -
NEW SALISBURY	7/8/2012	Thunderstorm Wind	0	0	\$ -	\$ -
DEPAUW	7/18/2012	Thunderstorm Wind	0	0	\$ -	\$ -
HILLCREST	9/5/2012	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	12/20/2012	Strong Wind	0	0	\$ 2,000	\$ -
HARRISON COUNTY	12/28/2012	Heavy Snow	0	0	\$ -	\$ -
SUGAR GROVE	1/30/2013	Tornado	0	0	\$ 40,000	\$ -
HARRISON COUNTY	6/26/2013	Thunderstorm Wind	0	0	\$ -	\$ -
CORYDON	7/10/2013	Thunderstorm Wind	0	0	\$ -	\$ -
NEW MIDDLETOWN	11/17/2013	Thunderstorm Wind	0	0	\$ -	\$ -
HARRISON COUNTY	12/6/2013	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	2/2/2014	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	2/4/2014	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	3/2/2014	Winter Storm	0	0	\$ -	\$ -
HILLCREST	4/4/2014	Flash Flood	0	0	\$ -	\$ -
NEW SALISBURY	5/22/2014	Thunderstorm Wind	0	0	\$ -	\$ -
MAUCKPORT	7/26/2014	Thunderstorm Wind	0	0	\$ -	\$ -
BRADFORD	10/6/2014	Hail	0	0	\$ -	\$ -
HARRISON COUNTY	11/16/2014	Heavy Snow	0	0	\$ -	\$ -

5.1.3 Hazard-Ranking Methodology

During Meeting #1, held on November 13, 2014, the planning team reviewed historical hazard information and participated in a risk analysis exercise to rank hazards by community and severity of risk. The hazards are ranked using the Calculated Priority Risk Index (CPRI) criteria. The CPRI is calculated through 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 since the previous Harrison County Multi-Hazard Mitigation Plan. Throughout the planning process, the MHMP team had the opportunity to update the NCDC data with more accurate local information. For example, the NCDC records often list the locations of hazards, such as floods, under the county, not accounting for how the individual communities were affected. In such situations, the probability rating assigned to the county was applied to all jurisdictions within the county.

Team consensus also was important in determining the probability of hazards not recorded by NCDC, for example, dam and levee failure, earthquakes, and hazardous materials spills. The probabilities for these hazardous events were determined by the planning team's estimation, derived from local experience and records, of the number of events that have occurred since the previous plan.

After improving the NCDC data with additional local data, the team determined 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. Table 5-2 lists the criteria used to determine both probability and impact.

Table 5-2: Guidelines for Determining Probability and Impact

PROBABILITY	IMPACT
Highly Likely 10+ events in 10 years	Catastrophic >Incident results in multiple fatalities >Damage to critical infrastructure and property over a large area of community >Up to 50% of community facilities are damaged, destroyed, or inaccessible >Complete shutdown of community facilities and loss of services for more than 2 weeks; community operations must be cancelled or relocated for an extended period of time.
Likely 6-9 events in 10 years	Critical >Incident results in a number of minor injuries, limited serious injuries >Damage to critical infrastructure and property over a moderate area of community >Up to 25% of community facilities are damaged, destroyed, or inaccessible >Complete shutdown of community facilities and loss of services for 2 weeks; some community operations must be cancelled or relocated temporarily
Possible 2-5 events in 10 years	Limited >Incident results in a number of minor injuries, limited serious injuries, and few, if any, fatalities >Damage to critical infrastructure and property over a small area of community >Up to 25% of community facilities are damaged, destroyed, or inaccessible >Complete shutdown of community facilities and loss of services for 1-2 weeks; some community operations must be cancelled or relocated temporarily
Unlikely 0-1 events in 10 years	Negligible >Incident results in only minor injuries and no fatalities >Damage contained to a single incident scene and immediate area >Less than 10% of community facilities are damaged, destroyed, or inaccessible >Complete shutdown of community facilities and loss of services for 24 hours or less; community operations may be cancelled or relocated temporarily

The overall hazard risk is calculated determined by weighting each CPRI category, and then combining them for a total value. Table 5-3 lists the CPRI categories and assigned weight values.

Table 5-3: 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

CPRI VALUE = [(PROBABILITY X .45) + (MAGNITUDE X .30) + (WARNING TIME X .15) + (DURATION X .10)

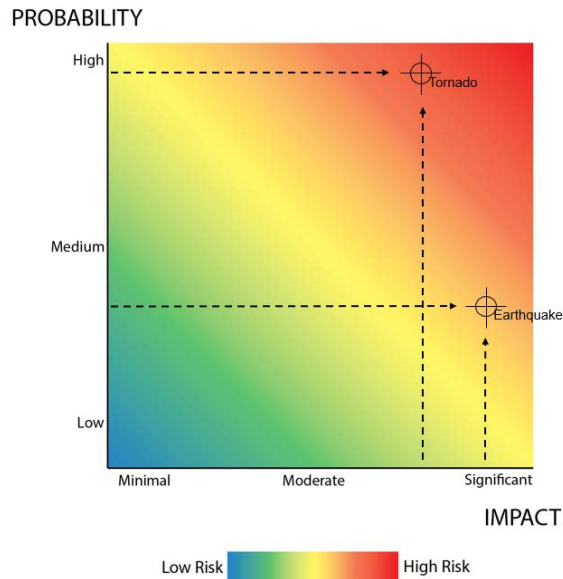
Below, Table 5-4 identifies the CPRI values for each hazard facing Harrison County.

Table 5-4: Harrison County CPRI and Hazard Ranking

Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI
Flood	4 - Highly Likely	4 - Catastrophic	3 - 6-12 Hours	3 - Less Than 1 Week	3.75
Flash Flooding	4 - Highly Likely	4 - Catastrophic	3 - 6-12 Hours	3 - Less Than 1 Week	3.75
Tornado	4 - Highly Likely	4 - Catastrophic	4 - Less Than 6 Hours	1 - Less Than 6 Hours	3.7
Hazmat	3 - Likely	4 - Catastrophic	4 - Less Than 6 Hours	2 - Less Than 1 Day	3.35
Severe Thunderstorm	4 - Highly Likely	2 - Limited	4 - Less Than 6 Hours	1 - Less Than 6 Hours	3.1
Winter Storm	3 - Likely	3 - Critical	3 - 6-12 Hours	3 - Less Than 1 Week	3.0
Fire	3 - Likely	1 - Negligible	4 - Less Than 6 Hours	1 - Less Than 6 Hours	2.35
Earthquake	2 - Possible	2 - Limited	4 - Less Than 6 Hours	2 - Less Than 1 Day	2.3
Subsidence	2 - Possible	1 - Negligible	4 - Less Than 6 Hours	2 - Less Than 1 Day	2.0
Extreme Temps	1 - Unlikely	1 - Negligible	1 - 24+ Hours	4 - More Than 1 Week	1.3
Drought	1 - Unlikely	1 - Negligible	1 - 24+ Hours	4 - More Than 1 Week	1.3

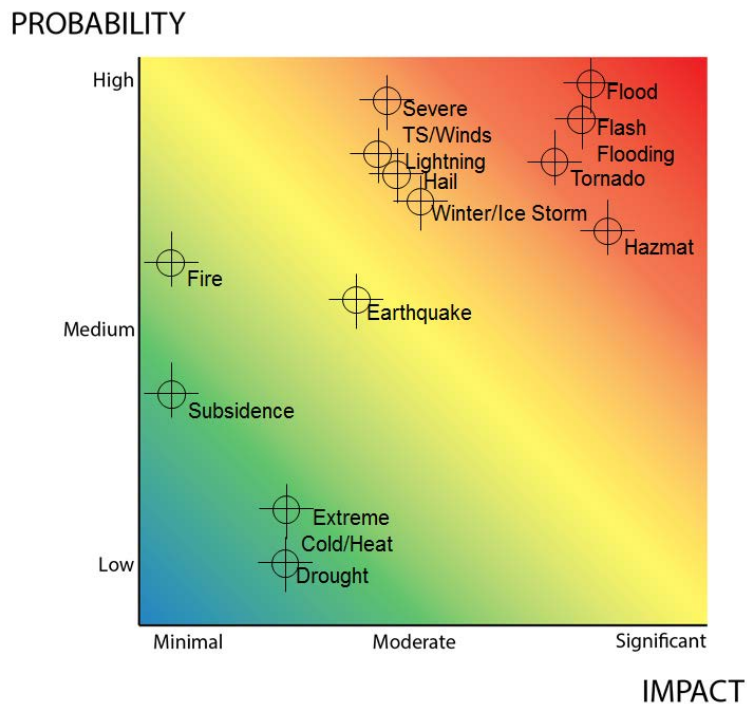
The planning teams plotted each hazard on a risk grid according to probability (y-axis) and potential impact (x-axis). The following figure describes the methodology of plotting hazards by risk. In this example, an earthquake has a medium probability of occurring but a significant potential impact, while a tornado has a high probability of occurring in a given year with a significant potential impact.

Figure 5-1: Risk Grid Methodology



Harrison County listed flooding, severe storms, and tornadoes as the highest-risk disasters. Figure 5-2 below illustrates the county's risk for each hazard.

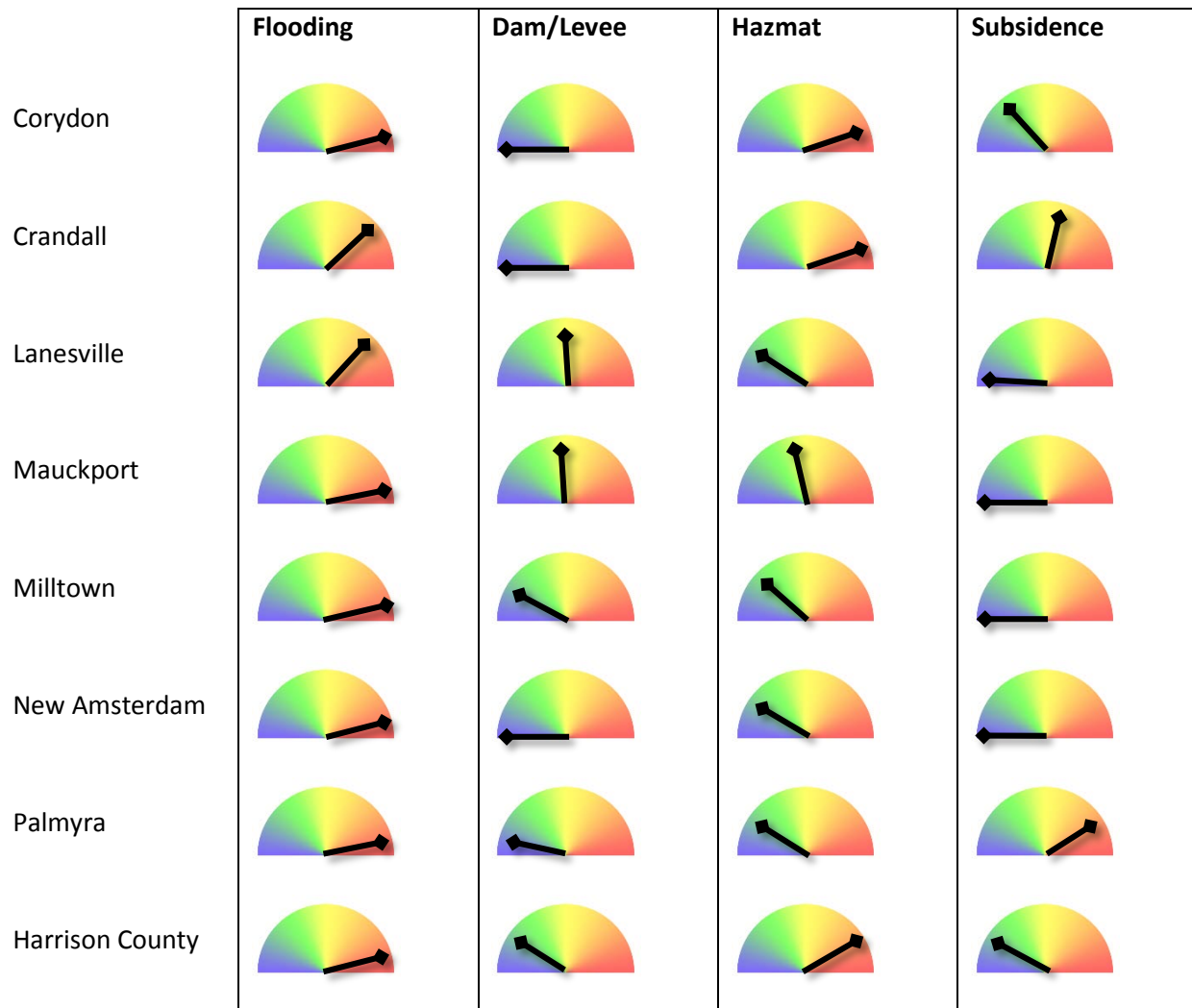
Figure 5-2: Harrison County Risk Matrix



While some hazards are widespread and will impact communities similarly, e.g. winter storms, others are localized leaving certain communities at greater risk than others. For instance, New Amsterdam and Mauckport are located on the Ohio River and Corydon is at the confluence of Indian Creek and Little Indian Creek. As a result, these locations are more vulnerable to flooding than some of the other communities.

In Figure 5-3 below, the meters illustrate each community's degree of risk, from blue or low risk to red or high risk to flooding, dam/levee failure and hazmat events and ground subsidence.

Figure 5-3: Community Risk to Hazards, Hazmat Events and Subsidence



5.1.4 GIS and Hazus-MH Modeling

Existing Hazus-MH technology was used in the development of the vulnerability assessment for flooding and earthquakes. With the implementation of new technology and locally available parcel datasets, more accurate results are now available. Multi-hazard mitigation plan updates may document significant variances from the original MHMP.

For this risk assessment, 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 upon loss estimations for individual structures. For flooding, analysis of site-specific structures takes into account the depth of water in relation to the structure. Hazus-MH also takes into account the actual dollar exposure to the structure for the costs of building reconstruction, content, and inventory. 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.

5.2 Assessing Vulnerability

The Indiana Department of Homeland Security, through IndianaMap, provided parcel boundaries to The Polis Center, and the Indiana Department of Local Government and Finance provided the Harrison County assessor records. 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 data has been updated as follows:

- The 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 have been updated based on the most recent available data sources. Hazus-MH critical and essential point facilities have been reviewed, revised as necessary, and approved by local subject matter experts.
- The essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) have been applied to the Hazus-MH model data. Hazus-MH reports of essential facility losses reflect updated data.

5.2.1 Identify Facilities

This plan includes three types of facilities: essential facilities, critical facilities, and community assets.

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 5-5 identifies the essential facilities that were verified, added or updated for the analysis. Harrison County's essential facilities are listed and mapped in Appendix C.

Table 5-5: Essential Facilities of Harrison County

Category	Number of Facilities
Care Facilities	22
Emergency Operations Centers	2
Fire Stations	14
Police Stations	3
Schools	21
Total	62

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

- **Transportation Systems** – 7 *airports*, 1 *railroad*, 5 *port facilities* – necessary for transport of people and resources including airports, highways, railways, and waterways.
- **Lifeline Utility Systems** – 8 *wastewater treatment plants*, 5 *potable water systems*, 42 *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 mis-operation 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** – 7 *hazardous materials facilities* – involved in the production, storage, and/or transport of corrosives, explosives, flammable materials, radioactive materials, and toxins.

Harrison County's critical facilities are listed and mapped in Appendix C.

COMMUNITY ASSETS are facilities that are significant to the county; for example, historic landmarks or significant tourist attractions. One such asset for this county is the Caesar's Riverboat Casino complex. Fees and taxes from the casino contribute a significant portion of the annual revenue for the county and its communities. Harrison County's community assets are listed and mapped in Appendix C.

5.2.2 Building Replacement Costs

The total building exposure for Harrison County is identified in Table 5-6 along with the estimated number of buildings within each occupancy class. These counts and costs were derived from the county assessor and parcel data.

One major community asset in Harrison County is the Caesar's Riverboat Casino complex located on the Ohio River in the far eastern portion of the county. The state-required evaluation conducted in 2006 after eight years of operation identified the investments made by the Casino. From 2001 to 2005, the casino spent \$135.9 million in capital investment¹⁴.

It is important to note that the building exposure information below reflects the current value of the buildings on the casino complex (as well as all of the buildings in the county), not replacement costs.

Table 5-6: Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure (\$)
Agricultural	4,769	\$597,997,000
Commercial	541	\$293,866,000
Education	15	\$95,894,000
Government	87	\$56,780,000
Industrial	57	\$64,756,000
Religious/Non-Profit	170	\$78,993,000
Residential	11,111	\$1,268,521,000
Total	16,750	\$2,456,807,000

5.3 Profiling Hazards

5.3.1 Tornadoes

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, but higher and lower values can occur. A wind velocity of 200 miles an hour will result in a wind pressure of

¹⁴ Indiana Gaming Commission website, <http://www.in.gov/igc/files/caesars-8.pdf>

102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings. Tornadoes are classified according to the Enhanced Fujita Tornado Intensity Scale shown in Table 5-7.

Table 5-7: Enhanced Fujita Tornado Rating¹⁵

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 <i>Gale</i>	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.
FE1 <i>Moderate</i>	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 <i>Significant</i>	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 <i>Severe</i>	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 <i>Devastating</i>	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 <i>Incredible</i>	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.

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.

Previous Occurrences for Tornadoes

We collected data for the number of tornado occurrences since the adoption year of the previous mitigation plan in 2008. There have been six tornadoes reported to NCDC in Harrison County since January 2008 and a total of 20 since 1971. In January 2013, unseasonably mild weather caused an outbreak of tornadoes in southern Indiana and Kentucky. Approximately \$40,000 in damage was incurred to several homes and barns in the southeastern portion of the county.

¹⁵ NOAA Storm Prediction Center, <http://www.srh.noaa.gov>

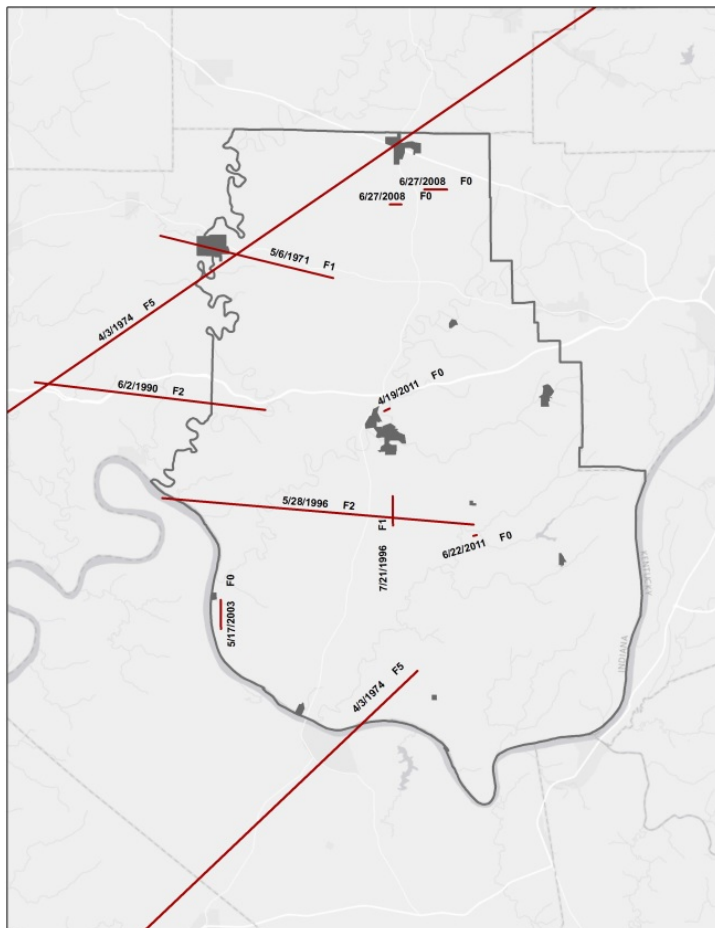
NCDC reported tornado activity in Harrison County is documented in Table 5-8.

Table 5-8: Harrison County NCDC-Reported Tornadoes (2008-2014)

Location	Date	F-Scale	Deaths	Injuries	Property Damage	Crop Damage
HILLGROVE	6/27/2008	EF0	0	0	\$ 1,000.00	\$ -
CENTRAL BARREN	6/27/2008	EF0	0	0	\$ -	\$ -
CENTRAL BARREN	6/27/2008	EF0	0	0	\$ 25,000.00	\$ 1,000.00
CORYDON	4/19/2011	EF0	0	0	\$ -	\$ -
HARRISON COUNTY	6/22/2011	EF0	0	0	\$ 5,000.00	\$ -
SUGAR GROVE	1/30/2013	EF0	0	0	\$ 40,000.00	\$ -

The tracks for these historical tornado events in Harrison County are illustrated in Figure 5-4.

Figure 5-4: Historical Tornado Paths (1971-2013)



Geographic Location for Tornado Hazard

The entire county has the same risk for tornadoes because they can occur at any location.

Hazard Extent for Tornadoes

The historical tornadoes generally moved from west to east across the county. The extent of the hazard varies in terms of the extent of the path and the wind speed. Tornadoes can occur at any location within the county.

Risk Identification for Tornadoes

Low Risk  High Risk

Based on historical information, the probability of a tornado in Harrison County is high and the potential impact of a tornado is significant; therefore the overall risk of a tornado in Harrison County is high.

Vulnerability Analysis for Tornadoes

Tornadoes can occur within any area in the county; therefore the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan will consider all buildings within the county as vulnerable.

Essential and Critical Facilities

All essential and critical facilities are vulnerable to tornadoes. These facilities will encounter many of the same impacts as any other building within the jurisdiction. The impacts will vary, based on the magnitude of the tornado, but can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community).

Building Inventory

The same risks to facilities are shared by other buildings within the county. The impacts can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of building function (e.g., damaged home will no longer be habitable causing residents to seek shelter).

Infrastructure

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

GIS Tornado Analysis

2008 Tornado Analysis

For the 2008 MHMP, an F4 tornado was modeled running just north of Corydon. The analysis estimated that 272 buildings (primarily residential) would be damaged with losses totaling \$46.8 million (within the .3-mile buffer zone).

The following analysis is an example scenario to gauge the anticipated impacts of a tornado in the county in terms of numbers and types of buildings and infrastructure.

GIS overlay modeling was used to determine the potential impacts of an F4 tornado. The analysis used a recreation of an actual tornado path from 1974. The modeled path ran for over 17 miles including travelling through the town of Palmyra. 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 5-9 depicts tornado damage curves, as well as path widths.

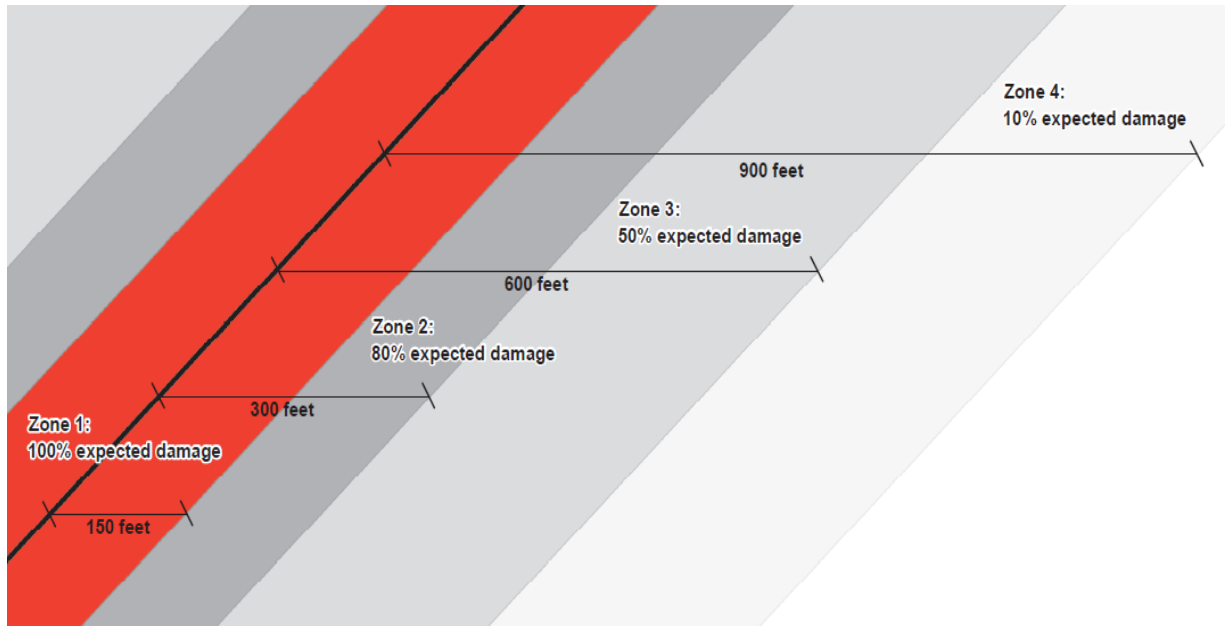
Table 5-9 Tornado Path Widths and Damage Curves

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%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the hypothetical tornado path.

Figure 5-5 and Table 5-10 describe the zone analysis.

Figure 5-5: F4 Tornado Analysis Using GIS Buffers



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

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

Table 5-10: F4 Tornado Zones and Damage Curves

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

The hypothetical tornado path is depicted in Figure 5-6 and the damage curve buffers are in Figure 5-7.

Figure 5-6: Hypothetical F4 Tornado Path in Harrison County

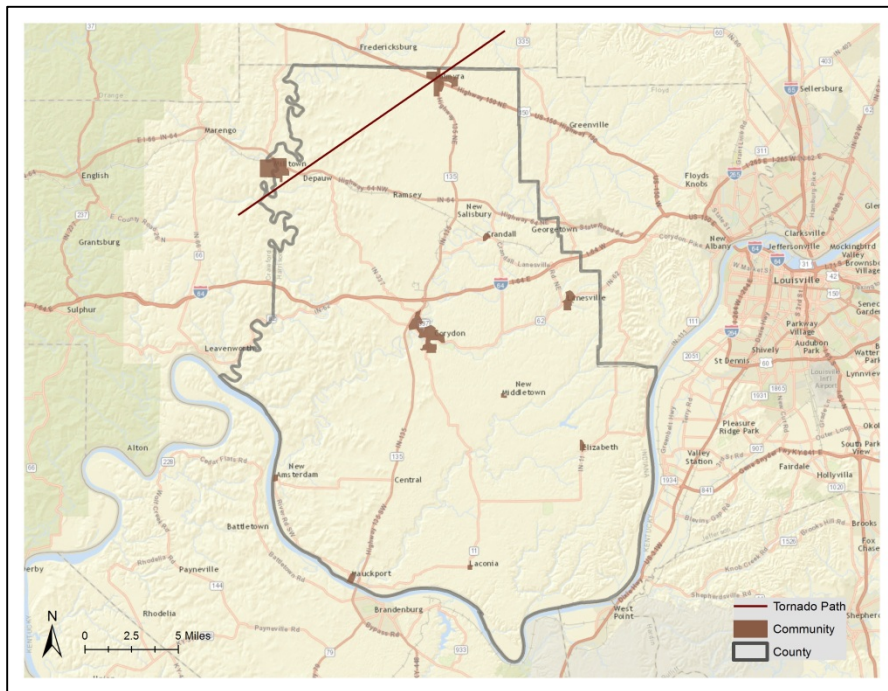
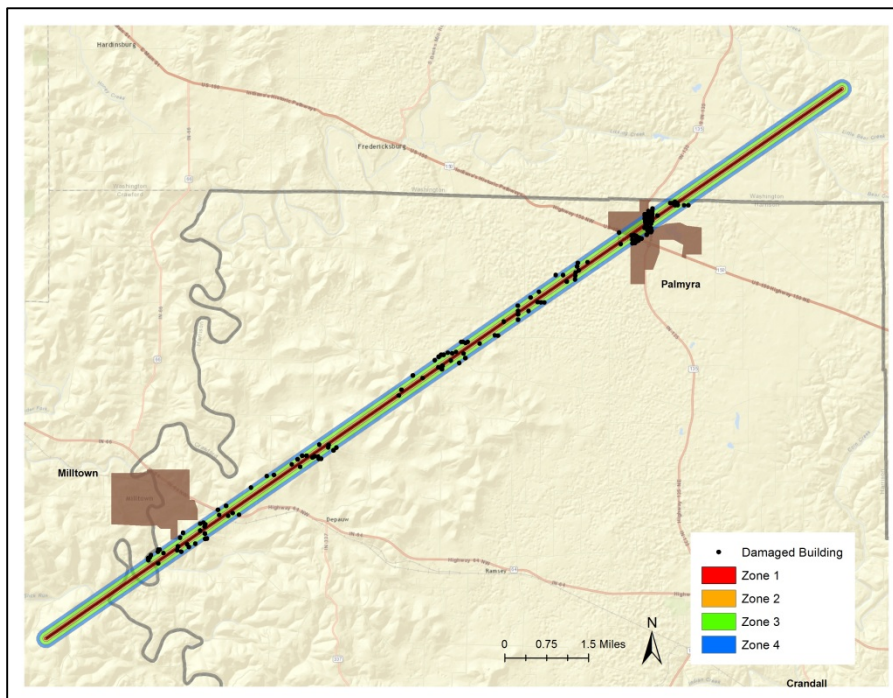


Figure 5-7: Modeled F4 Tornado Damage Buffers in Harrison County



The results of the analysis are depicted in Table 5-11. The GIS analysis estimates 167 buildings could be damaged. The estimated potential building losses would be \$9.5 million. The building losses are an estimate of building costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Harrison 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/non-profit, and education may be underestimated.

Table 5-11: Estimated Building Losses by Occupancy Type

General Occupancy	Buildings Damaged	Building Losses
Agricultural	45	\$2,924,000
Commercial	10	\$1,377,000
Government	0	\$0
Industrial	0	\$0
Religious	3	\$435,000
Residential	109	\$4,735,000
Total	167	\$9,471,000

Essential Facility Damage

There no essential facilities damaged in this scenario.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Tornado Hazard

Due to the unpredictability of this hazard, all buildings and infrastructure in Harrison 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 likely to be located in a tornado impact zone.

5.3.2 Flood Hazard

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry of the catchment, and flow dynamics and conditions in and along the river channel. Floods in Harrison County can be classified as one of two types: Flash floods or riverine floods. Both types of floods are common in Indiana.

Flash floods generally occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of

rushing water can upend a person; another 18 inches might carry off a car. Generally, flash floods cause damage over relatively localized areas, but they can be quite severe in the areas in which they occur. Urban flooding is a type of flash flood.

Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Flash floods can occur at any time of the year in Indiana, but they are most common in the spring and summer months.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine 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 riverine floods than for flash 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 for Flooding

The NCDC database reported 17 flood events in Harrison County since 2008. In March 2008, heavy rain from thunderstorms caused flash flooding. This flooding resulted in \$500,000 in property damage when trailers and vehicles were submerged near Corydon.

Table 5-12: Harrison County NCDC-Reported Flood Events (2008-2014)

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
LACONIA	3/19/2008	Flash Flood	0	0	\$500,000	\$ -
CORYDON	3/19/2008	Flood	0	0	\$ -	\$ -
FRENCHTOWN	4/4/2008	Flood	0	0	\$ -	\$ -
NEW MIDDLETOWN	6/11/2009	Flash Flood	0	0	\$ -	\$ -
LANESVILLE	8/4/2009	Flash Flood	0	0	\$ -	\$ -
ELIZABETH	8/4/2009	Flash Flood	0	0	\$ -	\$ -
CRANDALL	8/4/2009	Flood	0	0	\$ -	\$ -
TITUS	9/20/2009	Flood	0	0	\$ -	\$ -
NEW SALISBURY	9/20/2009	Flash Flood	0	0	\$ -	\$ -
DEPAUW	9/20/2009	Flash Flood	0	0	\$ -	\$ -
DEPAUW	10/9/2009	Flash Flood	0	0	\$ -	\$ -
CORYDON	4/23/2011	Flood	0	0	\$ -	\$ -
CORYDON	4/23/2011	Flood	0	0	\$ -	\$ -
HILLCREST	5/2/2011	Flood	0	0	\$ -	\$ -
HILLCREST	5/2/2011	Flood	0	0	\$ -	\$ -
DEPAUW	5/2/2011	Flood	0	0	\$ -	\$ -
HILLCREST	4/4/2014	Flash Flood	0	0	\$ -	\$ -

Geographic Location for Flooding

Most riverine flooding occurs in the spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Severe thunderstorms may cause flooding during the summer or fall, but tend to be localized.

Flash floods, brief heavy flows in small streams of normally dry creek beds, also occur within the county. Flash flooding is typically characterized by high-velocity water, often carrying large amounts of debris. Urban flooding involves the overflow of storm drain systems and is typically the result of inadequate drainage following heavy rainfall or rapid snowmelt.

In Harrison County, Corydon has the greatest overall exposure to flooding with 114 residential units in the 1% annual chance flood risk area (also known as the 100-year floodplain). There are 20 residential units located within the floodplain in Mauckport; 16 within the floodplain at Milltown; and 13 within the floodplain in New Amsterdam. Both Mauckport and New Amsterdam are along the Ohio River. The town of Palmyra has experienced flash flooding in the past, but is not located within the 1% annual-chance flood risk area.

Hazard Extent for Flooding

The Federal Emergency Management Agency (FEMA) provided the Digital Flood Insurance Rate Map (DFIRM) that identifies studied streams. The Special Flood Hazard Area (SFHA), which represents the modeling of the 1%-annual-chance flood, was used in the analysis to identify specific stream reaches for analysis.

Flood hazard scenarios were modeled using GIS analysis and Hazus-MH. The existing DFIRM maps were used to identify the areas of study. Planning team input and a review of historical information provided additional information on specific flood events.

Risk Identification for Flood Hazard

Low Risk  High Risk

Based on historical information, the probability of a flood is high, and the potential impact of a flood is significant; therefore the overall risk of a flood in Harrison County is high.

Vulnerability Analysis

2008 Flood Analysis

For the 2008 MHMP, a Hazus-MH analysis of the 100-year flood was modeled. That analysis estimated that 298 buildings would be damaged with losses totaling \$41.8 million. Better data collected for the 2015 plan update resulted in a more accurate estimation of damage, which is described in the following section.

The planning team analyzed vulnerability to flooding with an enhanced Hazus-MH analysis and an analysis of community participation in the National Flood Insurance Program (NFIP). It is important to note that

the losses to buildings, particularly essential facilities and state-owned properties, extend beyond physical damage. The economic and social impacts associated with loss of governmental, public safety, and health care infrastructure are far more significant for a community. When assessing the cost of building construction, it is important for government agencies to consider these impacts.

Hazus-MH Analysis

Hazus-MH was used to generate a flood depth grid for a 100-year return period based upon 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 of Harrison County. This was accomplished by creating points representing building locations that were generated from IDLGF-provided assessor data linked to parcel data provided by the county (through IDHS and IndianaMap). These data were then 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 (also known as the 100-year flood) would damage 512 buildings county-wide at a cost of \$21.8 million. In the modeled scenario, Corydon sustained the most damage with 196 buildings damaged at a cost of \$5.2 million. The total estimated numbers and cost of damaged buildings by community are given in Tables 5-13 and 5-14. Figure 5-8 depicts the Harrison County buildings that fall within the 1% annual chance flood risk area (100-year floodplain). Figures 5-9 through 5-15 highlight damaged buildings within the floodplain areas in each flood prone jurisdiction.

Table 5-13: Number of Buildings Damaged by Community and Occupancy

Community	Total Buildings Damaged	Building Occupancy Class						
		Agriculture	Commercial	Educ	Govt	Industrial	Religious	Residential
Harrison County (Unincorporated)	246	99	10	0	2	3	2	130
Corydon	196	0	102	0	10	4	9	71
Crandall	4	0	0	0	0	0	0	4
Elizabeth	5	0	0	0	0	0	0	5
Lanesville	8	0	5	1	0	0	0	2
Mauckport	17	0	2	0	1	0	0	14
Milltown	23	0	10	0	0	0	0	13
New Amsterdam	12	0	1	0	0	0	1	10

Table 5-14: Cost of Buildings Damaged by Community and Occupancy

Community	Total \$ Losses	Building Occupancy Class						
		Agriculture	Commercial	Educ	Govt	Industrial	Religious	Residential
Harrison County (Unincorporated)	\$10,545,000	\$4,666,000	\$1,858,000	\$0	\$18,000	\$233,000	\$427,000	\$3,343,000
Corydon	\$5,206,000	\$0	\$3,337,000	\$0	\$210,000	\$204,000	\$274,000	\$1,151,000
Crandall	\$205,000	\$0	\$0	\$0	\$0	\$0	\$0	\$205,000
Elizabeth	\$71,000	\$0	\$0	\$0	\$0	\$0	\$0	\$71,000
Lanesville	\$189,000	\$0	\$170,000	\$4,000	\$0	\$0	\$0	\$15,000
Mauckport	\$233,000	\$0	\$62,000	\$0	\$1,000	\$0	\$0	\$169,000
Milltown	\$869,000	\$0	\$480,000	\$0	\$0	\$0	\$0	\$390,000
New Amsterdam	\$225,000	\$0	\$41,000	\$0	\$0	\$0	\$45,000	\$138,000

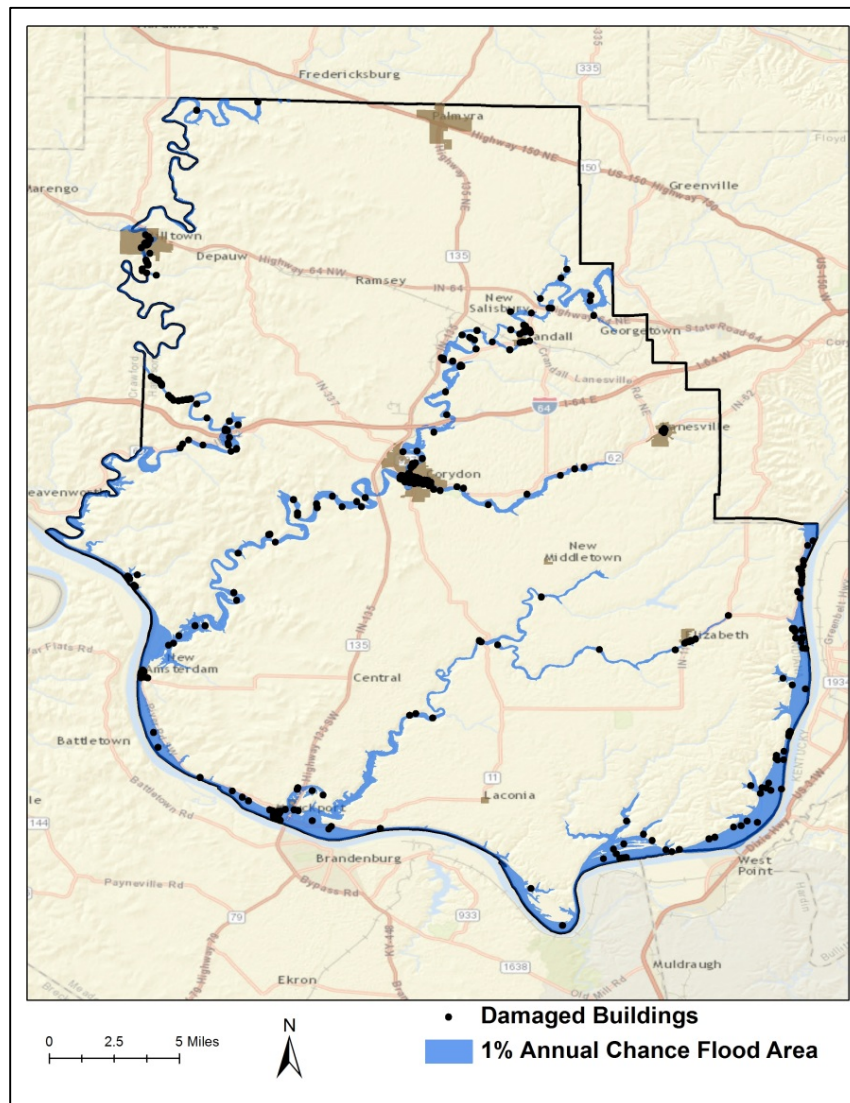
Figure 5-8: Harrison County Buildings in Floodplain (1% Annual Chance Flood)

Figure 5-9: Corydon Flood-Prone Areas (1% Annual Chance Flood)

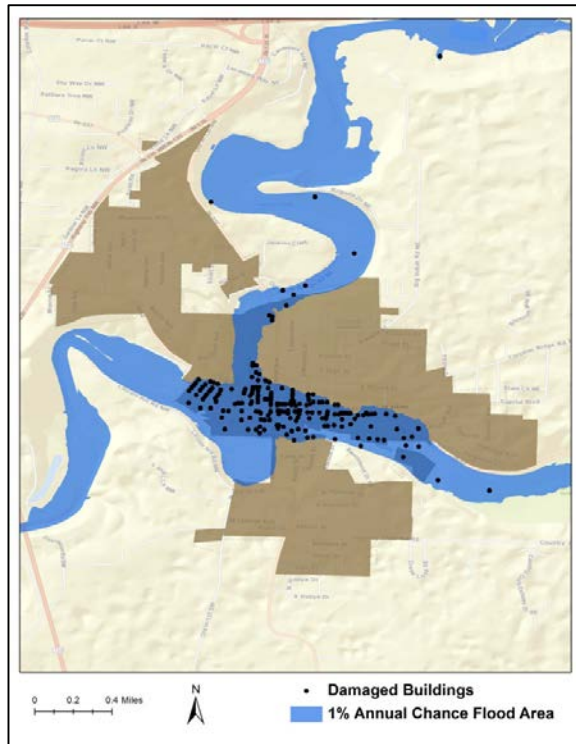


Figure 5-10: Crandall Flood-Prone Areas (1% Annual Chance Flood)



Figure 5-11: Elizabeth Flood-Prone Areas (1% Annual Chance Flood)

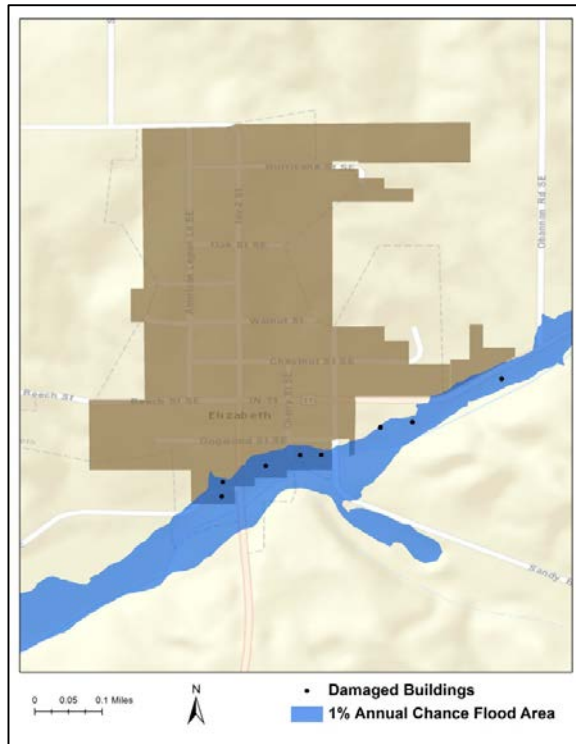


Figure 5-12: Lanesville Flood-Prone Areas (1% Annual Chance Flood)



Figure 5-13: Mauckport Flood-Prone Areas (1% Annual Chance Flood)

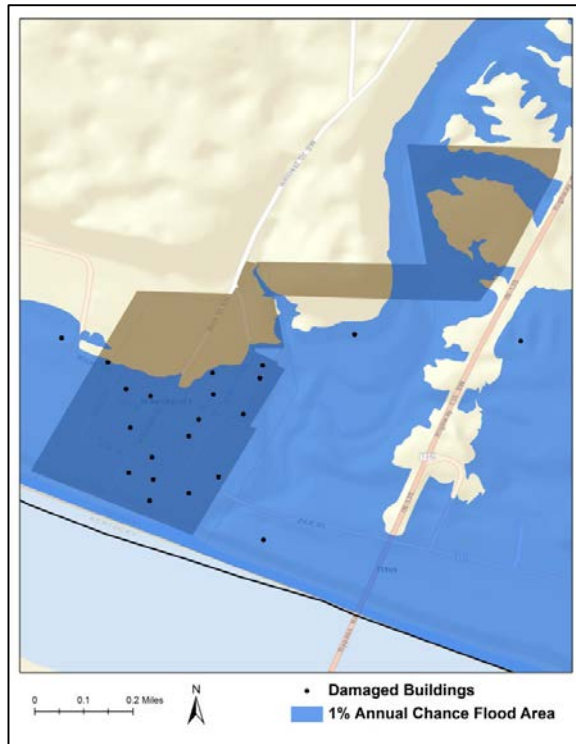
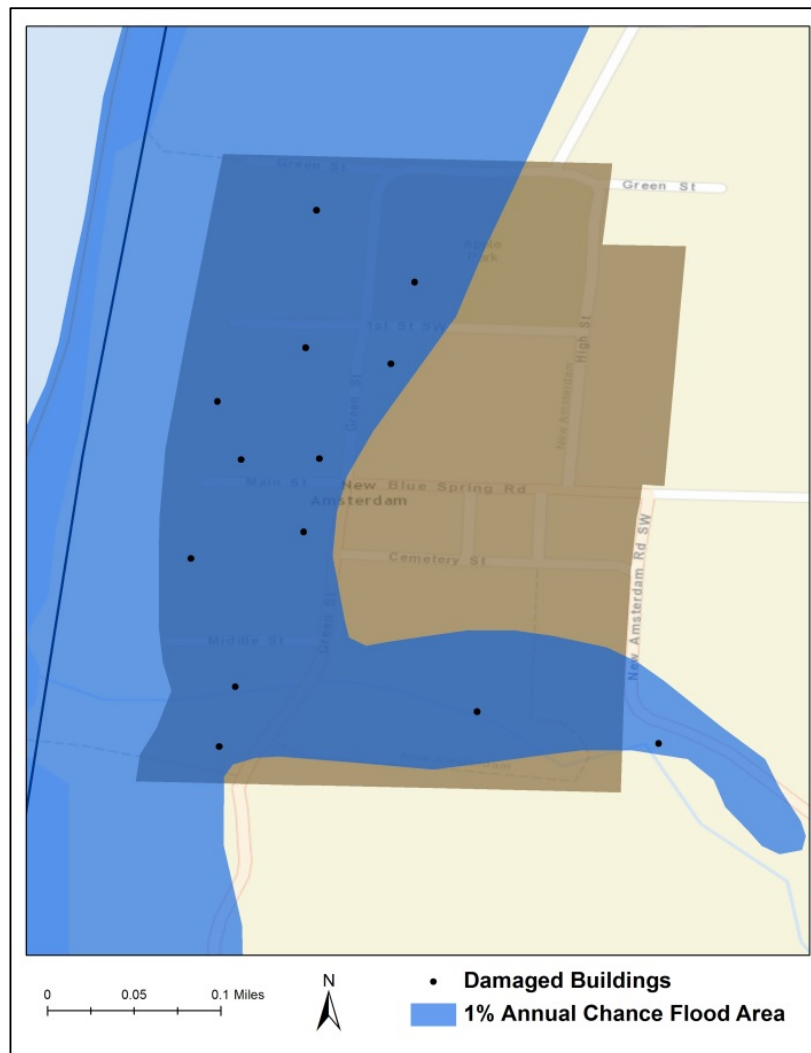


Figure 5-14: Milltown Flood-Prone Areas (1% Annual Chance Flood-Harrison County only)



Figure 5-15: New Amsterdam Flood-Prone Areas (1% Annual Chance Flood)

Hazus Analysis of 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).

Hazus estimates that two essential facilities in Harrison County could sustain damage. Heth Township Fire Station #2 in Mauckport is located within the 1% Annual Chance floodplain as shown in Figure 5-16. In addition, the Corydon Town Marshall's Office in Corydon is also within the flood boundary (Figure 5-17).

Figure 5-16: Mauckport Flood-Prone Essential Facilities



Figure 5-17: Corydon Flood-Prone Essential Facilities**Overlay Analysis of 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 (e.g. a damaged waste water facility will no longer be able to serve the community). As shown in Figures 5-18 through 5-20, the results of the overlay analysis indicate that a total of nine critical facilities and five community assets in Harrison County could sustain damage. In Corydon, both wastewater treatment plants, and one hazardous materials site are in the flood boundary. One hazardous materials site is in the flood boundary in Milltown. The entire Caesar's Casino complex lies within the within the 1% annual chance flood risk area. In addition, three communication towers (one at Mauckport and two at Corydon) are in the flood boundary as well as the water well fields for Corydon and Elizabeth.

Figure 5-18: Corydon Flood-Prone Critical Facilities



Figure 5-19: Milltown Flood-Prone Critical Facilities

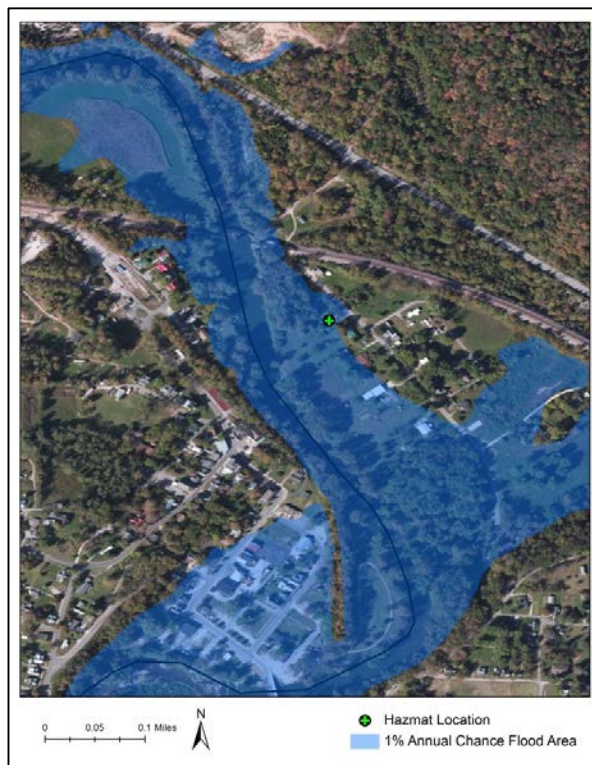
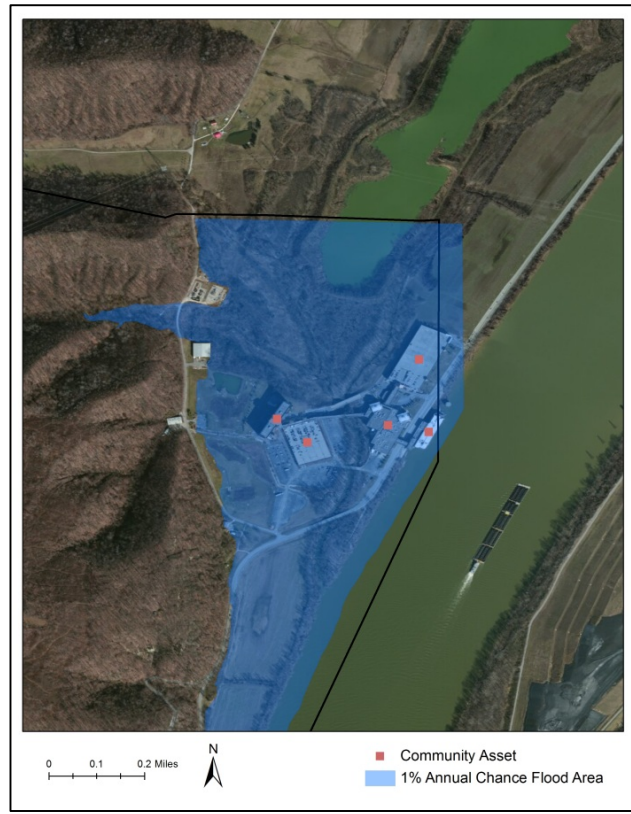


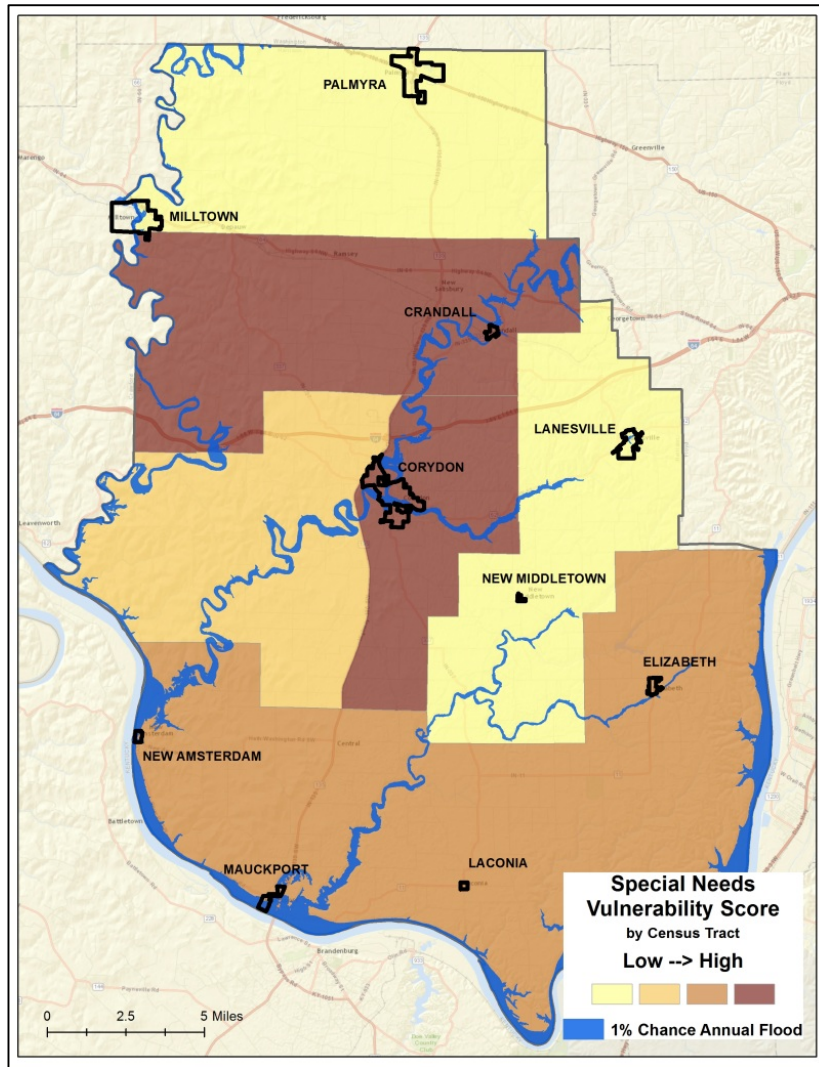
Figure 5-20: Harrison Flood-Prone Community Assets (Caesar's Casino Complex)

Flood Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. As previously noted, Corydon and Crandall have a high number of flood-prone buildings. These communities are also located in area with a high Special Needs Vulnerability Score. These particular census tracts have a relatively higher proportion of the population with special needs when compared to the rest of the county.

The tract which includes Corydon has 18.7% of its residents living in poverty and 17.7% aged 65 years or older. The census tract including Crandall also has a high proportion of its population in these groups – 13.7% living below poverty level, 14.6% 65 years and over, and 16.3% with a disability.

These populations will need particular attention in the event of a disaster. Figure 5-21 compares the 1% Annual Chance Flood Area with those areas of the county which have a higher Special Needs Vulnerability Scores.

Figure 5-21: Flood Dangers to Special Needs/Vulnerable Populations

NFIP Analysis

FEMA provides annual funding through the National Flood Insurance Fund (NFIF) to reduce the risk of flood damage to existing buildings and infrastructure. These grants include Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and the Severe Repetitive Loss (SRC) program. The long-term goal is to significantly reduce or eliminate claims under the NFIP through mitigation activities.

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which has suffered flood loss damage on two occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is 25% of the market value of the structure at the time of each flood loss.

The Indiana State NFIP Coordinator and FEMA Region V were contacted to determine the location of repetitive loss structures. Harrison County has 12 non-mitigated repetitive loss properties (Table 5-15), all of which are in unincorporated areas of the county.

Table 5-15 documents the Harrison County NFIP claims data as of December 31, 2015.

Table 5-15: NFIP Claims Data

Community	% of Community in SFHA	Number of Policies	Value of Insurance Claims/Payments	Number of Insurance Claims/Losses	Repetitive Losses in Dollars	Number of Repetitive Losses
Harrison County	5.69	58	\$8,111,800	80	\$626,717	12
Corydon	14.25	59	\$7,941,800	34	\$0	0
Mauckport	70.16	2	\$57,300	3	\$0	0
New Amsterdam	66.89	1	\$162,000	0	\$0	0

Table 5-16 provides a comparison of number of buildings in the 1% flood probability boundary to the number of policies, and then provides a percent of insured structures represented by those policies. The last column in the table provides an estimate of the exposure that is insured.

Table 5-16: Comparison of Building Exposure to Insured Buildings

Community	Buildings in 100-yr Floodplain	Exposure of Buildings in Floodplain	Number of Policies	Insured Value of Policies	Approximate Percent of Buildings Insured ¹	Percent of Exposure Insured ²
Harrison County (Unincorporated)	211	\$123,243,928	69	\$8,576,500	32.5%	6.6%
Corydon	247	\$55,722,766	58	\$7,749,400	23.5%	13.9%
Crandall	4	\$370,972	0	\$0	0%	0%
Elizabeth	5	\$391,330	0	\$0	0%	0%
Laconia	0	\$0	0	\$0	n/a	n/a
Lanesville	8	\$1,475,798	1	\$114,000	12.5%	7.7%
Mauckport	25	\$1,741,330	2	\$57,300	8.0%	3.3%
Milltown	26	\$2,305,174	0	\$0	0%	0%
New Amsterdam	15	\$619,555	1	\$147,300	6.7%	23.8%
New Middletown	0	\$0	0	\$0	n/a	n/a
Palmyra	0	\$0	0	\$0	n/a	n/a

¹Approximate percent of buildings insured is 2.6 times more than 100%

²Approximate percent of exposure insured is 3.4 times more than 100%

Table 5-17 identifies each community and the date each participant joined the NFIP.

Table 5-17: Additional Information on Communities Participating in the NFIP

Community	Participation Date
Harrison County	11/1/1995
Corydon	7/18/1983
Lanesville	1/4/1985
Mauckport	7/5/1983
New Amsterdam	7/5/1983

The NFIP'S Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions, meeting the three goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote the awareness of flood insurance. Harrison County and its incorporated areas do not participate in the CRS.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Flooding

The Harrison County, Indiana 2008 Comprehensive Plan Update discourages new construction in the defined floodplains through the implementation of floodplain ordinances. The Comprehensive Plan also encourages the conservation of natural areas including wetlands and floodplains by limiting development in those areas.

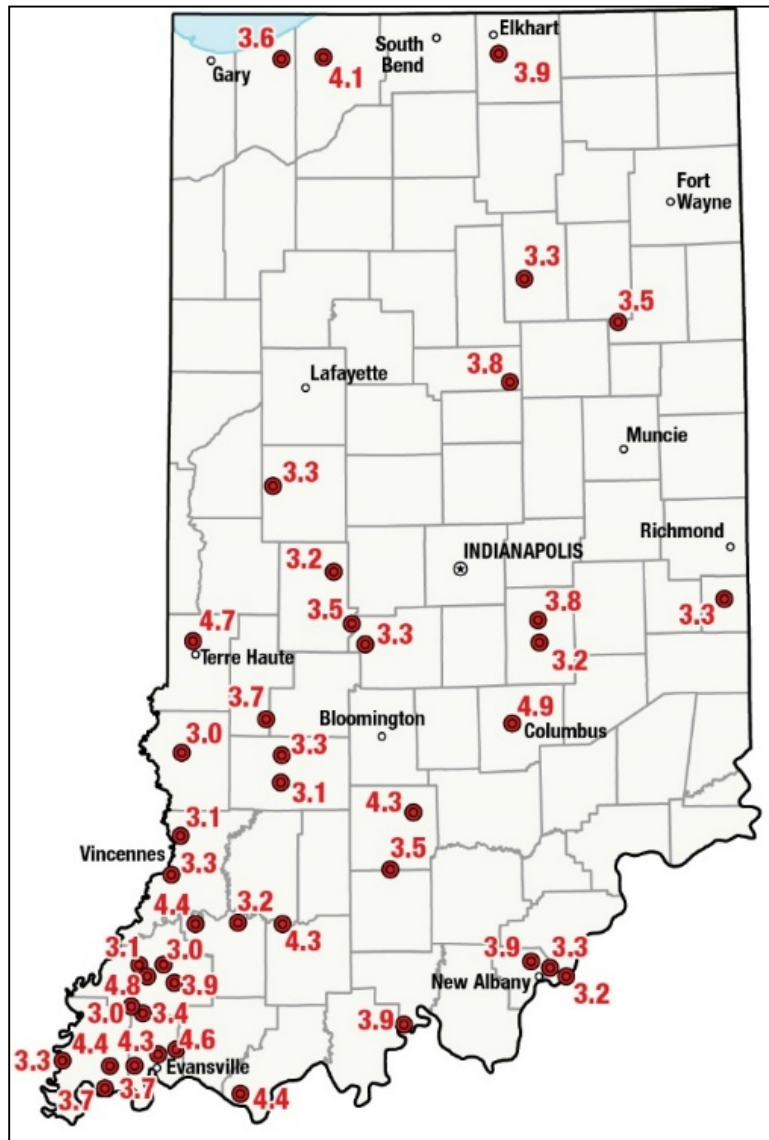
5.3.3 Earthquake Hazard

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake.

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 United States is referred to as 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. Figure 5-22 depicts Indiana's historical earthquake epicenters. Tables 5-18 and 5-19 provide guidance on how to interpret the modified Mercalli intensity scale.

Ground shaking from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and communication (e.g. phone, cable, Internet) services; 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.

Figure 5-22: Indiana Historical Earthquake Epicenters¹⁶



¹⁶ Indiana Geological Survey

Table 5-18: Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing 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 5-19: Earthquake Magnitude vs. Modified Mercalli Intensity Scale

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

Previous Occurrences for Earthquake Hazard

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 near Kokomo in December later that same year with approximately 10,390 individuals submitting felt reports to the USGS.

Geographic Location for Earthquake Hazard

The majority of seismic activity in Indiana occurs in the southwestern region of the state. Earthquakes originate just across the boundary in Illinois and can be felt in Indiana. The M5.2 Mt. Carmel event on April 19, 2008 was felt by residents in Indiana, Kentucky, and many more states across the central US.

Hazard Extent for Earthquake Hazard

The extent of an earthquake is countywide. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. Soils along rivers and other bodies of water have higher water tables and higher sand content. As a result, these areas are more susceptible to liquefaction and land shaking. Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking as a result of water filling the space between individual soil particles. This can cause buildings to tilt or sink into the ground, slope failures, lateral spreading, surface subsidence, ground cracking, and sand blows.

Risk Identification for Earthquake Hazard

Low Risk  High Risk

Based on historical information, the probability of an earthquake is medium, and the potential impact of an earthquake is moderate; therefore the overall risk of an earthquake in Harrison County is medium.

Vulnerability Analysis for Earthquake Hazard

This hazard could impact the entire jurisdiction equally; therefore the entire county's population and all buildings are vulnerable to an earthquake and can expect the same impacts within the affected area. To accommodate this risk, this plan will consider all buildings within the county as vulnerable.

Facilities

All facilities are vulnerable to earthquakes. These would encounter many of the same impacts as any other building within the county. These impacts include structural failure and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Names and locations of essential and critical facilities, as well as community assets, are in Appendix C.

Building Inventory

Impacts similar to those discussed for the facilities can be expected for the other buildings within the county. These impacts include structural failure and loss of building function that could result in indirect impacts (e.g., damaged homes will no longer be habitable, causing residents to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that could be impacted include roadways, runways, utility lines/pipes, railroads, and bridges. Because an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that any number of these structures could become damaged in the event of an earthquake. The impacts to these structures include broken, failed, or impassable roadways and runways; broken or failed utility lines (e.g., loss of power or gas to community); and railway failure from broken or impassable railways. Bridges also could fail or become impassable, causing traffic risks and ports could be damaged which would limit the shipment of goods. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of numbers and types of buildings and infrastructure.

Hazus-MH Earthquake Analysis

2008 Earthquake Analysis

For the 2008 MHMP, a Hazus-MH analysis of several earthquake scenarios including a 7.1 magnitude earthquake centered in the Wabash Valley, a 5.5 magnitude earthquake with the epicenter in Harrison County, a 500-year return period event, and an annualized earthquake loss. Similar to the flood and tornado models, the 2015 analyses revealed more accurate building damages and losses the quality and completion of data collected was significantly better than in 2008.

The Polis team reviewed existing geological information and recommendations for earthquake scenarios and ran three modeling scenarios—two deterministic and one probabilistic.

The probabilistic scenario is based on ground-shaking parameters derived from U.S. 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.

The deterministic scenarios included a 7.7-moment magnitude epicenter along the New Madrid fault zone and a 6.8-moment magnitude epicenter in the Mt. Carmel, IL zone. Shake maps provided by FEMA were used in Hazus-MH to estimate losses for Harrison County based on these events.

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. Fortunately, a National Earthquake Hazards Reduction Program (NEHRP) soil classification map exists 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.

Damage and Loss Scenario -- 7.7 Magnitude New Madrid, KY Earthquake

Hazus estimates that the damages incurred from the 7.7 magnitude New Madrid, KY earthquake scenario would be county-wide in scope.

Building Damages

Hazus estimates that 336 buildings in Harrison County would be at least moderately damaged. This is over 2% of the buildings in the county. An estimated three buildings would be damaged beyond repair.

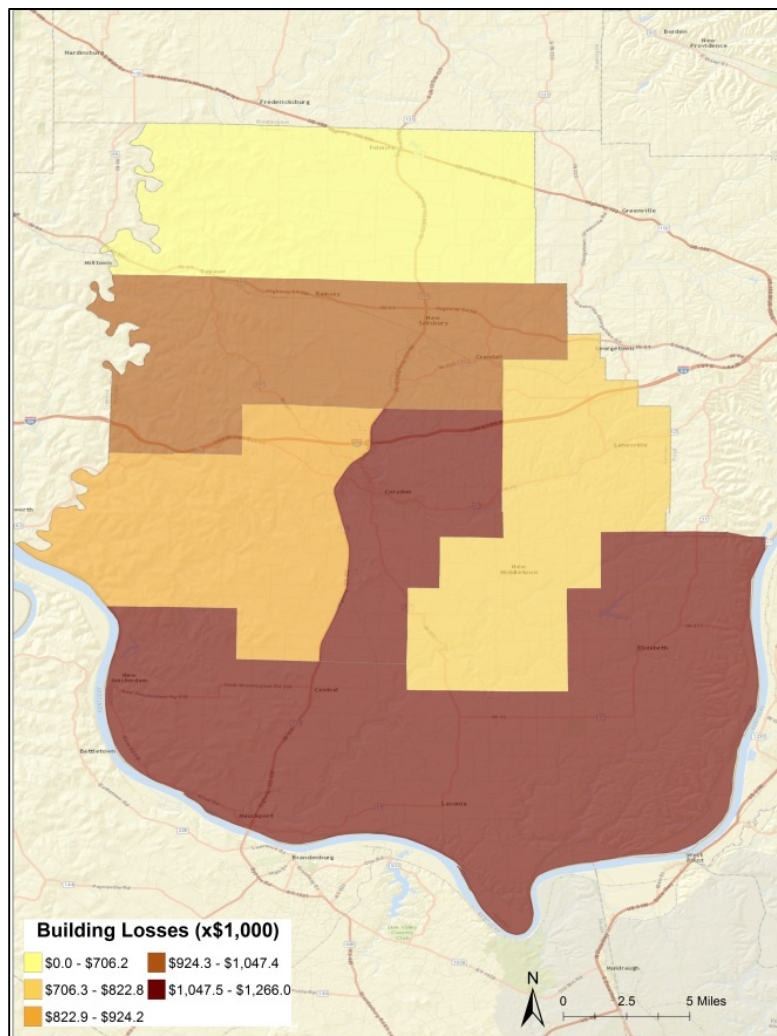
The model estimates that the aggregate building related losses would total over \$14.6 million; 52% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – 29% of the total. Tables 5-20 through 5-25 and Figures 5-23 and 5-24 show damage and loss scenarios for various earthquake magnitudes.

Table 5-20: New Madrid Earthquake Scenario - Building Damage by Occupancy Type

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	4,330	27.94	275	31.46	121	40.86	19	49.90	1	38.33
Commercial	498	3.21	31	3.49	12	3.96	2	4.70	0	4.20
Education	13	0.08	1	0.09	0	0.10	0	0.10	0	0.14
Government	79	0.51	5	0.52	2	0.59	0	0.57	0	0.85
Industrial	51	0.33	3	0.37	1	0.48	0	0.58	0	0.41
Other Residential	819	5.29	86	9.87	39	13.09	1	3.90	0	2.13
Religion	146	0.95	9	1.06	4	1.23	1	1.51	0	1.71
Single Family	9,559	61.69	465	53.15	117	39.68	15	38.74	1	52.23
Total	15,496		875		296		38		3	

Table 5-21: New Madrid Earthquake Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.02	1.54	0.04	0.19	1.79
	Capital-Related	0.00	0.01	1.68	0.02	0.12	1.83
	Rental	0.26	0.05	0.49	0.02	0.11	0.93
	Relocation	0.95	0.10	0.55	0.08	1.34	3.02
	Subtotal	1.21	0.18	4.26	0.16	1.76	7.57
Capital Stock Losses							
	Structural	0.81	0.08	0.30	0.07	1.66	2.92
	Non_Structural	1.56	0.17	0.49	0.09	0.82	3.13
	Content	0.20	0.02	0.16	0.05	0.42	0.84
	Inventory	0.00	0.00	0.01	0.03	0.14	0.18
	Subtotal	2.57	0.27	0.95	0.23	3.04	7.07
	Total	3.78	0.45	5.21	0.39	4.80	14.64

Figure 5-23: New Madrid Scenario - Building Losses in Thousands of Dollars

Essential Facility Damage

Before the earthquake, the county had an estimated 950 medical care facility beds available for use. On the day of the earthquake, the model estimates that 879 beds (93%) would be available for use by patients already in these facilities along with those injured by the earthquake. After one week, 98% of the beds would likely be back in service.

Table 5-22: New Madrid Earthquake Scenario - Essential Facility Damage

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	22	0	0	22
Schools	21	0	0	21
EOCs	2	0	0	2
Police Stations	3	0	0	3
Fire Stations	14	0	0	14

Damage and Loss Scenario -- 6.8 Magnitude Mt. Carmel, IL Earthquake

Hazus estimates that the damages incurred from the 6.8 magnitude Mt. Carmel earthquake scenario would be county-wide in scope.

Building Damages

Hazus estimates that about 482 buildings in Harrison County would be at least moderately damaged. This is over 3.0% of the buildings in the county. An estimated five buildings would be damaged beyond repair.

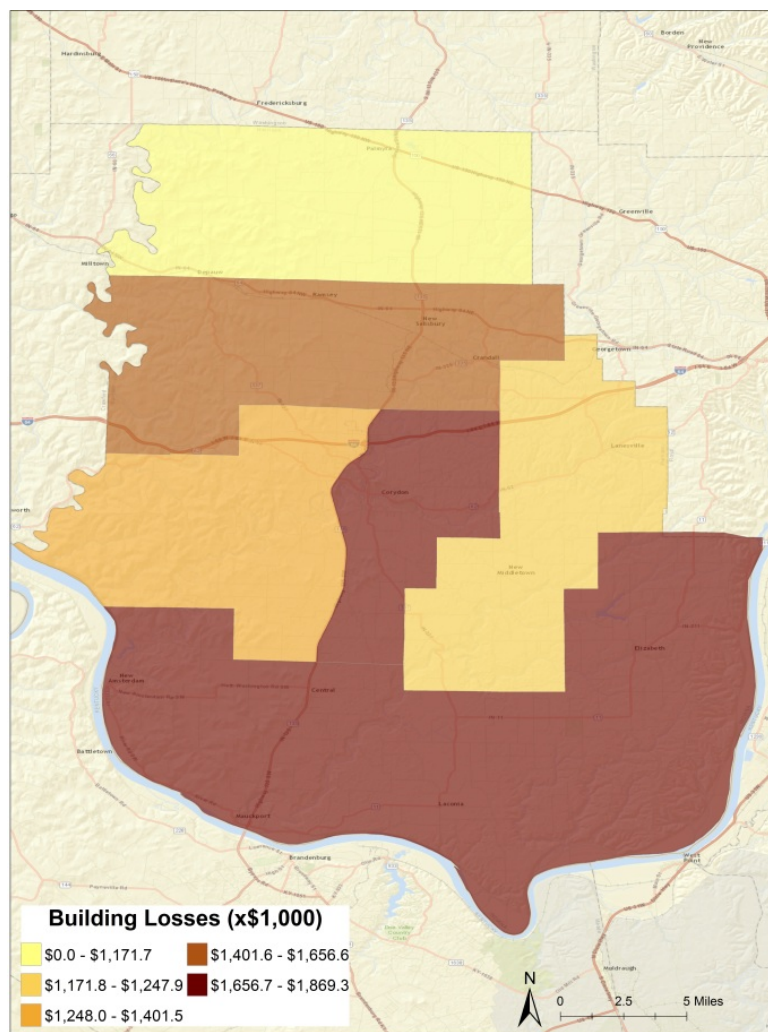
The model estimates that the aggregate building related losses would total \$21.8 million; 49% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – over 30% of the total.

Table 5-23: Mt. Carmel Earthquake Scenario - Building Damage by Occupancy Type

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	4,190	27.82	354	30.44	170	40.57	30	49.89	2	38.49
Commercial	482	3.20	40	3.44	17	3.98	3	4.77	0	4.20
Education	13	0.08	1	0.08	0	0.10	0	0.10	0	0.14
Government	77	0.51	6	0.50	2	0.57	0	0.55	0	0.81
Industrial	49	0.33	4	0.36	2	0.48	0	0.59	0	0.41
Other Residential	792	5.26	102	8.80	49	11.67	2	3.83	0	1.99
Religion	142	0.94	12	1.04	5	1.23	1	1.49	0	1.72
Single Family	9,315	61.85	644	55.34	173	41.39	23	38.78	2	52.24
Total	15,061		1,164		419		60		5	

Table 5-24: Mt. Carmel, IL Earthquake Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.04	2.14	0.06	0.27	2.50
	Capital-Related	0.00	0.02	2.31	0.04	0.17	2.53
	Rental	0.39	0.07	0.68	0.03	0.16	1.33
	Relocation	1.42	0.13	0.79	0.11	1.94	4.40
	Subtotal	1.81	0.25	5.92	0.24	2.54	10.76
Capital Stock Losses							
	Structural	1.20	0.11	0.44	0.10	2.40	4.24
	Non_Structural	2.48	0.26	0.75	0.15	1.33	4.97
	Content	0.38	0.03	0.27	0.09	0.74	1.51
	Inventory	0.00	0.00	0.01	0.05	0.25	0.32
	Subtotal	4.06	0.40	1.48	0.39	4.72	11.04
	Total	5.87	0.65	7.40	0.62	7.26	21.80

Figure 5-24: Mt. Carmel Earthquake Scenario - Building Losses in Thousands of Dollars

Essential Facility Damage

Before the earthquake, the county would have an estimated 950 medical care facility beds available for use. On the day of the earthquake, the model estimates that 854 beds (90.0%) would be available for use by patients already in these facilities along with those injured by the earthquake. After one week, 97.0% of the beds would likely be back in service.

Table 5-25: Mt. Carmel Scenario - Essential Facility Damage

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	22	0	0	22
Schools	21	0	0	21
EOCs	2	0	0	2
Police Stations	3	0	0	3
Fire Stations	14	0	0	14

Results for Probabilistic 500-Year Earthquake Scenario

Hazus-MH estimates that approximately 296 buildings will be at least moderately damaged. This is approximately 2.0% of the total number of buildings in the region. It is estimated that two buildings will be damaged beyond repair.

The model estimates that the aggregate building-related losses would total over \$13.4 million; 50% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – 30% of the total.

The results of the probabilistic 500-year analysis are depicted in Tables 5-26 through 5-28 and Figure 5-25.

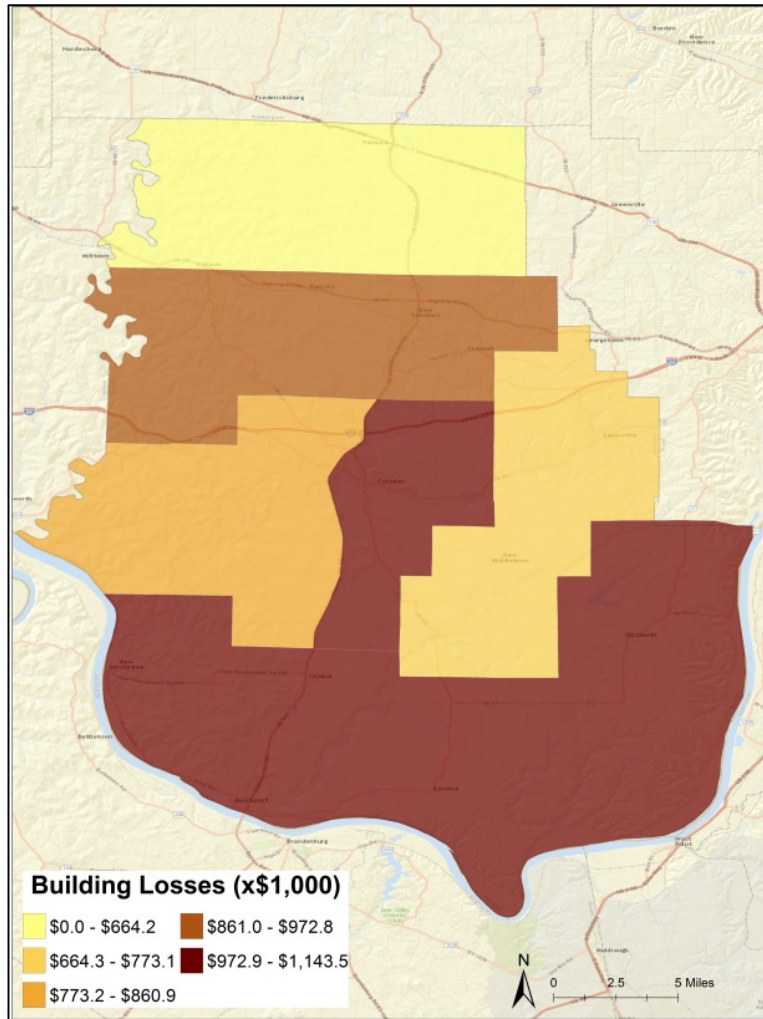
Table 5-26: Probabilistic 500-Year Scenario -- Damage Counts by Building Occupancy Type

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	4,369	27.98	251	31.58	108	41.36	17	50.07	1	37.58
Commercial	502	3.21	28	3.52	11	4.03	2	4.76	0	4.13
Education	13	0.08	1	0.08	0	0.09	0	0.10	0	0.14
Government	81	0.52	4	0.47	1	0.52	0	0.55	0	0.74
Industrial	52	0.33	3	0.37	1	0.49	0	0.59	0	0.39
Other Residential	843	5.40	73	9.17	29	11.27	1	3.07	0	0.93
Religion	148	0.94	9	1.08	3	1.28	1	1.52	0	1.76
Single Family	9,609	61.54	428	53.72	107	40.94	13	39.34	1	54.32
Total	15,615		796		260		34		2	

Table 5-27: 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	0.02	1.34	0.04	0.17	1.56
	Capital-Related	0.00	0.01	1.45	0.02	0.10	1.59
	Rental	0.23	0.04	0.43	0.02	0.10	0.82
	Relocation	0.86	0.08	0.49	0.07	1.18	2.67
	Subtotal	1.09	0.15	3.72	0.14	1.54	6.64
Capital Stock Losses							
	Structural	0.74	0.07	0.27	0.06	1.47	2.60
	Non_Structural	1.48	0.16	0.46	0.09	0.79	2.98
	Content	0.24	0.02	0.17	0.06	0.45	0.93
	Inventory	0.00	0.00	0.01	0.03	0.16	0.20
	Subtotal	2.45	0.24	0.91	0.24	2.87	6.71
	Total	3.55	0.39	4.63	0.38	4.40	13.35

Figure 5-25: Probabilistic 500-Year Scenario – Building Losses in Thousands of Dollars



Essential Facility Damage

Before the earthquake, the analysis estimated that region would have 950 care beds available for use. On the day of the earthquake, the model estimates that 886 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, 98% of the beds would be back in service.

Table 5-28: 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	22	0	0	22
Schools	21	0	0	21
EOCs	2	0	0	2
Police Stations	3	0	0	3
Fire Stations	14	0	0	14

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

Due to the unpredictability of this hazard, all buildings and infrastructure in Harrison County are at risk of damage including temporary or permanent loss of function. For earthquakes, non-reinforced structures are more vulnerable to damages. New development vulnerability will be minimal due to new construction codes coupled with the low earthquake probability.

5.3.4 Severe Thunderstorm Hazard

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

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.

There have been 18 NCDC reported hail events in Harrison County since January 1, 2008 and these are outlined in Table 5-29.

Table 5-29: Harrison County Hail Events (2008- 2014)

Location	Date	Deaths	Injuries	Property Damage	Crop Damage
KINGS STORE	7/20/2008	0	0	\$ -	\$ -
CORYDON	7/20/2008	0	0	\$ -	\$ -
CORYDON	7/20/2008	0	0	\$ -	\$ -
NEW AMSTERDAM	7/20/2008	0	0	\$ -	\$ -
CENTRAL	4/10/2009	0	0	\$ -	\$ -
ELIZABETH	4/10/2009	0	0	\$ -	\$ -
CENTRAL	4/10/2009	0	0	\$ -	\$ -
BRIDGEPORT	4/10/2009	0	0	\$ -	\$ -
CENTRAL	4/13/2009	0	0	\$ -	\$ -
RAMSEY	6/2/2009	0	0	\$ -	\$ -
PALMYRA	6/2/2009	0	0	\$ -	\$ -
NEW MIDDLETOWN	5/23/2011	0	0	\$ -	\$ -
RAMSEY	5/23/2011	0	0	\$ -	\$ -
RAMSEY	4/28/2012	0	0	\$ -	\$ -
PALMYRA	4/28/2012	0	0	\$ -	\$ -
NEW SALISBURY	4/28/2012	0	0	\$ -	\$ -
CRANDALL	4/28/2012	0	0	\$ -	\$ -
CRANDALL	4/28/2012	0	0	\$ -	\$ -
BRADFORD	10/6/2014	0	0	\$ -	\$ -

Lightning

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.

Although numerous storms have been reported in Harrison County in the past few years, there have not been any lightening events recorded by NCDC.

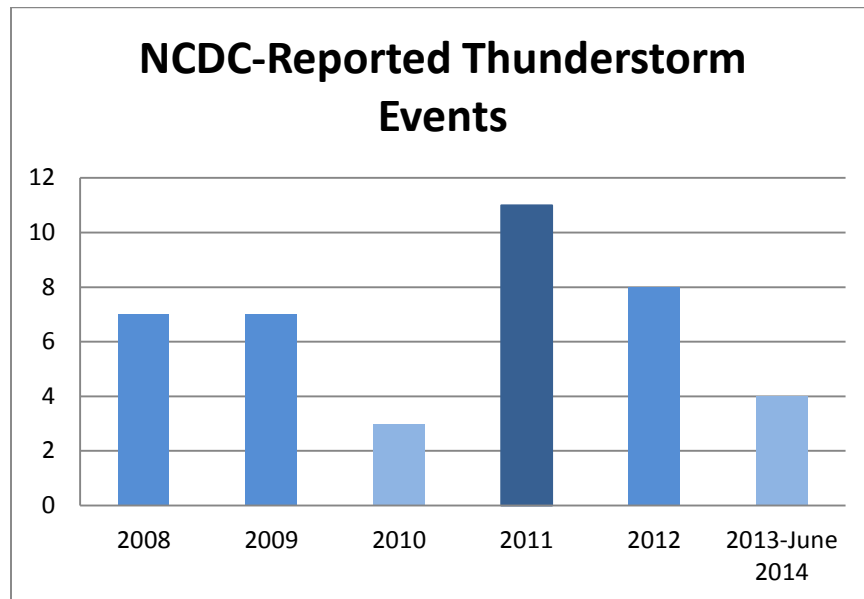
Severe Winds (Straight-Line Winds)

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 for Thunderstorm Hazards

The NCDC database reported 42 severe storms in Harrison County since 2008 as shown in Figure 5-26. A storm system in early July, 2012, contained winds of almost 60 MPH. This storm caused \$15,000 in property damage when part of metal roof was blown off in New Salisbury and trees were blown over onto a car in Elizabeth.

Figure 5-26: Harrison County Storms Events Reported to NCDC (2008-2014)



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

Geographic Location for Thunderstorm Hazard

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

Hazard Extent for Thunderstorm Hazard

The extent of the historical thunderstorms varies in terms of the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

Risk Identification for Thunderstorm Hazard

Low Risk  High Risk

Based on historical information, the probability of severe thunderstorms is high, and the potential impact is moderate; therefore the overall risk of a severe thunderstorm in Harrison County is medium to high.

Vulnerability Analysis for Thunderstorm Hazard

Severe thunderstorms are an equally distributed threat across the entire jurisdiction; therefore the entire county's population and all buildings are vulnerable to a severe thunderstorm, and the same impacts can be expected within the affected area. This plan will therefore consider all buildings within the county as vulnerable.

Facilities

All facilities are vulnerable to severe thunderstorms. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a damaged police station will no longer be able to serve the community). Names and locations of critical and essential facilities, as well as community assets, are provided in Appendix C.

Building Inventory

Impacts similar to those discussed for the facilities can be expected for the other buildings within the county. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a damaged home will no longer be habitable, causing residents to seek shelter).

Infrastructure

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

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

Due to the unpredictability of this hazard, all new buildings and infrastructure in Harrison County are at risk of damage including temporary or permanent loss of function. For hailstorms, thunderstorms, and windstorms, it is not possible to isolate specific essential or non-essential facilities that would be more or less vulnerable to damages. NCDC data for the past ten years reports property damage of \$117,000, or an average of \$11,700 in property damage per year. These totals derive mainly from storms in 2006 and 2007. It should also be noted that property owners often do not report damages caused by the events recorded by the NCDC. Therefore, damages to property should be expected to be significantly higher than the stated range.

5.3.5 Winter Storm Hazard

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

Ice (Glazing) and Sleet Storms

Ice or sleet, even in the smallest quantities, can result in hazardous driving conditions and can be a significant cause of property damage. Sleet can be easily identified as frozen raindrops. Sleet does not stick to trees and wires. The most damaging winter storms in Indiana have been ice storms. Ice storms are the result of cold rain that freezes on contact with objects having a temperature below freezing. Ice storms occur when moisture-laden gulf air converges with the northern jet stream, causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain, coating power lines, communication lines, and trees with heavy ice. The winds then will cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication. Falling trees and limbs also can cause building damage during an ice storm. In the past few decades, numerous ice-storm events have occurred in Indiana.

Snowstorms

Significant snowstorms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snowstorm with winds of 35 miles an hour or greater and/or visibility of less than one-quarter mile for three or more hours. The strong winds during a blizzard blow about falling and already existing snow, creating poor visibility and impassable roadways. Blizzards have the potential to result in property damage.

Indiana has been struck repeatedly by blizzards. Blizzard conditions not only cause power outages and loss of communication but can also make transportation difficult. The blowing of snow can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous, if not deadly.

Previous Occurrences for Winter-Storm Hazard

The winter of 2013-2014 ranked among the coldest on record throughout the Midwest. The National Weather Service reported this season as “one of the coldest and snowiest winter seasons on record and certainly one of the most extreme winter seasons in several decades.” NOAA’s National Climatic Data Center stated that the period from December 2013 through February 2014 was the 34th coldest for the contiguous 48 states since 1895.

Table 5-30 documents the NCDC reported winter storm events since 2008 when the previous mitigation plan was adopted. While there have been relatively few winter storms over this timeframe, it should be noted that precipitation types vary significantly throughout the course of each storm. Each type of precipitation carries its own dangers which are combined when multiple types occur in an individual storm.

Table 5-30: Harrison County Winter Storm Events (2008- 2014)

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
HARRISON COUNTY	2/11/2008	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	2/21/2008	Ice Storm	0	0	\$ -	\$ -
HARRISON COUNTY	3/7/2008	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	1/27/2009	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	2/9/2010	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	1/7/2010	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	2/14/2010	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	12/15/2010	Ice Storm	0	0	\$ -	\$ -
HARRISON COUNTY	1/20/2011	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	3/4/2012	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	12/28/2012	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	12/6/2013	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	2/2/2014	Heavy Snow	0	0	\$ -	\$ -
HARRISON COUNTY	2/4/2014	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	3/2/2014	Winter Storm	0	0	\$ -	\$ -
HARRISON COUNTY	11/16/2014	Heavy Snow	0	0	\$ -	\$ -

Geographic Location for Winter-Storm Hazard

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

Hazard Extent for Winter-Storm Hazard

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

Risk Identification for Winter-Storm Hazard

Low Risk  High Risk

Based on historical information, the probability of a winter storm is high, and the potential impact is moderate; therefore the overall risk of a winter storm in Harrison County is medium to high.

Vulnerability Analysis for Winter-Storm Hazard

Winter-storm impacts are distributed equally across the entire jurisdiction; therefore the entire county is vulnerable to a winter storm and can expect the same impacts within the affected area.

Facilities

All facilities are vulnerable to a winter storm. These facilities will encounter many of the same impacts as other buildings within the jurisdiction including loss of gas or electricity from broken or damaged utility

lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow. Names and locations of critical and essential facilities, as well as community assets are in Appendix C.

Building Inventory

The impacts to other buildings within the county are similar to the damages expected to the facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

Infrastructure

During a winter storm, the types of infrastructure that could be impacted include roadways, runways, utility lines/pipes, railroads and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these structures could become damaged during a winter storm. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads, runways and railways, and broken water pipes. Additionally, aerial navigations aids in Harrison County, including components of the national air traffic control system, could be damaged or destroyed possibly impacting nationwide air travel.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

Because winter-storm events are regional in nature, future development will be impacted equally across the county. Any new development within the county will remain vulnerable to these events.

5.3.6 Hazardous Material Release Hazard

The state of Indiana has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances between our borders every day. The transportation of chemicals and substances along interstate routes is commonplace in Indiana. The rural areas of Indiana have considerable agricultural commerce, creating a demand for fertilizers, herbicides, and pesticides to be transported along rural roads. Finally, Indiana is bordered by two major rivers and Lake Michigan. Barges transport chemicals and substances along these waterways daily. These factors increase the chance of hazardous material releases and spills throughout the State of Indiana.

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

Previous Occurrences for Hazardous Materials Hazard

Harrison County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in multiple deaths or serious injuries. However, there have been minor releases that have put local firefighters, hazardous materials teams, emergency management, and local

law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Harrison County residents.

Geographic Location for Hazardous Materials Hazard

The hazardous material release hazards are countywide and primarily are associated with the transport of materials by highway and/or railroad. I-64 is the main east/west route in the county and runs along the northern edge of Corydon SR-62 also travels in a general east/west line and passes through Corydon and Lanesville. Other east/west routes are SR-64 which runs through Milltown and US-150 which cuts across the northeastern part of the county through Palmyra. SR-135 travels in a general north/south direction and passes through Palmyra, New Salisbury, and Corydon and near Mauckport. Finally, SR-337 branches off from US-150 at Depauw, travels through Corydon to Laconia.

There are two major rail lines running through the county. A Norfolk Southern line runs east/west roughly parallel to SR- 64 and through Milltown, Depauw, and Crandall. The second rail line is a Lucas Oil route running north/south from its junction with the Norfolk Southern line to Corydon.

In addition, Harrison County is bordered on the south by the Ohio River with the towns of New Amsterdam and Mauckport sitting on the river's edge. Laconia is located 1.5 miles from the river. The US Army Corps of Engineers reported that over 200 tons of cargo was shipped on the Ohio River in 2012, including many toxic chemicals and other hazardous substances.

Hazard Extent for Hazardous Materials Hazard

The extent of the hazardous material (referred to as hazmat) hazard varies in terms of the quantity of material being transported as well as the specific content of the container.

Risk Identification for Hazardous Materials Release

Low Risk  High Risk

Based on historical information, the probability of a hazardous materials release is medium to high, and the potential impact is significant; therefore the overall risk of a hazardous materials release in Harrison County is medium/high.

Vulnerability Analysis for Hazardous Materials

Hazardous material impacts are an equally distributed threat across the entire jurisdiction; therefore the entire county is vulnerable to a hazardous material release and can expect the same impacts within the affected area. The main concern during a release or spill is the population affected. This plan will therefore consider all buildings located within the county as vulnerable.

Facilities

All facilities within the county are at risk. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged or chemically-contaminated police station will no longer be able

to serve the community). Names and locations of critical and essential facilities, as well as community assets, are in Appendix C.

Infrastructure Components

During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. 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.

GIS Hazardous Materials Release Analysis

2008 Hazmat Analysis

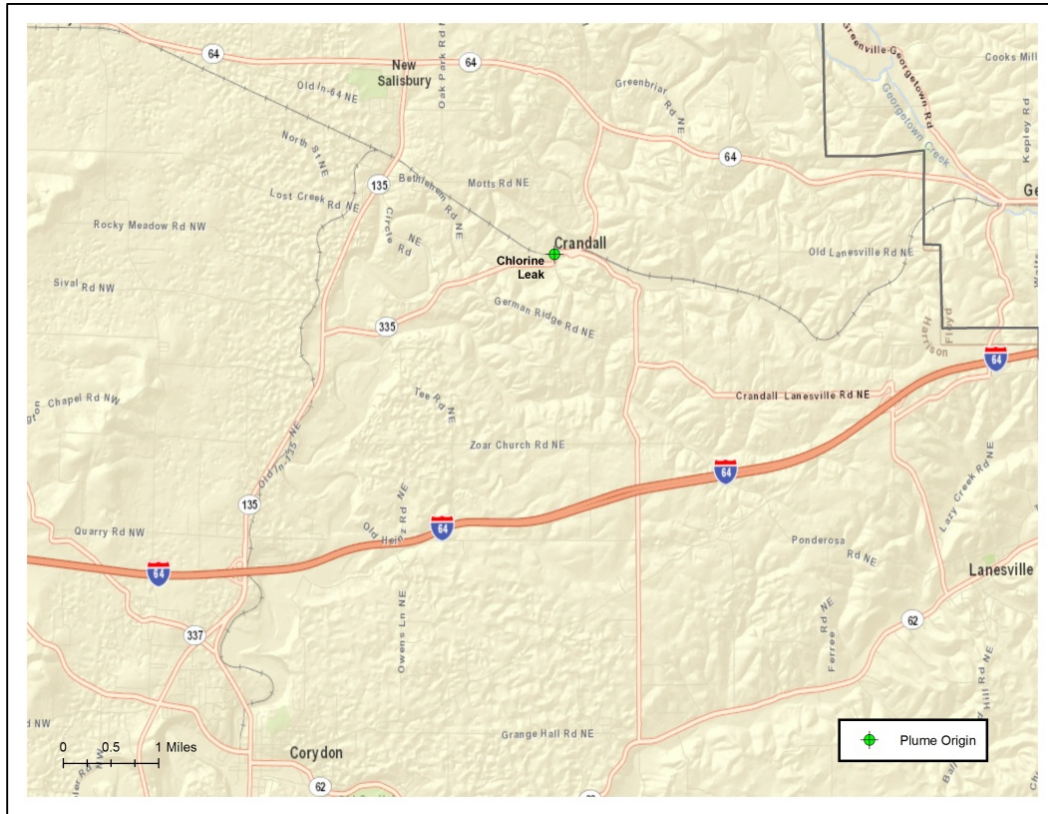
For the 2008, an ammonia release in Corydon at the Tyson Foods location was modeled. That analysis estimated that 334 buildings would be impacted at a potential loss of over \$45.9 million. Better data collected for the 2015 plan update resulted in a more accurate estimation of damage, which is described in the following section.

The US EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for a chlorine release where State Road 335 crosses the Norfolk Southern railroad tracks at Crandall.

Chlorine is a greenish yellow gas with a pungent suffocating odor. The gas liquefies at -35°C and room pressure or will liquefy from pressure applied at room temperature. Contact with unconfined liquid chlorine can cause frostbite from evaporative cooling. Chlorine does not burn, but, like oxygen, supports combustion. The toxic gas can have adverse health effects from either long-term inhalation of low concentrations of vapors or short-term inhalation of high concentrations. Chlorine vapors are much heavier than air and tend to settle in low areas. Chlorine is commonly used to purify water, bleach wood pulp, and make other chemicals.¹⁷

ALOHA is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training and is used in this hazardous materials release analysis. For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the southeast were assumed. The target area was chosen by the planning team at Meeting #1. The geographic area covered in this analysis is depicted in Figure 5-27.

¹⁷ Source: CAMEO

Figure 5-27: Location of Chemical Release

The ALOHA atmospheric modeling parameters, depicted in Figure 5-28, were based upon the actual conditions at the location when the model was run including a southeast wind speed of 6 mph. The temperature was 35°F with 37% humidity and clear skies. The modeled source of the chemical spill was a tanker with a diameter of 8 feet and a length of 33 feet (12,408 gallons). The model incorporated a tank that was 100% full with the chlorine in its liquid state at the time of its release.

This modeled release was based on a leak from a 2.5-foot-diameter hole. According to the ALOHA parameters, approximately 2,510 pounds of material would be released per second.

Figure 5-28: ALOHA Plume Modeling Parameters**SITE DATA:**

Location: CRANDALL, INDIANA
Building Air Exchanges Per Hour: 0.59 (sheltered single storied)
Time: November 21, 2014 1301 hours EST (using computer's clock)

CHEMICAL DATA:

Chemical Name: CHLORINE Molecular Weight: 70.91 g/mol
AEGL-1 (60 min): 0.5 ppm AEGL-2 (60 min): 2 ppm AEGL-3 (60 min): 20 ppm
IDLH: 10 ppm
Ambient Boiling Point: -30.2° F
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 6 miles/hour from SE at 3 meters
Ground Roughness: urban or forest Cloud Cover: 3 tenths
Air Temperature: 35° F Stability Class: C
No Inversion Height Relative Humidity: 37%

SOURCE STRENGTH:

Leak from hole in horizontal cylindrical tank
Non-flammable chemical is escaping from tank
Tank Diameter: 8 feet Tank Length: 33 feet
Tank Volume: 12,408 gallons
Tank contains liquid Internal Temperature: 35° F
Chemical Mass in Tank: 75.7 tons Tank is 100% full
Circular Opening Diameter: 2.5 feet
Opening is 12 inches from tank bottom
Release Duration: 1 minute
Max Average Sustained Release Rate: 2,510 pounds/sec
(averaged over a minute or more)
Total Amount Released: 150,391 pounds
Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:

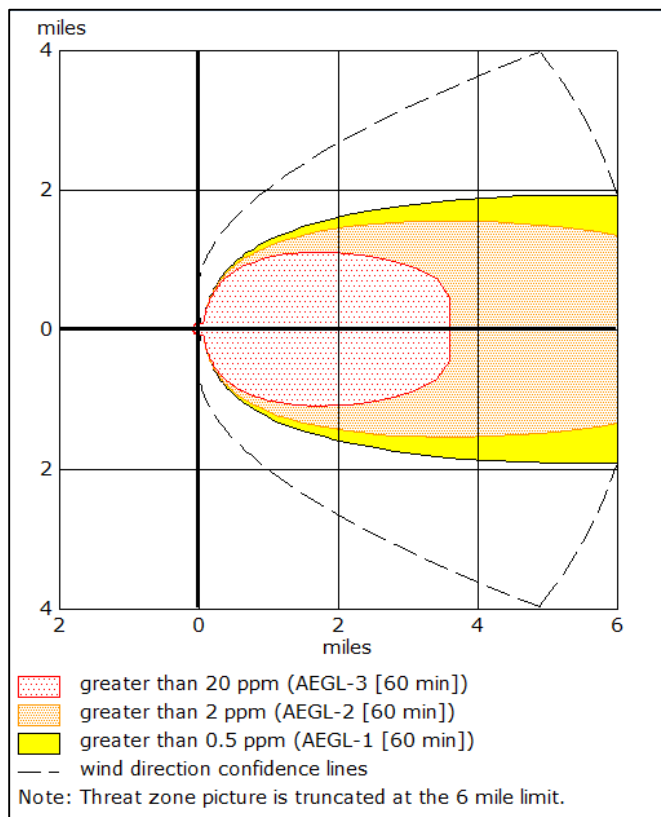
Model Run: Heavy Gas
Red : 3.6 miles --- (20 ppm = AEGL-3 [60 min])
Orange: greater than 6 miles --- (2 ppm = AEGL-2 [60 min])
Yellow: greater than 6 miles --- (0.5 ppm = AEGL-1 [60 min])

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

- AEGL 1: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
- AEGL 2: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- AEGL 3: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

According to the ALOHA parameters, approximately 2,510 pounds of material would be released per second. The image in Figure 5-29 depicts the plume footprint generated by ALOHA.

Figure 5-29: Plume Footprint Generated by ALOHA

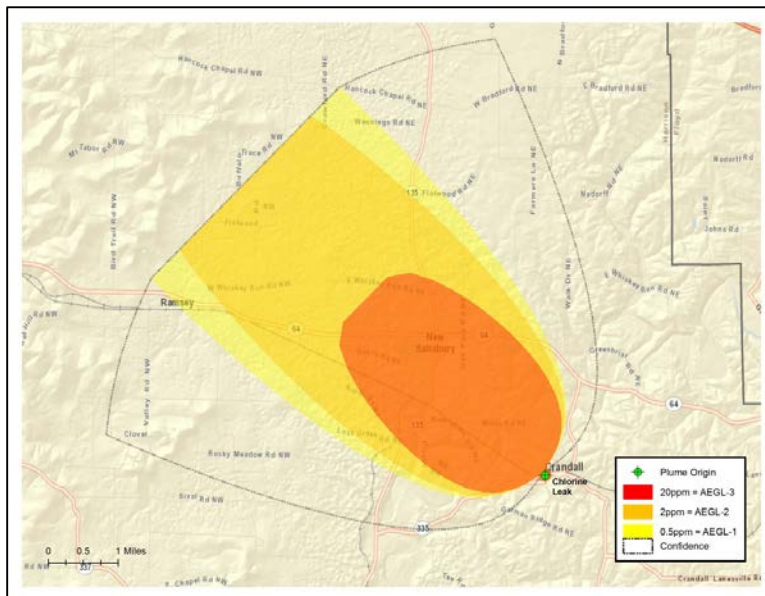


As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). For the purpose of clarification, this report will designate each level of concentration as a specific zone. The zones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

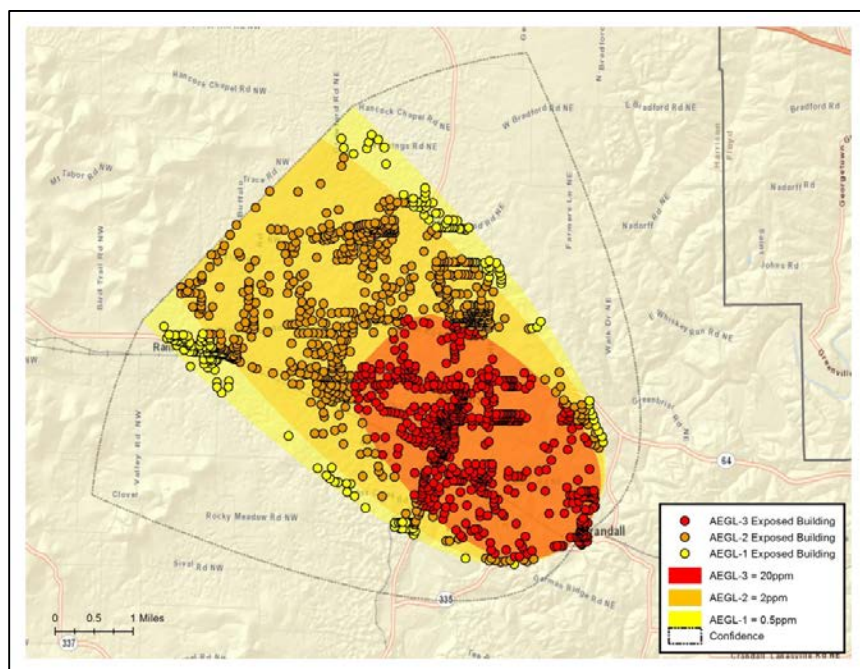
- **Zone 1 (AEGL-3):** The red buffer (≥ 20 ppm) extends approximately 3.5 miles from the point of release after one hour.
- **Zone 2 (AEGL-2):** The orange buffer (≥ 2 ppm) extends more than six miles from the point of release after one hour.
- **Zone 3 (AEGL-1):** The yellow buffer (≥ 0.5 ppm) extends more than six miles from the point of release after one hour.
- **Confidence Lines:** The dashed lines depict the level of confidence in which the exposure zones will be contained. The ALOHA model is 95% confident that the release will stay within this boundary.

The image in Figure 5-30 depicts the plume footprint generated by ALOHA. The modeling program, however, does not account for terrain. In portions of southern Indiana, the terrain is very hilly. Because chlorine vapor is a very heavy gas, the vapor cloud will follow the contours of the land rather than flowing over the hills as depicted below. In this specific scenario, more of the vapor may flow down Indian Creek rather than toward New Salisbury.

Figure 5-30: ALOHA Plume Footprint Overlaid in ArcGIS



The Harrison County Building Inventory was added to ArcMap and overlaid with the plume footprint. The Building Inventory was then intersected with each of the four footprint areas to classify each point based upon the plume footprint in which it is located. Figure 5-31 depicts the Harrison County Building Inventory after the intersect process.

Figure 5-31: Harrison County Building Inventory Classified By Plume Footprint

Results

By summing the building inventory within all AEGL zones (Zone 1: 0.5 ppm, Zone 2: 2 ppm, and Zone 3: 20 ppm), the GIS overlay analysis predicts that as many as 1,404 buildings and 2,548 people could be exposed. The population is estimated based on 2.5 people per residence.

Building Inventory Exposure

The results of the analysis against the building Inventory are listed in Tables 5-31 through 5-34. Table 5-31 summarizes the results of the chemical spill by combining all AEGL zones.

Table 5-31: Estimated Exposure for all Zones (all ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	301	\$38,147,000
Commercial	0	53	\$14,668,000
Education	0	4	\$22,972,000
Government	0	6	\$488,000
Industrial	0	4	\$9,890,000
Religious	0	17	\$5,383,000
Residential	2,548	1,019	\$109,032,000
Total	2,548	1,404	\$200,580,000

The following tables summarize the results of the chemical spill for each zone separately. Values represent only those portions of each zone that are not occupied by other zones.

Table 5-32: Estimated Exposure for Zone 3 (20 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	96	\$12,706,000
Commercial	0	33	\$10,047,000
Education	0	0	\$0
Government	0	5	\$465,000
Industrial	0	3	\$9,848,000
Religious	0	10	\$3,506,000
Residential	1,120	448	\$47,744,000
Total	1,120	595	\$84,315,000

Table 5-33: Estimated Exposure for Zone 2 (2 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	172	\$20,918,000
Commercial	0	9	\$1,975,000
Education	0	4	\$22,972,000
Government	0	1	\$23,000
Industrial	0	0	\$0
Religious	0	3	\$685,000
Residential	1,078	431	\$45,071,000
Total	1,078	620	\$91,645,000

Table 5-34: Estimated Exposure for Zone 1 (0.5 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	33	\$4,523,000
Commercial	0	11	\$2,646,000
Education	0	0	\$0
Government	0	0	\$0
Industrial	0	1	\$42,000
Religious	0	4	\$1,192,000
Residential	350	140	\$16,217,000
Total	350	189	\$24,621,000

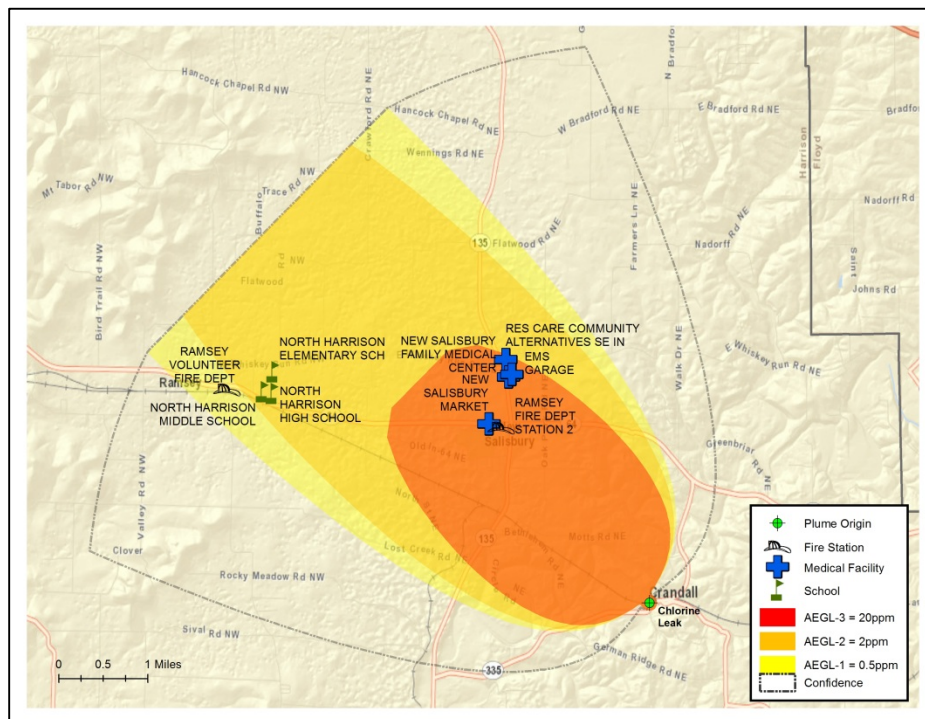
Essential Facilities Exposure

There are nine essential facilities within the limits of the chemical spill plume. The affected facilities are identified in Table 5-35. Their geographic locations are depicted in Figure 5-32

Table 5-35: Essential Facilities within Plume Footprint

Name
Ramsey Volunteer Fire Dept.
Ramsey Volunteer Fire Dept. Station #2
New Salisbury Market
ResCare Community Alternatives SE IN
New Salisbury Family Medical Center
EMS Garage
North Harrison Elementary School
North Harrison Middle School
North Harrison High School

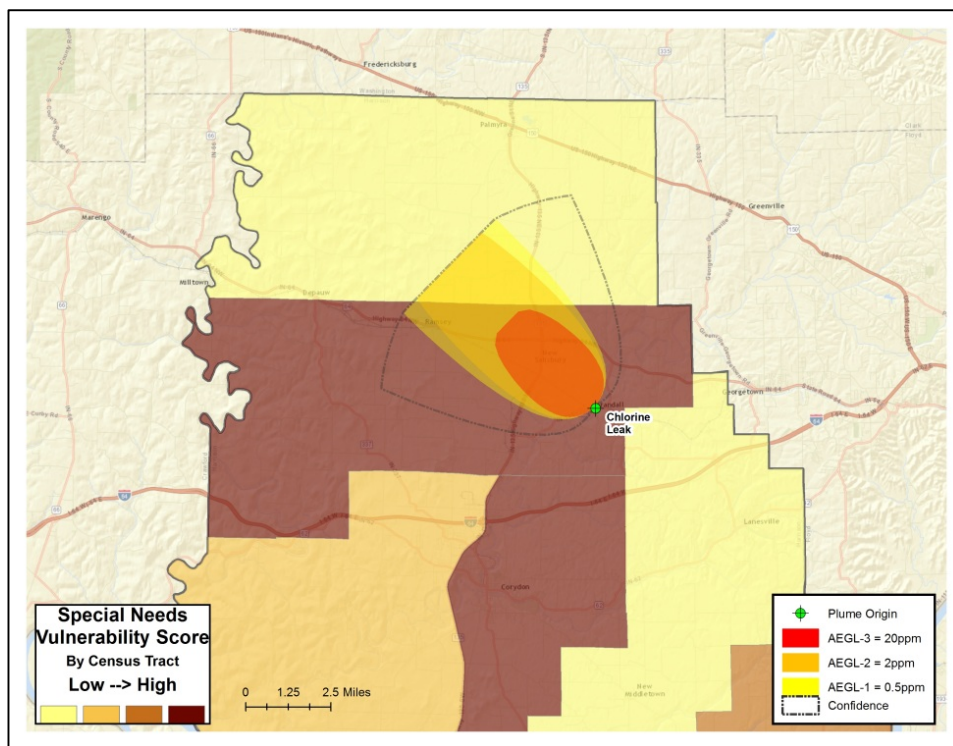
Figure 5-32: Essential Facilities at Greatest Risk



Hazmat Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. The particular scenario modeled involves a chlorine vapor plume in Crandall and New Salisbury. These communities are also located in area with a high Special Needs Vulnerability Score. This particular census tract has a relatively higher proportion of the population with special needs when compared to the rest of the county. Specifically, this census tract has a high proportion of its population in these groups – 13.7% living in poverty, 14.6% 65 years or over, and 16.3% of the population has a disability. These populations will need particular attention in the event of a disaster. Figure 5-33 compares the ALOHA-generated plume with those areas of the county which have higher Special Needs Vulnerability Scores.

Figure 5-33: Hazmat Dangers to Special Needs/Vulnerable Populations



Future Development Trends and Vulnerability to Future Assets/Infrastructure for Hazardous Material Release Hazard

Due to the unpredictability of this hazard, all buildings and infrastructure in Harrison County are at risk of damage including temporary and permanent loss of function.

5.3.7 Extreme Temperatures

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 country, based on the range of average temperatures within the region.

Severe Cold Hazard Definition

What constitutes an extreme cold event, and its effects, varies by region 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° Fahrenheit or below.

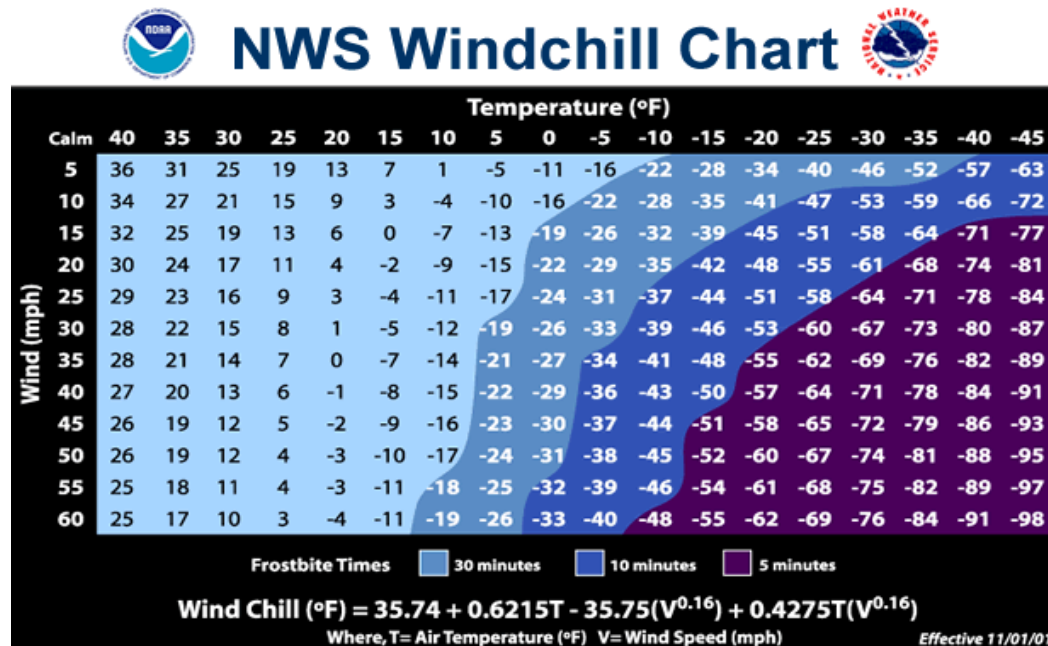
Exposure to cold temperatures—indoors or outdoors—can lead to serious or life-threatening health problems, including hypothermia, cold stress, frostbite or freezing of the exposed extremities, such as fingers, toes, nose, and earlobes. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, individuals who are homeless or stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes)—are at greater risk to the effects of extreme cold.

Extremely cold temperatures often accompany a winter storm, so individuals may also have to cope with power failures and icy roads. Although staying indoors can help reduce the risk of vehicle accidents and falls on the ice, individuals are susceptible to indoor hazards. Homes may become too cold due to power failures or inadequate heating systems. The use of space heaters and fireplaces to keep warm increases the risk of household fires, as well as carbon monoxide poisoning.

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.

In 2001, the NWS implemented a new WCT Index, designed to more accurately calculate how cold air feels on human skin. The index, shown in Figure 5-34, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

Figure 5-34: National Weather Service (NWS) Wind Chill Temperature Index



Each National Weather Service Forecast Office may issue the following wind chill-related products as conditions warrant:

- **Wind Chill Watch:** Issued when there is a chance that wind chill temperatures will decrease to at least 24° F below zero in the next 24-48 hours.
- **Wind Chill Advisory:** Issued when the wind chill could be life threatening if action is not taken. The criteria for this advisory are expected wind chill readings of 15° F to 24° F below zero.
- **Wind Chill Warning:** Issued when wind chill readings are life threatening. Wind chill readings of 25° F below zero or lower are expected.

Summary Vulnerability Assessment

Excessive cold affects mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of extreme cold.

Previous Occurrences for Extreme Cold

Although the NCDC database does not include any reported past occurrences of extreme cold, residents of Harrison County should be prepared for such an event in any given year.

Geographic Location for Extreme Cold Hazard

Extreme cold events are regional in nature. All areas of the state are vulnerable to the risk of excessive cold.

Hazard Extent for Extreme Cold Hazard

Extreme cold events typically occur in the winter months. The extent of extreme cold varies in terms of the Wind Chill Temperature and duration of the event.

Risk Identification for Extreme Cold Hazard

Low Risk  High Risk

The planning team determined that although the probability of an excessive cold hazard is low in Harrison County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.

Vulnerability Analysis for Extreme Cold Hazard

Extreme cold can result in damages to buildings, utilities, and infrastructure, due to the strong winds that often accompany these events. Additionally, extreme cold events often lead to severe short and long term health conditions, or even death. Extreme cold events can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to extreme cold hazards.

Extreme Heat Hazard Definition

Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat wave. Most summers see EHEs in one or more parts of the U.S. East of the Rocky Mountains. They tend to combine both high temperatures and high humidity; although some of the worst heat waves have been catastrophically dry.

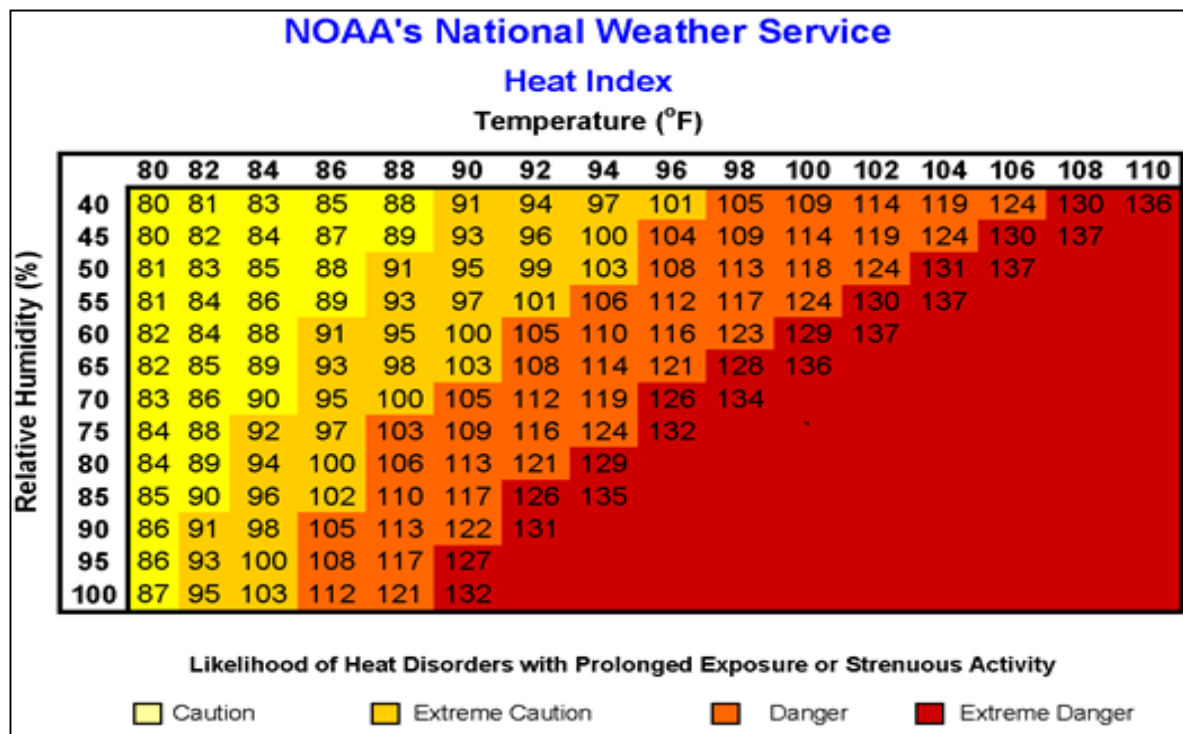
Prolonged exposure to extreme heat may lead to serious health problems, including heat stroke, heat exhaustion, or sunburn. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, pregnant women, the homeless or poor, the overweight, and people with mental illnesses, disabilities, and chronic diseases—are at greater risk to the effects of extreme heat. Depending on severity, duration, and location, EHEs can also trigger secondary hazards, including dust storms, droughts, wildfires, water shortages, and power outages.

Criteria for EHE typically shift by location and time of year, and are dependent on the interaction of multiple meteorological variables (i.e. temperature, humidity, cloud cover.) While this makes it difficult

to define EHEs using absolute, specific measures, there are ways to identify conditions. Some locations evaluate current and forecast weather to identify conditions with specific, weather-based mortality algorithms. Others identify and forecast conditions based on statistical comparison to historical meteorological baselines, e.g. the criterion for EHE conditions could be an actual or forecast temperature that is equal to or exceeds the 95th percentile value from a historical distribution for a defined time period.

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 in Figure 5-35.

Figure 5-35: NWS Heat Index



Source: *Excessive Heat Events Guidebook* (2006), Office of Atmospheric Programs-US Environmental Protection Agency.

Each National Weather Service Forecast Office may issue the following heat-related products as conditions warrant:

- **Excessive Heat Outlooks-** issued when the potential exists for an EHE in the next 3-7 days. An Outlook provides information to those who need considerable lead time to prepare for the event, such as public utility staff, emergency managers, and public health officials.
- **Excessive Heat Watches-** issued when conditions are favorable for an EHE in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain. A Watch provides enough lead time so that those who need to prepare can do so, such as city officials who have excessive heat mitigation plans.
- **Excessive Heat Warnings/Advisories-** issued when an EHE is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

Summary Vulnerability Assessment

Excessive heat affects mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of extreme heat.

Previous Occurrences for Excessive Heat

Although the NCDC database does not include any reported past occurrences of excessive heat, residents of Harrison County should be prepared for such an event in any given year.

Geographic Location for Excessive Heat Hazard

Excessive heat events are regional in nature. All areas of the state are vulnerable to the risk of excessive heat.

Hazard Extent for Excessive Heat Hazard

Excessive heat events typically occur in the summer months. The extent of excessive heat events varies in terms of the Heat Index and duration of the event. The duration will vary although it could span up to several months.

Risk Identification for Excessive Heat Hazard

Low Risk  High Risk

The planning team determined that although the probability of an excessive heat hazard is low in Harrison County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.

Vulnerability Analysis for Excessive Heat Hazard

Extreme heat may lead to severe short and long term health conditions, or even death. Extreme heat events are widespread and can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to extreme heat hazards. The elderly are particularly vulnerable to the effects of extreme heat; approximately 14% of Harrison County's population is aged 65 or over. A secondary hazard that may be produced by extreme heat is drought.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Excessive Heat Hazard

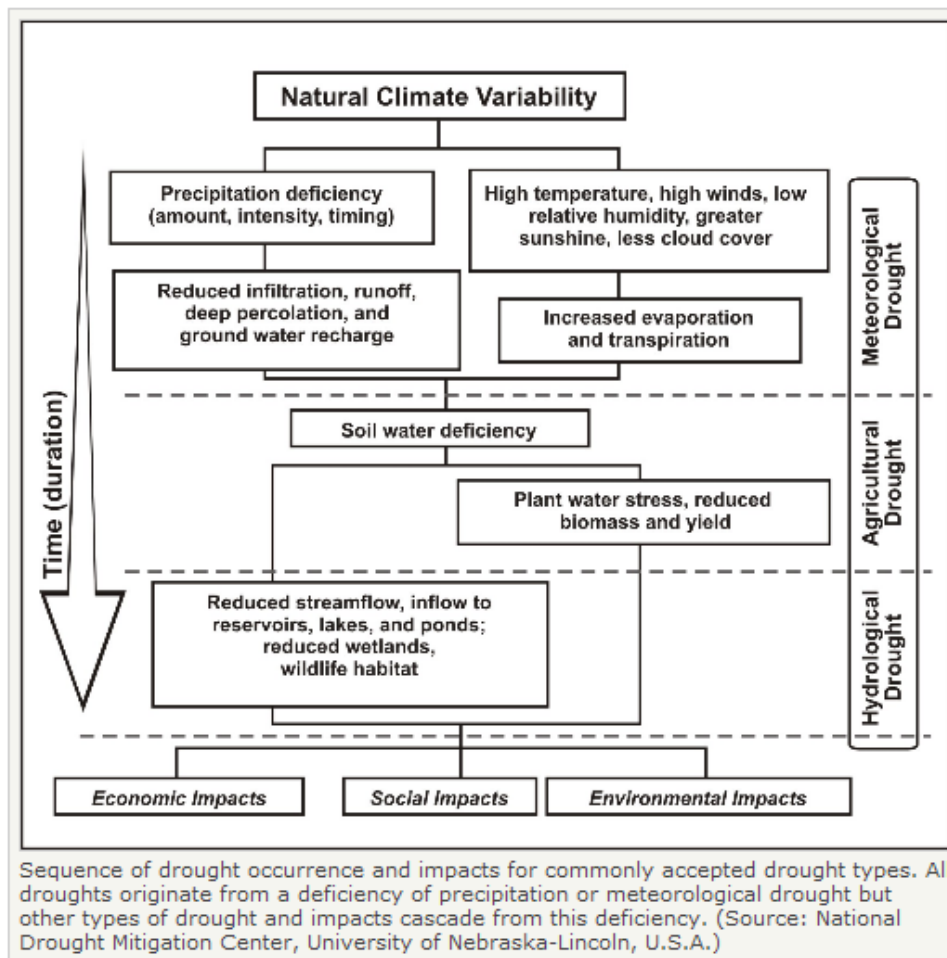
Unlike other natural hazard events, extreme heat events leave little to no physical damage to communities; however, they can lead to severe short and long-term health conditions, or even death. Extreme heat events can also impact environmental and economic vulnerabilities as a result of water shortages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

5.3.8 Drought Hazard

The meteorological condition that creates a drought is below normal rainfall. However, excessive heat can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

There are several common types of droughts including meteorological, hydrological, agricultural, and socioeconomic. Figure 5-36 describes the sequence of drought occurrence and impacts of drought types.

- **Meteorological:** Defined by the degree of dryness (as compared to an average) and the duration of the dry period. These are region-specific and only appropriate for regions characterized by year-round precipitation.
- **Hydrological:** Associated with the effects of periods of precipitation shortfalls (including snow) on surface or subsurface water supply, e.g. stream flow, reservoir and lake levels, and groundwater. Impacts of hydrological droughts do not emerge as quickly as meteorological and agricultural droughts. For example, deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months.
- **Agricultural:** Links characteristics of meteorological or hydrological drought to agricultural impacts. An agricultural drought accounts for the variable susceptibility of crops during different stages of crop development from emergence to maturity.
- **Socioeconomic:** Links the supply and demand of some economic good, e.g. water, forage, food grains, and fish, with elements of meteorological, hydrological, or agricultural droughts. This type of drought occurs when demand for an economic good exceeds supply as a result of weather-related shortfall in water supply.

Figure 5-36: Sequence of Drought Occurrence and Impacts

Drought is a climatic phenomenon that occurs in Harrison County. The meteorological condition that creates a drought is below-normal rainfall. Excessive heat, however, can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low-rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

In the past decade, the US has continued to consistently experience drought events with economic impacts greater than \$1 billion; FEMA estimates that the nation's average annual drought loss is \$6 billion to \$8 billion. For Indiana alone, the National Drought Mitigation Center reported hundreds of drought impacts from June 2010 through October 2010 ranging from water shortage warnings to reduced crop yields and wild fires.

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. Drought brings several different problems that must be addressed. The quality and quantity of crops, livestock, and other agricultural assets will be affected during a drought. Drought

adversely can impact forested areas, leading to an increased potential for extremely destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that hover 10°F or more above the average high for the area and last for several weeks. Extreme heat can occur in humid conditions when high atmospheric pressure traps the damp air near the ground or in dry conditions, which often provoke dust storms.

The Palmer Drought Severity Index (PDSI), developed by W.C. Palmer in 1965, is a soil moisture algorithm utilized by most federal and state government agencies to trigger drought relief programs and responses. The PDSI—shown in Table 5-36—is based on the supply-and-demand concept of the water balance equation, taking into account more than just the precipitation deficit at specific locations. The objective of the PDSI is to provide standardized measurements of moisture, so that comparisons can be made between locations and periods of time—usually months. The PDSI is designed so that a -4.0 in South Carolina has the same meaning in terms of the moisture departure from a climatological normal as a -4.0 does in Indiana.

Table 5-36: Palmer Drought Severity Classifications

Classification Rating	Classification Description
4.0 or greater	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

Previous Occurrences for Drought Hazard

Although the NCDC database reports numerous drought events that affected Indiana in the past five years, there are no reports of drought directly impacting Harrison County.

Geographic Location for Drought Hazard

Droughts are regional in nature. All areas of the United States are vulnerable to the risk of drought.

Hazard Extent for Drought

Droughts can be widespread or localized events. The extent of droughts varies both in terms of the extent of the heat and range of precipitation.

Risk Identification for Drought Hazard

Low Risk  High Risk

The planning team determined that although the probability of drought hazard is low in Harrison County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.

Vulnerability Analysis for Hazard

Droughts affect mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of drought.

Drought impacts can be an equally distributed threat across the entire jurisdiction; therefore the county is vulnerable to this hazard and can expect the same impacts within the affected area. The entire population and all buildings have been identified as at risk.

Facilities

All facilities included in this plan are vulnerable to drought. These facilities will encounter many of the same impacts as any other building within the jurisdiction, which should involve only minor damage. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather. A complete list of essential and critical facilities and their locations is included as Appendix C.

Building Inventory

The other buildings within the county can all expect the same impacts similar to those discussed for the essential and critical facilities. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather.

Infrastructure

During a drought the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with a fire that could result from the hot, dry conditions. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these infrastructure components could be impacted during a drought.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Drought Hazard

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

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

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

5.3.9 Dam/Levee Failure Hazard

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

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, this false sense of security leads to new construction, added infrastructure, and increased population over time. Levees in particular are built to hold back flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that

maximum is exceeded by more than the design safety margin, the levee will be overtopped or otherwise fail, inundating communities occupying 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 ensure their integrity. Many structures across the US have been under-funded or otherwise neglected, leading to an eventual day of reckoning in the form either of realization that the structure is unsafe or, sometimes, an actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Previous Occurrences for Dam and Levee Failure

There are no records or local knowledge of any dam or certified levee failure in the county.

Geographic Location for Dam and Levee Failure

The Indiana Department of Natural Resources identified 14 dams in Harrison County. Table 5-37 summarizes the dam information.

Table 5-37: Indiana Department of Natural Resources Dams

Dam Name	River/Stream	City	Hazard Level	EAP
St Peter's Lake Dam	Mosquito Creek	Buena Vista	Low	No
Indian Creek Dam No 1	Indian Creek	Corydon	Low	No
Corydon Water Works Dam No 2	Indian Creek	Corydon	Low	No
Corydon Water Works Dam No 3	Indian Creek	Corydon	Low	No
White Cloud Dam	Unidentified	Corydon	Low	No
Lutheran Laymen's Lake Dam	Tributary – Little Indian Creek	Corydon	Low	No
Gehlbach Lake Dam	Unidentified	Crandall	Low	No
Pine Springs Lake Dam	Tributary - Little Indian Creek	Lanesville	Low	No
Pinestone Lake Dam	Panther Creek	Lanesville	High	No
Seven Springs Lake Dam	Middle Fork Buck Creek	Lanesville	Low	No
Pine Lake Dam	Unidentified	Leavenworth	Low	No
Lucas Corporation Dam	Big Run	Mauckport	Low	No
Milltown Dam	Blue River	Milltown	Low	No
Buffalo Trace Lake Dam	Unidentified	Palmyra	Significant	No

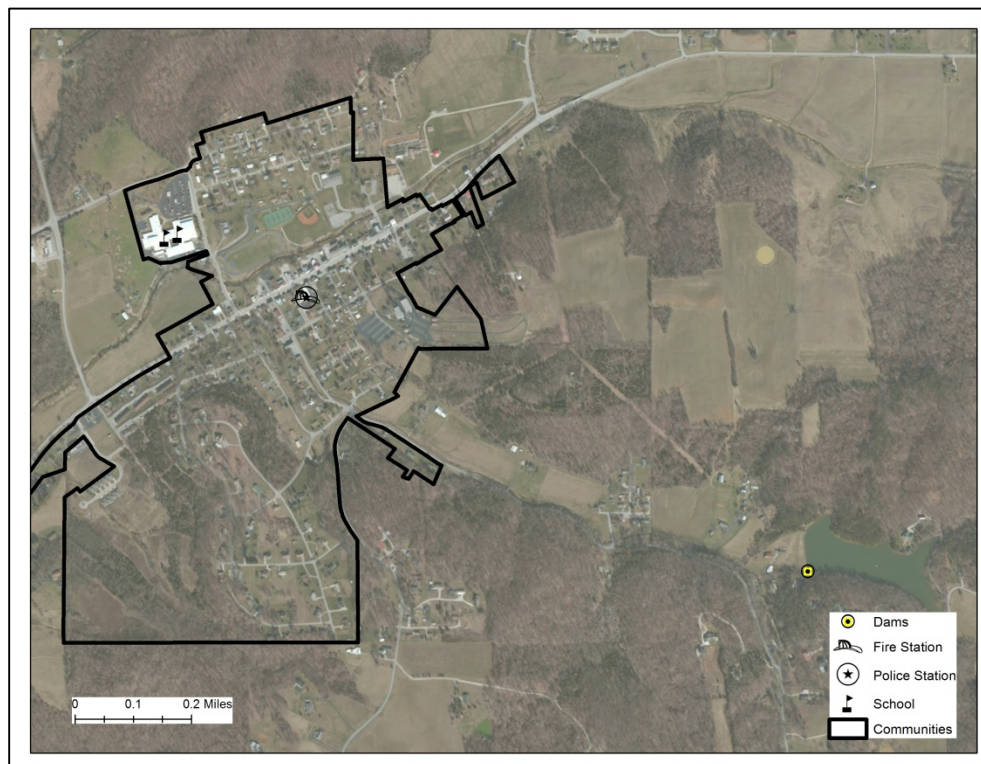
Although some agricultural and private levees do exist in Harrison County, a review of the US Army Corp of Engineers resource files identified no certified levees.

Hazard Extent for Dam and Levee Failure

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

According to the IDNR, two dams in Harrison County are classified as high or significant hazard. The dam classified as high hazard is Pinestone Lake Dam which is approximately $\frac{3}{4}$ mile upstream from Lanesville. Figure 5-37 shows Pinestone Lake Dam in relation to the town. The "significant" dam is the Buffalo Trace Lake Dam which is located in Palmyra.

Figure 5-37: High Hazard Dam – Lanesville



None of the dams in Harrison County have an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana, but is strongly recommended in the 2003 *Indiana Dam Safety & Inspection Manual*.

Risk Identification for Dam/Levee Failure



Based on historical information, the probability of a dam failure that would impact Harrison County is low. The planning team determined that the potential impact of a dam failure is minimal to moderate; therefore, the overall risk of a flood hazard for Harrison County is medium low.

Vulnerability Analysis for Dam and Levee Failure

In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the "one-percent-annual chance" flood.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

The county recognizes the importance of maintaining its future assets, infrastructure, and residents. Inundation maps can highlight the areas of greatest vulnerability in each community.

5.3.10 Landslide Hazard/Ground Failure

According to the USGS, the term ground failure is a general reference to landslides, liquefaction, lateral spreads, and any other consequence of land shaking that affects ground stability. For ground failure this plan will only address land subsidence and landslides.

Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The term landslide is a general designation for a variety of downslope movements of earth materials. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions. There are three main types of landslides that occur in Indiana: 1) rotational slump, 2) earthflow, and 3) rockfall.

Land Subsidence

Southern Indiana has a network of underground caves formed by what is known as karst landscape. According to the Indiana Geological Survey, karst landscapes usually occur where carbonate rocks (limestone and dolostone) underlie the surface. Freely circulating, slightly acidic water in the soil slowly dissolves the bedrock causing karst formations. These karst formations have the potential to collapse under the weight of the ground above them creating a sinkhole. Ground failure of this nature is known as

land subsidence. Any structures built above a karst formation could potentially be subject to land subsidence and collapse into a resulting sinkhole.

Landslides

A landslide is a rapid movement of surface land material down a slope. The main causes of landslides include:

- Earthquake or other significant ground vibration
- Slope failure due to excessive downward movement, gravity
- Groundwater table changes (often due to heavy rains)

Preventive and remedial measures include modifying the landscape of a slope, controlling the ground water, constructing tie backs, spreading rock nets, etc.

The USGS claims that landslides are a significant geologic hazard in the United States causing \$1 to 2-billion in damage and over 25 fatalities per year. The expansion of urban and recreational development into hillside areas has resulted in an increasing number of properties subject to damage as a result of landslides. Landslides commonly occur in connection with other major natural disasters such as earthquakes, wildfires, and floods.

Although landslides may not be preventable, their effect on people and property can be mitigated. Mitigation includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Investing in preventive mitigation steps now such as planting ground cover (low growing plants) on slopes, or installing flexible pipe fittings to avoid gas or water leaks, will help reduce the impact of landslides and mudflows in the future.¹⁸

Previous Occurrences for Landslide/Ground Failure

While there have been no major incidents involving landslide or ground failure in Harrison County, minor events have occurred throughout the area.

Geographic Location for Landslide/Ground Failure

Harrison County is located directly over an area of karst landscape which covers much of south-central Indiana. As a result, sinkholes and caves which are associated with a karst landscape are scattered throughout the county. Due to a history of massive ground clearing, this area is prone to severe erosion. The regional locations of karst landscape are included in Figure 5-38.

¹⁸ <http://earthquake.usgs.gov/learn/glossary/?termID=105>

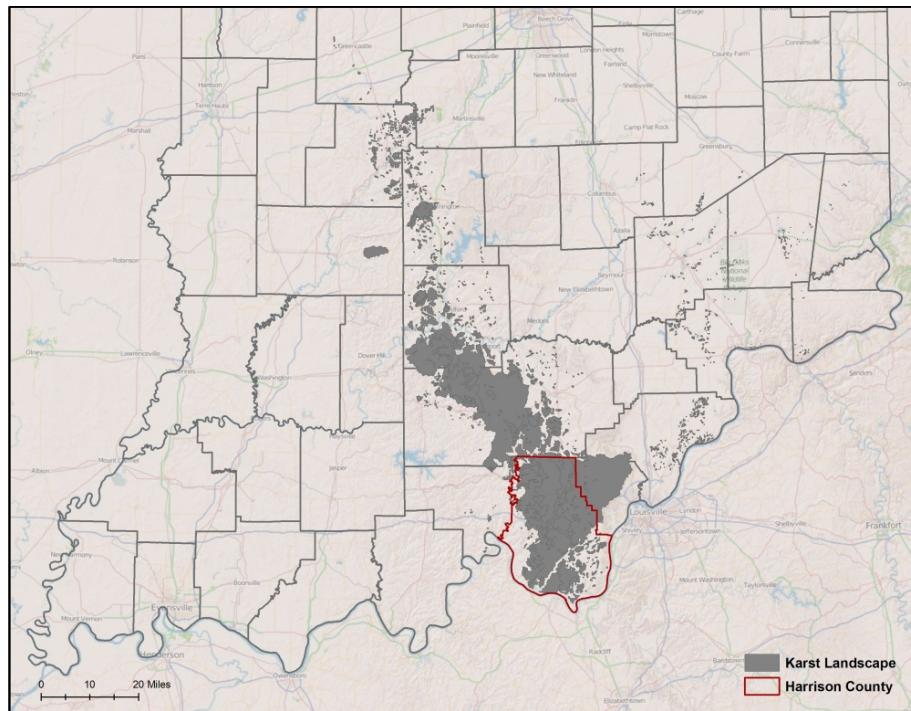
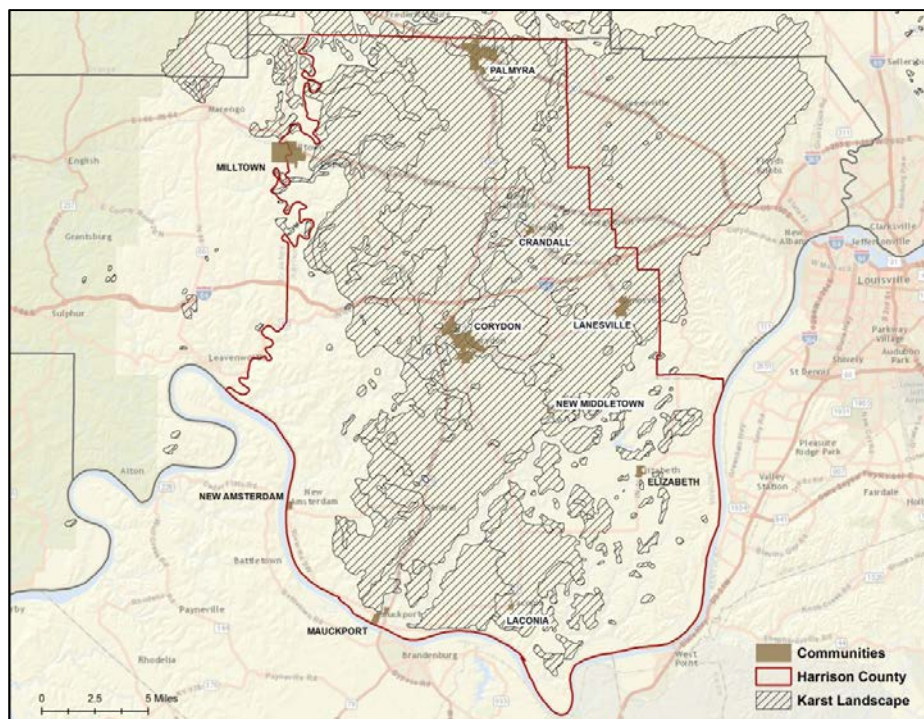
Figure 5-38: Regional Karst Map

Figure 5-39 illustrates the intersection of populated areas and karst in Harrison County. As can be seen, multiple communities in Harrison County lie above known areas of karst. These communities stand a greater risk for subsidence events than do the other communities.

Figure 5-39: Karst Landscape and Populated Areas in Harrison County

Hazard Extent for Landslide/Ground Failure

The extent of the ground failure hazard is closely related to development near the regions that are at risk. The extent will vary within these areas depending on the potential of elevation change, as well as the size of the underground structure. The hazard extent of ground failure is spread throughout the county in various concentrated areas.

Risk Identification for Landslide/Ground Failure

Low Risk  High Risk

Based on historical information, the probability of ground failure is medium. In Meeting #1, the planning team determined that the potential impact of a ground failure event is minimal; therefore, the overall risk of ground failure for Harrison County is low.

Vulnerability Analysis for Landslide/Ground Failure

Because of the difficulty predicting which communities are at risk of ground failure, the entire population and all buildings have been identified as at risk. As a result this plan will consider all buildings as vulnerable. The existing buildings and infrastructure of Harrison County are discussed in types and number below.

Facilities

Any facility built above karst landscape or near a steep slope could be vulnerable to land subsidence. An essential or critical facility will encounter many of the same impacts as any other building within the affected area. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases the failure of building foundations causes cracking of critical structural elements. Table 5-38 lists the types and numbers of all the essential facilities in the area. Critical and essential facilities are included in Appendix C.

Table 5-38: Essential Facilities of Harrison County

Category	Number of Facilities
Care Facilities	22
Emergency Operations Centers	2
Fire Stations	14
Police Stations	3
Schools	21
Total	62

Building Inventory

The buildings within the county can all anticipate the same impacts, similar to those discussed for critical facilities. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor

cracks in walls due to a small amount of settling, while in more severe cases the failure of building foundations causes cracking of critical structural elements.

Infrastructure

In the area of Harrison County affected by land subsidence, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with land collapsing directly beneath them in a way that undermines their structural integrity. Since all infrastructures in the affected area is equally vulnerable, it is important to emphasize that any number of these items could become damaged as a result of significant land subsidence. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (e.g. loss of power or gas to community); and railway failure from broken or impassable railways. In addition, bridges could fail or become impassable causing risk to traffic.

Future Development Trends and Vulnerability to Future Assets/Infrastructure for Ground Failure

All future communities, buildings, and infrastructure will remain vulnerable to ground failure in the areas of Harrison County where karst landscape features exist and in areas of significant elevation change. In areas with higher levels of population, the vulnerability is greater than in open areas with no infrastructure demands.

Karst-related subsidence or landslides may affect several locations within the county; therefore buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Currently, Harrison County reviews new developments for compliance with the local zoning ordinance. Newly planned construction should be reviewed with the geological maps to minimize potential subsidence structural damage.

Section

6

Mitigation Strategies

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Mitigation actions and projects should be based on a well-constructed risk assessment, provided in Section 5 of this plan. Mitigation should be an ongoing process, adapting over time to accommodate a community's needs.

6.1 Community Action Potential Index (CAPI)

FEMA Region V mitigation planners developed the Community Action Potential Index (CAPI) in 2013 as a tool to prioritize communities for Risk MAP initiatives and mitigation activities. CAPI includes a number of indicators that, when weighted, sum to a total score for each community in the state. This helps federal and state planners determine which communities would be most likely to advance mitigation strategies through the Risk MAP program.

CAPI currently includes index scores for every Indiana community, a total of 661. Of those communities, slightly more than half (325) have been deployed, which means that Risk MAP activities have occurred or are in the process of occurring. All of Harrison County's incorporated communities are currently deployed.

Table 6-1 lists the Indiana communities with the highest CAPI scores (highest possible score is 131). The higher the score, the higher the potential risk the community faces in the event of a disaster. But also, a high score indicates that the community has the potential to move mitigation activities forward. For example, communities that participate in the NFIP's Community Rating System and/or have approved local mitigation plans will be assigned a higher CAPI score.

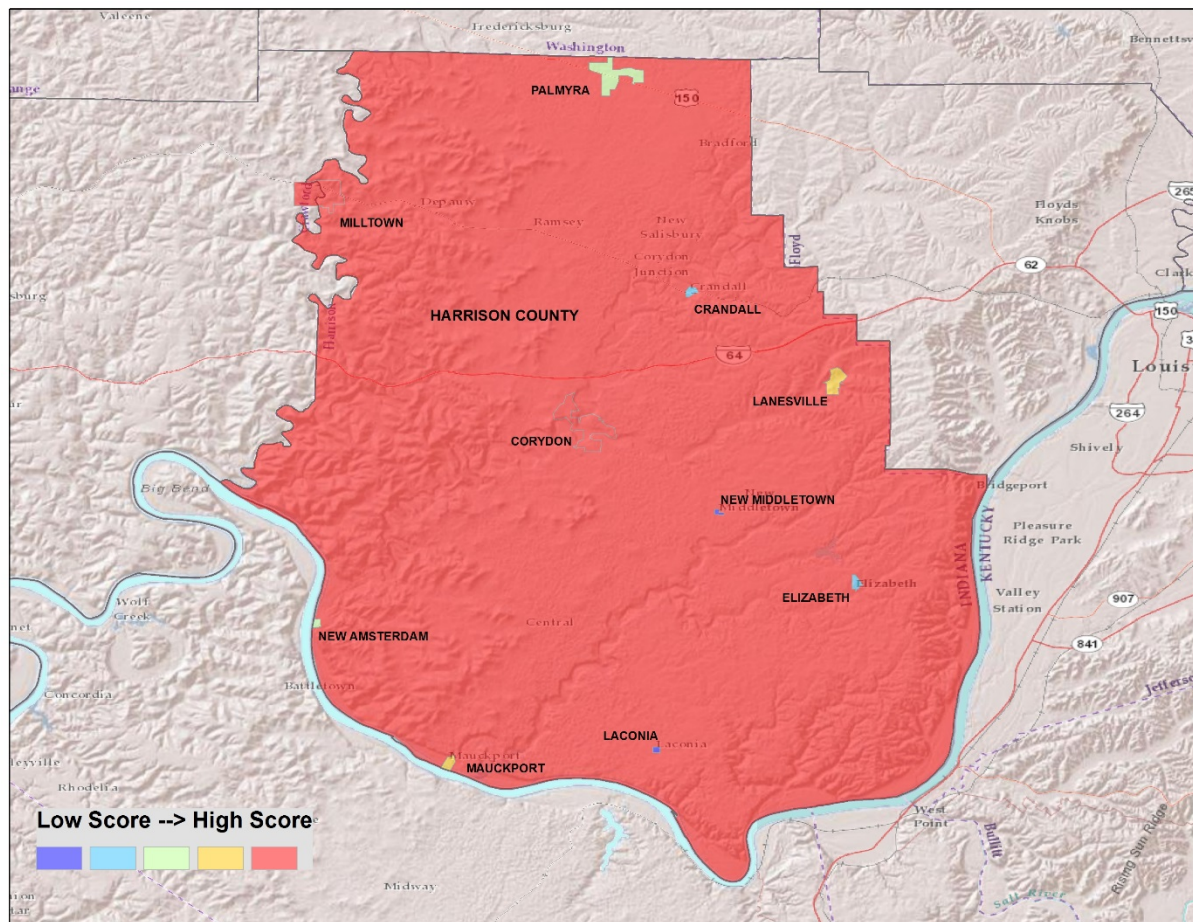
Table 6-1: Indiana Communities with Highest CAPI Scores

County Name	Community	Deployed?	CAPI Score
Marion	City of Indianapolis	Yes	92.24
Vanderburgh	Vanderburgh County	No	85.14
Allen	City of Fort Wayne	No	83.62
Bartholomew	City of Columbus	Yes	83.20
Hamilton	City of Noblesville	Yes	79.43

Table 6-2 lists Harrison County communities' high risk factors as well as their composite CAPI scores. The arrows illustrate how the community compares to the state average. As shown in Table 6-2 and Figure 6-1 on the following page, Harrison County (unincorporated) has the highest CAPI score.

Table 6-2: Harrison County Communities' CAPI Scores

Community Name	Total CAPI Score		% Community within SFHA		Insurance claims \$		Insurance claims #		Repetitive loss \$		Repetitive loss #		Individual Assistance \$ per Capita	
Harrison County	▲	58.55	▼	5.69	▲	\$1,294,169	▲	80	▲	\$492,659.90	▲	10		-
Corydon	▲	38.64	▲	14.25	▲	\$350,581	▲	34	▼	\$0.00	▼	0	▲	\$15.57
Mauckport	▲	29.84	▲	70.16	▼	\$8,248	▼	3	▼	\$0.00	▼	0	▲	\$166.02
Lanesville	▼	20.75	▼	3.96	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$25.10
Palmyra	▼	17.09	▼	0.0	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$34.97
New Amsterdam	▼	16.14	▲	66.89	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$0.00
Crandall	▼	13.11	▲	12.73	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$0.00
Elizabeth	▼	13.05	▼	0.0	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▲	\$152.29
Laconia	▼	13.01	▼	0.0	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$34.45
New Middletown	▼	3.01	▼	0.0	▼	\$0.00	▼	0	▼	\$0.00	▼	0	▼	\$0.00
KEY:														
Better than State Average ▼														
Worse than State Average ▲														

Figure 2: CAPI Scores for Harrison County and Jurisdictions

6.2 Plans and Ordinances

Harrison County and its communities have several ordinances, listed in Table 6-3, that are relevant to emergency management and disaster planning.

Table 6-3: Harrison County Plans and Ordinances

Community	Ordinance/Plan
Harrison County/ Corydon	Harrison County Comprehensive Plan, 2009 Harrison County Zoning Ordinance, Amended 2009
Lanesville	Lanesville Interchange Master Plan
New Middletown	Middletown Town Ordinances, Title XV Land Use

The Harrison County Plan Commission is responsible for planning orderly development throughout the County. This office is responsible for zoning, subdivision control, variance and special exception requests, building permits and building inspections. Harrison County has an erosion control plan as an element of the Subdivision Control Ordinance. As part of the Zoning Ordinance, Harrison County will continue to implement erosion control requirements, among others, to mitigate adverse land use effects.

6.3 Mitigation Goals

The MHMP planning team members understand that although hazards cannot be eliminated altogether, Harrison County can work toward building disaster-resistant communities. Following are a list of goals, objectives, and actions. The goals represent long-term, broad visions of the overall vision the county would like to achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

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

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

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

Objective C: Minimize the amount of infrastructure exposed to hazards.

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

Objective E: Improve emergency sheltering in the community.

Goal 2: Create new or revise existing plans/maps for the community

Objective A: Support compliance with the NFIP.

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

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

Goal 3: Develop long-term strategies to educate community residents on the hazards affecting their county

Objective A: Raise public awareness on hazard mitigation.

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

6.4 Mitigation Actions and Projects

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

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

MHMP members were presented with the task of individually listing potential mitigation activities using the FEMA evaluation criteria. The MHMP members presented their mitigation ideas to the team. The evaluation criteria (STAPLE+E) involved the following categories and questions.

Social:

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

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?

Administrative:

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

Political:

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

Legal:

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

Economic:

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

Environmental:

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

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step was to review the strategies developed for the 2008 MHMP. The planning team was presented with the task of evaluating the 2008 mitigation strategies and documenting the status of each activity for their jurisdiction. Priorities were also reviewed using the same criteria as the 2008 plan.

Then the team brainstormed a new list of strategies, which in some cases, reiterated 2008 strategies that were not implemented due to lack of funding or resources. Finally, the team decided, based upon many factors, which actions should be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions was important. Some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action.

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

Table 6-4: STAPLE+E Planning Factors

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

6.5 Multi-Jurisdictional Mitigation Strategy and Actions

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

Each of the ten incorporated communities, within and including Harrison County, was invited to participate in a brainstorming session in which goals, objectives, and strategies were discussed and prioritized. Each participant in this session was armed with possible mitigation goals and strategies provided by FEMA, as well as information about mitigation projects discussed in neighboring communities. All potential strategies and goals that arose through this process are included in this section.

This section includes a comprehensive list of all mitigation strategies from the 2008 plan, as well as new strategies developed for the 2015 update. We categorized the progress of each strategy using the following symbols and guidelines.



Mitigation action has been identified and prioritized. Funding has not yet been secured.



Mitigation action is in early phase of implementation. Community has identified source of funding and submitted project proposal. Implementation will begin once funding is secured.



Mitigation project is in progress or ongoing. Funding and/or resources are available to complete it.







Mitigation project is complete.



Table 6-5 on the following pages lists completed strategies followed by incomplete and new mitigation strategies in order of priority. Assuming funding is available, it is the intention that high priority strategies will be implemented within one year of plan adoption, medium priorities will be implemented within three years, and low priorities will be implemented within five years.



The Harrison County Emergency Management Agency will be the local champion for the mitigation actions. The County Commissioners and the city and town councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified actions.



Table 6-5: Harrison County Mitigation Strategies



Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
Obtain back-up generators for critical facilities (especially the EOC facility) Action developed in 2008 MHMP	 Completed	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input checked="" type="checkbox"/> Drought <input checked="" type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	MHMP Team Regional Planning Commission County Commissioners Harrison County EMA	
Expand the warning siren coverage within the county where needed. Action developed in 2008 MHMP	 <i>Funding secured; action in progress</i> Completed – There are currently 27 warning sirens however Harrison County leaders recognize this as an on-going process to insure the continued safety of residents and visitors.	<input checked="" type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	Harrison County EMA Harrison County Commissioners	Harrison County



Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Continued distribution of weather radios</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding secured; action in progress</i></p> <p>Completed – To date, the EMA has distributed over 300 weather radios. The EMA recognize this as a necessary on-going process to insure the continued safety of residents.</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input checked="" type="checkbox"/> Drought <input checked="" type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>MHMP Team</p> <p>Regional Planning Commission</p> <p>County Commissioners</p> <p>Harrison County EMA</p>	FEMA
<p>Municipal acquisition of property that is at risk to hazards</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding secured; action in progress</i></p> <p>Completed – Property in Corydon floodplain purchased. Harrison County community leaders recognize this is an on-going process to insure the continued safety of residents.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>MHMP Team</p> <p>Regional Planning Commission</p> <p>County Commissioners</p> <p>Harrison County Planning Dept</p>	FEMA



Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Encourage watershed/ storm water management through planning</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding secured; action in progress</i></p> <p>Completed –Harrison County leaders recognize this as a necessary on-going process to insure the continued safety of residents.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>MHMP Team</p> <p>Regional Planning Commission</p> <p>County Commissioners</p> <p>Harrison County Planning Dept.</p> <p>Harrison County Sewer/ Storm Water</p>	
<p>Increase training for first responders</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding secured; action in progress</i></p> <p>Completed –Harrison County leaders recognize this as a necessary on-going process to insure the continued safety of residents.</p>	<input type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>MHMP Team</p> <p>Regional Planning Commission</p> <p>County Commissioners</p> <p>Harrison County EMA.</p>	Local Resources



Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Analyze the safety status of critical facilities</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding secured; action in progress</i></p> <p>Completed –Harrison County community leaders recognize this as a necessary on-going process to insure the continued safety of residents.</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input checked="" type="checkbox"/> Drought <input checked="" type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County 	<p>Regional Planning Commission</p> <p>Harrison County Commissioners</p> <p>Harrison County Planning Dept.</p>	<p>Harrison County Commissioners</p>
<p>Work with neighboring communities to develop mutual aid agreements</p> <p>Action developed in 2008 MHMP</p>	 <p><i>Funding proposed; not yet secured</i></p> <p>This is a high priority for the County since current emergency efforts are limited. Agreements are in progress with Louisville Metro and Floyd County</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input checked="" type="checkbox"/> Drought <input checked="" type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County 	<p>Harrison County EMA</p>	




Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Examine the feasibility of purchasing a reverse 911 system for alerting Harrison County's residence during a tornado or severe thunderstorm event</p> <p>Action originally developed in 2008 MHMP</p>	 <p><i>Funding proposed; not yet secured</i></p> <p>Number one priority for Harrison County with a high priority. Harrison County emergency management leaders have completed their study and have chosen a vendor. Funding is required</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input checked="" type="checkbox"/> Drought <input checked="" type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Harrison County Commissioners</p> <p>Harrison County EMA.</p> <p>Red Cross</p>	<p>Grant</p> <p>Harrison County Funding</p> <p>E911 monies</p>
<p>Update development standards to address street drainage issues</p> <p>Action originally developed in 2008 MHMP</p>	 <p><i>Funding proposed; not yet secured</i></p> <p>Street drainage has been a long standing concern for Harrison County and is a high priority. In many places culverts have been built but are not capable of handling heavy rain storms. A storm water project has been initiated but funding has not been determined.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Harrison County Planning Dept.</p> <p>Regional Planning Commission</p>	<p>FEMA</p>



Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Secure funding to initiate a feasibility study for public shelters. Study should include recommendations for shelter locations.</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a high priority for the County</p>	<input checked="" type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Red Cross</p> <p>Regional Planning Commission</p> <p>Harrison County Commissioners</p> <p>Harrison County EMA</p>	<p>Red Cross</p>
<p>Require an Emergency Action Plan for high hazard dams in Harrison County, in particular the Lanesville Dam.</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a high priority as several homes below the dam could be at risk</p>	<input type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>IDNR</p> <p>Private Owner</p>	<p>Private Owner</p> <p>Local Funding</p>


Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Mitigate erosion issues along the bank of the Ohio River at New Amsterdam</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a high priority and will probably require a feasibility study to determine areas of greatest need.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input type="checkbox"/> Harrison County	<p>FEMA</p> <p>Harrison County EMA</p> <p>Local Leaders</p>	<p>FEMA</p>
<p>Analyze ways to improve communications throughout the County for phone/internet towers</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a high priority as there are many areas of Harrison that do not have cell phone access. In particular, Muckport is at risk since emergency warnings are communicated via cell phones.</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Harrison County EMA</p> <p>Local Leaders</p>	<p>Local Utilities</p>

Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Determine sheltering opportunities for the residents of Palmyra</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a high priority. The residents of Palmyra do not have available shelters. Palmyra would like to retro-fit the senior center basement as a safe room with back-up power.</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input checked="" type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input type="checkbox"/> Harrison County	<p>Town Leaders</p> <p>Harrison County EMA</p> <p>Red Cross</p>	<p>FEMA</p> <p>Red Cross</p>
<p>Secure funding to initiate a wastewater/stormwater study</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a medium priority.</p>	<input type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input type="checkbox"/> Harrison County	<p>Harrison County</p>	<p>Local Funding</p>

Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Provide incentive for utility customers to keep trees on right-of-way clear from utility lines</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i> This is a medium priority.</p>	<input type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>REMC</p> <p>Local Utility Companies</p>	<p>REMC</p> <p>Local Utility Companies</p>
<p>Initiate a water quality monitoring process so public can be informed</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i> This is a medium priority. Algae plumes are common around during the summer. At this time there are no monitors and no means to advise the public of potentially dangerous swimming areas.</p>	<input type="checkbox"/> Tornado <input type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Local Utility Companies</p> <p>Harrison County Commissioners</p>	<p>Local Utility Companies</p>

Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Encourage participation in the NFIP through local education</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a medium priority.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Harrison County Commissioners</p> <p>Harrison County EMA.</p> <p>Local Jurisdictions</p> <p>FEMA</p>	
<p>Develop and implement a system to advise utility customers of power outages via text message</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a medium priority.</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>REMC</p>	<p>REMC</p>
<p>Address drainage problems in Elizabeth</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>Elizabeth has two wells that are causing erosion problems. This is a medium priority.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input type="checkbox"/> Harrison County	<p>Town of Elizabeth</p> <p>Harrison County EMA</p>	<p>Town of Elizabeth</p> <p>FEMA</p> <p>Harrison County Highway Department</p>

Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Improve public awareness of flooding dangers along the Ohio River</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a medium priority. Although most of the homes located in the SFHA have been removed, there are still public safety issues. This awareness program should include sheltering locations.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input type="checkbox"/> Crandall <input type="checkbox"/> New Amsterdam <input type="checkbox"/> Elizabeth <input type="checkbox"/> New Middleton <input type="checkbox"/> Laconia <input type="checkbox"/> Palmyra <input type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Town of Mauckport</p> <p>Harrison County EMA</p>	<p>Local Support</p> <p>FEMA</p>
<p>Improve firefighting efforts in the County by updating equipment and facilities, developing a Hazmat team and CERT.</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a low priority. County leaders see the need to enhance emergency response efforts.</p>	<input type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Earthquake <input type="checkbox"/> Thunderstorm <input type="checkbox"/> Winter Storm <input checked="" type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>Harrison County EMA</p> <p>Local Jurisdictions</p> <p>Harrison County Fire Departments</p>	<p>Local Funding</p> <p>IDHS</p>

Mitigation Item	Status	Hazard(s)	Community	Collaborator(s)	Funder(s)
<p>Develop a program for utility companies to text customers of power outages</p> <p>New action item for 2015 MHMP</p>	 <p><i>New action; funding not secured</i></p> <p>This is a low priority. The local REMC is a supporter of this project</p>	<input checked="" type="checkbox"/> Tornado <input checked="" type="checkbox"/> Flood <input checked="" type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Thunderstorm <input checked="" type="checkbox"/> Winter Storm <input type="checkbox"/> Hazmat <input type="checkbox"/> Drought <input type="checkbox"/> Subsidence <input type="checkbox"/> Dam/Levee	<input checked="" type="checkbox"/> Corydon <input checked="" type="checkbox"/> Mauckport <input checked="" type="checkbox"/> Crandall <input checked="" type="checkbox"/> New Amsterdam <input checked="" type="checkbox"/> Elizabeth <input checked="" type="checkbox"/> New Middleton <input checked="" type="checkbox"/> Laconia <input checked="" type="checkbox"/> Palmyra <input checked="" type="checkbox"/> Lanesville <input checked="" type="checkbox"/> Harrison County	<p>REMC</p> <p>Harrison County EMA</p>	<p>REMC</p>

Section **7** **Plan Maintenance**

7.1 Monitoring, Evaluating, and Updating the Plan

Relevant data, information, maps, and tables developed for this local mitigation plan will be integrated as appropriate into other planning efforts to include zoning, floodplain management, and land use planning. Many of the planning team members, representing the county as well as participating jurisdictions, will integrate these data as part of their roles as floodplain enforcers, zoning officers, and community administrators.

Throughout the past planning cycle, Harrison County Emergency Management Agency and the MHMP planning committee will monitor, evaluate, and update the plan on an annual basis.

Additionally, a meeting will be held during June of 2019 to address the next five-year update of this plan. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If the need for a special meeting, due to new developments or a declared disaster occurs in the county, the team will meet to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

The committee will then review the county goals and objectives to determine their relevance to changing situations in the county. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

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

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

7.2 Implementation through Existing Programs

The results of this plan will be incorporated into ongoing planning efforts since many of the mitigation projects identified as part of this planning process are ongoing. Harrison County and its incorporated jurisdictions will update the zoning plans and ordinances as necessary and as part of regularly scheduled updates. Each community will be responsible for updating its own plans and ordinances.

7.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the Harrison County EMA director and forwarded to the MHMP planning committee for discussion. Education efforts for hazard mitigation will be ongoing through the Harrison County EMA. The public will be notified of any periodic planning meetings through notices in the local newspaper. Once adopted, a copy of this plan will be available on the Harrison County website, in each jurisdiction and in the Harrison County EMA Office.

APPENDICES

Appendix A: Meetings

Appendix B: Newspaper Articles and Announcements

Appendix C: List and Locations of Harrison County Facilities

Appendix D: Historical Disaster Photographs

Appendix E: Mitigation

Appendix F: Threats and Hazard Identification and Risk Assessment (THIRA) Checklist

Appendix G: Adopting Resolutions

Appendix A

Meetings

MEETING #1 MINUTES**HARRISON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE****November 13, 2014 – 6:00PM (local time)**

Greg Reas, Director, Harrison County Emergency Management Agency, introduced himself and welcomed the communities. Representatives from the following communities were present: Corydon, Crandall, Elizabeth, Laconia, Lanesville, New Amsterdam and Palmyra.

Chelsea Crump, Charitable Financial Specialist, River Hills Economic Development District and Regional Planning Commission, introduced herself and thanked everyone for participating.

Dave Coats, Associate Director, The Polis Center, introduced himself and his associate, Chris Schmitz, and went on to explain that the County's Multi-Hazard Mitigation Plan (MHMP) has expired and needs to be updated. Mr. Coats then discussed the meeting's agenda and shared background information on The Polis Center.

Mr. Coats shared that the Harrison County MHMP was adopted in 2008 and has been expired for several months. The goal of this committee is to submit a new plan to FEMA by March 2015. Mr. Coats explained that Harrison County needs this plan in order to access future funds from FEMA and that all communities must participate to access funds as well.

Mr. Coats stated that this meeting is the first of three meetings, and that during this first meeting, the committee will review critical facilities data and profile and prioritize hazards. During the second meeting, which will most likely be held in January, the committee will review risk assessment results and brainstorm mitigation strategies. The second meeting will be open to the public. Mr. Coats explained that the third meeting will consist of a final review of the draft plan.

Mr. Coats shared Harrison County's history of disasters since January 2008, which include 100 severe weather reports and three federal disaster declarations. He then described the equation to be used to determine risks and prioritize hazards, and explained that they would be putting together a risk profile for each community.

The committee looked at the risk profile graph pulled from the last MHMP. Fred Wattula, Crandall, stated that he felt that Hazmat should be moved to *Medium* probability on the graph. Mr. Reas agreed and added that it should also be moved to *Significant* impact. Scott Byrum, Laconia, stated that Winter/Ice Storms effect electricity service in the county and should therefore be moved over to *Moderate* impact on the graph. Mr. Wattula agreed.

The committee looked over the previous risk profile graph for Corydon. Mr. Reas explained that due to the Tyson plant being located in that community, Hazmat should be moved higher in impact. Treggie King, Corydon, agreed and stated that it should be moved to *Significant*.

The committee looked over the previous risk profile graph for Milltown. No updates were suggested.

The committee looked over the previous risk profile graph for New Amsterdam. No updates were suggested.

The committee looked over the previous risk profile graph for Lanesville. No updates were suggested.

The committee looked over the previous risk profile graph for Mauckport. Dam/Levee failures were listed as a moderate concern. Ms. Crump stated that a representative from the community could not attend the meeting, but that she would speak with him to find out if this is still a concern.

Mr. Coats directed the attendees to a map of the county and explained that The Polis Center can create a model of hazard scenarios. The committee chose the following hazards to model: 1) F4 tornado through Milltown and Palmyra and 2) chlorine chemical spill in Crandall at a railroad crossing.

Mr. Coats spoke about critical facilities and gave examples: care facilities, emergency operations, schools, airports, fire stations, police stations and community assets.

Mr. Coats tasked each community with completing the following items before the next meeting: 1) review the 2008 mitigation strategies handout, 2) gather articles, photos, damage summaries, etc. related to hazards since the last update and 3) speak with anyone in the community that may have added information that is valuable to the update process.

Mr. Coats reminded everyone that the next meeting would be open to the public. He informed Mr. Reas that he would need to advertise for the meeting and Ms. Crump offered to assist.

Mr. Coats asked if anyone in attendance had any questions or comments. There were none.

Mr. Reas and Ms. Crump thanked everyone for coming. The meeting was adjourned at 7:30 pm (local time).



Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

Harrison County Meeting #1 Attendance

NAME	TITLE	COMMUNITY	TOTAL HOURS INVESTED (Include 1.5 hours for this)
Fred Wattaba	Councilman	Crandall	2.0 hrs
Peggy Stilger	Clerk-Treasurer	Crandall	2.0
Melissa Shaffer	Clerk-Treasurer	New Amsterdam	2.0
Treggie King	Clerk-Treasurer	Corydon	2.0
VIRGINIA KIRKHAM	COUNCIL PRESIDENT	PAHMYRA	2 1/2 hrs.
Hugh BURNIS	CLERK TREAS	ELIZABETH	2 hrs
SCOTT BYRUM	Town Council	Laconia	2 hrs.
Chelsea Crump	charitable financial specialist	River Hills EDD:RPC	(2.5 hrs)
Greg Reas	EMA DIRECTOR	Harrison County	
Regina Glass	Councilman	New Amsterdam	2 1/2 hrs
Betsy Blocker	Clerk-Treasurer	Lawrenceville	2 hrs.

MEETING #2 MINUTES**HARRISON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE****June 3, 2015 – 6:00PM (local time)**

John Buechler, The Polis Center, introduced himself, and went on to explain that he and his staff pulled together information from Greg Reas, Harrison County Emergency Management Agency, Chelsea Crump, River Hills Economic Development District and Regional Planning Commission, and the local jurisdictions to draft the first five chapters of the Harrison County Multi-hazard Mitigation Plan (MHMP) update. Christine Schmitz, The Polis Center, passed out a copy of the draft plan and the 2008 Mitigation Strategies spreadsheet to each participant.

Mr. Buechler informed the room that during the meeting they would briefly go over the draft plan and work on Chapter 6: Mitigation Strategies. He also explained the purpose of updating the plan as well as funding opportunities.

Mr. Buechler asked participants to introduce themselves. Representatives from the following communities were present: Crandall, Laconia, Lanesville, Mauckport, New Amsterdam and Palmyra. Also in attendance were David Lett and Jon Wernert, Harrison County REMC.

Mr. Buechler gave a brief explanation of the remaining steps for the MHMP update plan. Jurisdictions should get any comments or updates to the Polis Center within two weeks. The Polis Center will complete the final draft and the planning committee can review it at the third meeting in approximately 4 – 6 weeks. Mr. Buechler stated that the Polis Center would make needed updates and then send the plan to FEMA for conditional approval. Once approval is received from FEMA, the plan will go to each jurisdiction board for adoption by resolution.

Mr. Reas asked Mr. Buechler to explain the local match for the project. Mr. Buechler stated that each participant's time spent on the planning process should be documented and would count towards the match (\$5,000).

Scott Byrum, Laconia, asked if there was a form that needed to be filled out to track hours. Mr. Buechler replied that he could send his total number of hours via email. He also explained that this meeting was a public meeting, which is required as part of the process, and that a public notice was advertised in the local paper.

Mr. Buechler thanked the representatives from Harrison County REMC for participating and explained that the Polis Center would make sure to include their mitigation activities, such as tree trimming, in the plan.

Mr. Buechler then went on to review the first five chapters of the draft MHMP plan, which includes:

- Information on jurisdiction, community and neighboring county participation
- A profile of Harrison County
- Risk assessment information
- Historical hazards records
- Guidelines for determining probability and impact

- Previous hazards and their rankings
- Modeled disasters: tornado, flood, earthquake, and hazmat
- Karst Map

Robert Crosier, Mauckport, asked what the term subsidence in the plan referred to. Mr. Buechler explained that subsidence refers to landslides, sink holes, etc.

Melissa Shaffer, New Amsterdam, stated that the map on page 59 was incorrect. Several street names were listed incorrectly. Ms. Schmitz made note of the change.

Mr. Buechler asked the participants to take 5 minutes to look over the 2008 Mitigation Strategies spreadsheet.

Mr. Reas explained that the handout included his notes on the past strategies. Some of the strategies are in progress or have already been completed. He asked if there were any additional projects not listed that the participants felt should be included in the updated plan. He also asked if they felt any of the previous strategies should be removed from the list.

Ms. Shaffer stated that New Amsterdam should be listed with the other jurisdictions as part of the mitigation strategy to update development standards to address street drainage issues. The Town is putting in drainage along Green Street. Ms. Schmitz made note of the change.

Mr. Crosier explained that because Mauckport is close to the Ohio River, it has unique problems. Everyone tries to prepare as best they can when told the river is rising. Mr. Buechler asked if the Town had an early warning system. Mr. Crosier noted that they are aware when the river level is rising and there is a flood gauge near at the locks. Residents can call the lock and dam for a 2 to 3 day forecast. Holly Kingsley, Mauckport, added that she studies the river forecast online daily in order to be prepared.

Mr. Buechler stated that a mitigation strategy could be to improve the public awareness of the USGS National Weather Service capabilities. Ms. Kingsley noted that both internet and phone service is hard to come by in their area. Ms. Shaffer stated the same for New Amsterdam.

Mr. Buechler said that cell tower reception and communication improvements could be added to the plan.

Ms. Schmitz asked if there were sirens in Mauckport. Ms. Kingsley replied yes.

Mr. Lett added that Harrison County REMC crews go to a number of places that do not have a signal.

Mr. Buechler asked Ms. Crump if she knew of any completed or upcoming mitigation projects in the region. Ms. Crump explained that Palmyra recently completed a wastewater and storm water analysis. Laconia recently completed a comprehensive plan. Both studies address a need for storm water improvements.

Mr. Buechler asked if any facilities need back-up generators or transfer switches. Mr. Crosier stated that the firehouse in Mauckport has a generator.

Virginia Kirkham, Palmyra, asked if they could put a safe room in the basement of the Town's senior center. Mr. Buechler stated that it is a possibility and should be included in the plan. He asked if the senior center has back-up power. Ms. Kirkham responded that it does not.

Ms. Kingsley asked Mr. Crosier if the church in Mauckport would be a good place to have back-up power since they use it as a shelter. Mr. Crosier said that it would be something they would need to discuss with the church.

Mr. Buechler asked if anyone was in need of weather radios. Mr. Reas responded that the Harrison County EMA office has a program in which they give them out to low income areas, mobile home parks, schools, nursing homes, etc. They have given out around 300 to the public over the last several years.

Mr. Reas explained that he likes the idea of a shelter, but said it could be a problem to figure out where to set it up. Ms. Schmitz responded that a mitigation strategy could be to conduct a feasibility study for shelter locations. Mr. Reas liked that idea.

Mr. Buechler asked the representatives from Harrison County REMC if they had any strategies that they wanted to acknowledge in the plan. Mr. Wernert explained that since 2008, they have incentivized residents to remove trees in the right-of-ways, and it has made a drastic improvement in the number of outages that occur.

Mr. Reas added that Harrison County REMC updated a number of the lines that came down during Hurricane Ike, and that it helped tremendously with outages. Mr. Lett explained that they invest \$4 to \$5 million a year upgrading lines, and so it is an ongoing process. They also trim the entire system every 5 years.

Ms. Schmitz asked if the reservoir dam in Lanesville was a concern. Linda Smith, Lanesville, stated that the reservoir is privately owned now and doesn't have much water in it. Mr. Reas asked how it would affect the town if it failed. Ms. Smith replied that she doesn't think it would cause much impact. The land levels out below and, therefore, the water would spread out. However, there is a subdivision called Whispering Valley with 12 homes that may be impacted.

Ms. Schmitz asked if they should include an impact study on the dam as a mitigation strategy. Ms. Smith thought that would be a good idea.

Mr. Buechler asked if anyone had anything else to add.

Ms. Kingsley mentioned that Mauckport has drainage issues.

Mr. Reas stated that Hugh Burns, Elizabeth, explained that they have several wells with issues at the last meeting. A drainage ditch near one of the wells is causing erosion problems.

Ms. Kingsley mentioned that Mauckport is also experiencing erosion issues at their riverbank.

Ms. Shaffer stated that they have erosion in New Amsterdam as well.

Mr. Buechler asked if anyone else had any comments. Mr. Reas asked if they would be including all of the 2008 mitigation strategies in the plan. Mr. Buechler explained they would strike any that the

planning committee felt should be removed. Mr. Reas explained which of the strategies have been completed or are in process. He stated that a high priority should remain the purchase of an alert system for Harrison County residents during a tornado or severe thunderstorm event. Ms. Schmitz took note.

Mr. Lett added that the Harrison County REMC is looking into power outage text alerts, and suggested a partnership with the County.

Mr. Buechler asked if anyone in attendance had any questions or comments. There were none.

Mr. Buechler reminded everyone to send in any additional comments over the next few weeks.

Mr. Buechler thanked everyone for coming. The meeting was adjourned at 7:25 pm (local time).

A handwritten signature in black ink, appearing to read 'C. Crump', is written over a horizontal line.

Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

HARRISON COUNTY MHMP MEETING #2, JUNE 3, 2015

NAME	TITLE	COMMUNITY	TOTAL HOURS INVESTED (Include 1.5 hours for this
Holly Ringsley	Town Council Member	Marekport IN.	4.3 hrs
Peggy Stilger	Clerk-Treasurer	Crandall	3.5 hrs.
MELISSA Shaffer	Clerk Treasurer	New Amsterdam	4 hrs.
Betsy Blocker	Clerk Treasurer	Lanesville	4 hrs. 35 min
LINDA SMITH	Council MEMBER	LANESVILLE	-
Debby Jones	Council member.	Palmyra	11.5
JENNY KIRKHAM	COUNCIL PRESIDENT	PALMYRA	12.5
ROBERT CROSIER	Council President	Marekport	4.30 min
George S BYRUM	Council Member	Laconia	4.30 min
Jon Wernert	Eng/OPS Mgr	REMC	1.5
DAVID LETT	CEO	REMC	1.5
Chelsea Crump	charitable Financial Specialist	River Hills	1.5 +
Traci Russell	Admin. Asst. - Harrison Co. EMA	Corydon	1.5
Greg Reas	Director - Emerg. mgmt	Harrison County	10.5

55 Public Notices**55 Public Notices****HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN PUBLIC MEETING ANNOUNCEMENT**

The Harrison County Hazard Mitigation Steering Committee will host a public information and strategy planning session at 6:00PM on June 3, 2015 at the office of Harrison County Emergency Management, 245 Atwood Street, Corydon, IN 47112.

Over the last several months, a planning committee consisting of community members has worked with The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to develop a Multi-Hazard Mitigation Plan for Harrison County. Once the plan is completed, the committee will submit it to FEMA for approval. The committee will also work to develop funding for any mitigation activities that are identified.

The steering committee is interested in receiving public input on the plan. Anyone who has questions or would like to provide input should contact Greg Reas, Harrison County Emergency Management Director, (812)738-8949.

hspaxlp

County to update multi-hazard mitigation plan

In the pursuance of compliance with the federally mandated Disaster Mitigation Act of 2000, Harrison County and River Hills Economic Development District and Regional Planning Commission have formed an alliance with The Polis Center of IUPUI to identify potential natural hazards and to produce a mitigation plan to address the issues.

The ongoing efforts of the partnership will result in a Multi-Hazard Mitigation Plan, which will seek to identify potential natural hazards for Harrison County and then establish a mitigation measure that is intended to reduce or eliminate the negative impact that a particular hazard may have on the locality. The plan is unique in that it will utilize state-of-the-art FEMA modeling software to provide casualty

and damage estimates, corresponding to a predetermined disaster scenario. The finished plan will then be reviewed and accepted by the county and sent to FEMA for federal approval. Once FEMA approves, the county will be eligible for emergency relief funding in the event of a natural disaster. The county also will be eligible for federal funding to implement the mitigation measures defined in the plan to minimize the effects of a natural disaster.

One particular requirement of the Disaster Mitigation Act of 2000 is that public involvement is required as part of the planning process.

For information, call the Harrison County Emergency Management Agency at 812-738-8949 or the River Hills EDD and RPC at 1-812-288-4624 for meeting dates and times.

Appendix B

Newspaper Articles and Announcements

Parts of Southern Indiana come to halt after heavy snow

Posted: Thursday, March 5, 2015 7:56 pm

Associated Press |

Parts of southern Indiana have ground to a halt after as much as 10 inches of fresh snow fell.

The National Weather Service had an unofficial report of 10.5 inches of snow having fallen New Salisbury in Harrison County by late Thursday morning. The weather service says 8-12 inches of snow fell in a band along the Ohio River, including southern Indiana, and 5-9 inches fell farther north.

Clark, Floyd and Harrison counties issued travel warnings, the most severe travel status, urging motorists to refrain from all travel. Most government buildings were closed there.

Indiana State Police say they handled more than 550 calls during a 31-hour period ending at 7 a.m. Thursday. They included 160 crashes, with one fatality and 32 others involving injuries, and 175 slide-offs.

The winter storm blanketed the Northeast on Thursday after zipping across much of the South, leaving hundreds of drivers and their passengers stranded on highways in Kentucky and thousands without power in West Virginia.

By Thursday afternoon, a strong cold front moving across the eastern U.S. had dumped more than 20 inches of snow on parts of Kentucky, and conditions worsened in the Northeast as snow started to pile up, reaching 11.5 inches and counting in the northern Maryland community of Lineboro.

The massive snow in Kentucky left hundreds of people stranded on two major highways and National Guard members delivering them food or driving them to warming centers.

Authorities say that hundreds of drivers were stuck on two major highways in Kentucky, where snow totals topped 2 feet in some places. Many had to spend the night in their vehicles.

The National Guard was sent out to check on the people who were stuck, deliver them food and water and, in some cases, take them to warming centers.

Source: www.tribstar.com/news/indiana_news/parts-of-southern-indiana-come-to-halt-after-heavy-snow/article_16748caa-2ce6-5a61-b408-3ed941b25c22.html

Thursday, January 31, 2013

NWS Confirms Tornado In Harrison County

The NWS in Louisville has confirmed an EF0 tornado occurred in Harrison county on Wednesday. This tornado then crossed the border into Kentucky.

**PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE LOUISVILLE KY
1205 PM EST THU JAN 31 2013**

...EF-0 TORNADO CONFIRMED IN HARRISON COUNTY INDIANA AND JEFFERSON COUNTY KENTUCKY...

DAMAGE TYPE: TORNADO

DATE: JAN 30 2013
BEGIN TIME: 4:17 AM EST
END TIME: 4:17 AM EST

BEGIN POINT: 3.2 MILES EAST OF ELIZABETH, INDIANA
END POINT: 2.6 MILES NORTHWEST OF VALLEY STATION, KENTUCKY

EF SCALE: EF-0
WIND SPEED: 80MPH

PATH LENGTH: 1 MILE
PATH WIDTH: 215 YARDS

NARRATIVE: AN NWS SURVEY TEAM HAS CONFIRMED AN EF-0 TORNADO TOUCH DOWN EAST OF ELIZABETH IN HARRISON COUNTY, INDIANA. FOUR HOMES AND TWO BARNs WERE DAMAGED ALONG HIGHWAY 111. THE PORCH OF ONE HOME WAS LIFTED AND THROWN 30 FEET. THE WALLS OF ONE OF THE BARNs COLLAPSED IN MULTIPLE DIRECTIONS. TREES WERE DOWN AT THIS LOCATION AS WELL. THE TRACK OF THE TORNADO EXTENDED EAST OVER THE OHIO RIVER AND INTO JEFFERSON COUNTY, KENTUCKY. NORTHWEST OF VALLEY STATION MANY SOFTWOOD TREES WERE DAMAGED, A PINE TREE WAS SNAPPED, AND A TRAMPOLINE WAS BLOWN OVER BEFORE THE TORNADO LIFTED.

Source: <http://indianadoes.blogspot.com/2013/01/nws-confirms-tornado-in-harrison-county.html>

Appendix C

List of Harrison County Facilities

Essential Facility Name	Facility Type	Location
Jay C 14	Care Facility	Corydon
Wal Mart 0922	Care Facility	Corydon
Corydon Dialysis Center	Care Facility	Corydon
Harrison County Hospital	Care Facility	Corydon
Fresenius Medical Care Corydon	Care Facility	Corydon
At-Home Care of Harrison County Hospital	Care Facility	Corydon
New Salisbury Market	Care Facility	New Salisbury
Blue River Services Inc	Care Facility	Corydon
Corydon Nursing and Rehabilitation Center	Care Facility	Corydon
Kindred Transitional Care and Rehab-Harrison	Care Facility	Corydon
Kindred Transitional Care and Rehab-Indi	Care Facility	Corydon
Save-A-Lot 900	Care Facility	Corydon
Harrison County WIC Program	Care Facility	Corydon
Blue River Services Inc	Care Facility	Corydon
Blue River Services Inc	Care Facility	Corydon
Blue River Services Inc	Care Facility	Palmyra
Res Care Community Alternatives	Care Facility	New Salisbury
Ems Garage	Care Facility	Elizabeth
Unknown	Care Facility	New Salisbury
EMS Garage	Care Facility	New Salisbury
EMS Station	Care Facility	Corydon
Corydon Medical Office Building	Care Facility	Corydon
Harrison County Emergency	Emergency Ops Center	Corydon
Harrison County Dispatch	Emergency Ops Center	Corydon
Palmyra Fire Dept Station 2	Fire Station	Palmyra
Boone Township Volunteer Fire	Fire Station	Laconia
New Middletown Volunteer Fire	Fire Station	New Middletown
Harrison Twp Volunteer Fire Dept	Fire Station	Corydon
Lanesville Volunteer Fire Dept	Fire Station	Lanesville
Ramsey Volunteer Fire Dept	Fire Station	Ramsey
Elizabeth Volunteer Fire Dept Station 1	Fire Station	Elizabeth
Heth Township Fire Dept	Fire Station	Central
Palmyra Fire Dept	Fire Station	Palmyra
Elizabeth Volunteer Fire Dept Station 2	Fire Station	Elizabeth
Ramsey Fire Dept Station 2	Fire Station	New Salisbury
Ramsey Fire Dept Station 3	Fire Station	Depauw
Heth Twp Fire Dept Station 2	Fire Station	Mauckport
Harrison Twp Fire Dept Station 2	Fire Station	Corydon
Milltown Volunteer Fire Dept	Fire Station	Milltown
Corydon Town Marshall	Police Station	Corydon
Harrison County Sheriff's Ofc	Police Station	Corydon
Lanesville Town Marshall	Police Station	Lanesville

Essential Facility Name	Facility Type	Location
Milltown Police Dept	Police Station	Milltown
St John Lutheran School	School	Lanesville
Cornerstone Christian Academy	School	Laconia
Shiloh Holiness Christian School	School	Corydon
Morgan Elementary School	School	Palmyra
North Harrison Elementary School	School	Ramsey
North Harrison High School	School	Ramsey
North Harrison Middle School	School	Ramsey
Lanesville Elem School	School	Lanesville
St Joseph Elementary School	School	Corydon
Lanesville Jr-Sr Hs	School	Lanesville
Corydon Intermediate School	School	Corydon
Corydon Elementary School	School	Corydon
Heth-Washington Elem School	School	Central
New Middletown Elem School	School	New Middletown
Harrison County Spec Ed Coop	School	Corydon
Corydon Central High School	School	Corydon
Corydon Central Jr High School	School	Corydon
South Central Elementary	School	Elizabeth
South Central Jr & Sr Hs	School	Elizabeth
Alternative School	School	Corydon
Furthering Youth, Inc.	School	Corydon
Milltown School	School	Milltown

Critical Facility Name	Facility Type	Location
Cedar Farm	Airport	Laconia
Amy	Airport	Corydon
Robinson Airpark	Airport	Elizabeth
Lanesville Skyways	Airport	Lanesville
Greenridge RLA	Airport	Lanesville
Byrne Field	Airport	Georgetown
Jacobi	Airport	Palmyra
Caesars World Pavillion	Community Asset	Elizabeth
Casino Parking Garage	Community Asset	Elizabeth
Casino Parking Garage	Community Asset	Elizabeth
Casino Hotel	Community Asset	Elizabeth
Caesars Riverboat Casino	Community Asset	Elizabeth
YMCA	Community Asset	Corydon
Mauckport Siren	Communication	Mauckport
Laconia Siren	Communication	Laconia
South Central School Siren	Communication	Elizabeth
Central Siren	Communication	Central
New 39	Communication	Elizabeth
Heth Twp Siren	Communication	Central
New Amsterdam Siren	Communication	New Amsterdam
Elizabeth Siren	Communication	Elizabeth
WRVI Ch 290	Communication	Elizabeth
W227BO 93.3 mhz	Communication	Elizabeth
WQMF 95.7 mhz	Communication	Elizabeth
WGMF Ch 239	Communication	Jeffersonville
WQMF 95.7 mhz	Communication	Elizabeth
New Middletown Siren	Communication	New Middletown
WSFR Ch 299	Communication	Elizabeth
NEW 99.3 mhz	Communication	Elizabeth
WGZB 96.5 mhz	Communication	Elizabeth
WOCC 1550	Communication	Corydon
860221MN 107.7 mhz	Communication	Corydon
Corydon Campus Siren	Communication	Corydon
W274AD 102.7 mhz	Communication	Corydon
WGZB-FM 96.5 mhz	Communication	Corydon
WGZB-FM Ch 243	Communication	Lanesville
Water Tower Siren	Communication	Corydon
Sunshine Terrace Siren	Communication	Corydon
Highway Garage Siren	Communication	Corydon
Crandall Siren	Communication	Crandall
Ramsey Siren	Communication	Ramsey
New Salisbury Siren	Communication	New Salisbury

Critical Facility Name	Facility Type	Location
Milltown Siren	Communication	Depauw
Morgan Elementary Siren	Communication	Palmyra
Palmyra Siren	Communication	Palmyra
W270AN 101.9 mhz	Communication	Palmyra
Lanesville Siren	Communication	Lanesville
Lanesville High School Siren	Communication	Lanesville
K of C Siren	Communication	Lanesville
St Johns School Siren	Communication	Lanesville
Bradford Siren	Communication	Greenville
Berkshire Siren	Communication	New Salisbury
Frenchtown Siren	Communication	Depauw
Country Aire Trailer Park Siren	Communication	Corydon
Courthouse Siren	Communication	Corydon
St. Peters Lake Dam	Dam	Buena Vista
Seven Springs Lake Dam	Dam	Elizabeth
Pine Springs Lake Dam	Dam	Corydon
Unknown	Dam	
Corydon Water Works Dam #1 (Middle)	Dam	Corydon
Gs Dd No 2-35	Dam	White Cloud
Lanesville Reservoir Dam	Dam	Lanesville
Corydon Water Works Dam #2 (North)	Dam	Corydon
Lutheran Laymens Lake Dam	Dam	Corydon
Unknown	Dam	
Milltown Blue River	Dam	Milltown
Unknown	Dam	Palmyra
Tyson Foods Inc.	Hazmat	Corydon
Exide Corp.	Hazmat	Corydon
Na-Churs/Alpine Solutions	Hazmat	Corydon
Tyson Foods Inc.	Hazmat	Ramsey
Tyson Foods Inc.	Hazmat	Ramsey
Tyson Foods Inc.	Hazmat	Ramsey
Blue River Water Company	Hazmat	Milltown
Mauckport Ferry Landing Boat Ramp	Port	Mauckport
Mauckport Boat Ramp	Port	Mauckport
Mulzer Crushed Stone Loading Facility	Port	Mauckport
New Amsterdam Boat Ramp	Port	New Amsterdam
Caesars Riverboat Casino	Port	New Albany
South Harrison Water Co Pumping Station	Potable Water	Laconia
Town Of Elizabeth WTP	Potable Water	Elizabeth
South Harrison Water Co Wells Field	Potable Water	Laconia
Town Of Corydon Water Wells Field	Potable Water	Mauckport
Town Of Elizabeth Water Wells Field	Potable Water	Elizabeth

Critical Facility Name	Facility Type	Location
Laconia Town Of	Wastewater	Laconia
Corydon Municipal WWTP	Wastewater	Corydon
Lanesville Municipal STP	Wastewater	Lanesville
Milltown WWTP (Harrison Co)	Wastewater	Milltown
Milltown Municipal WWTP	Wastewater	Milltown
Palmyra Municipal WWTP p	Wastewater	Palmyra
Corydon Municipal WWTP	Wastewater	Corydon
New Salisbury WWTP	Wastewater	New Salisbury
Milltown WWTP Lift Station	Wastewater	Milltown
Milltown WWTP Lift Station	Wastewater	Milltown

Appendix D

Historical Disaster Photographs

Photo #1: Milltown Flooding 2008



Source: NOAA, 2008

Photo #2: Milltown Flooding 2008



Source: NOAA, 2008

Photo #3: Milltown Flooding 2008



Source: NOAA, 2008

Photo #4: Milltown Flooding 2008



Source: NOAA, 2006

Photo #5: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #6: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #7: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #8: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #9: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #10: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #11: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #12: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #13: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Photo #14: New Amsterdam Flooding 1997



Source: 2015 MHMP Planning Team

Appendix E

Mitigation

SBA DISASTER LOANS AVAILABLE TO HARRISON COUNTY FOR APRIL SEVERE STORMS



As the result of a Presidential Disaster Declaration in Kentucky, U.S. Small Business Administration (SBA) low interest disaster loans are available to Clark, Floyd and Harrison in Indiana.

The disaster was declared for several counties in Kentucky affected by severe storms, tornadoes, flooding, landslides and mudslides on April 2-17, 2015.

Businesses and private non-profit organizations of any size may borrow up to \$2 million to repair or replace disaster damaged or destroyed real estate, machinery and equipment, inventory, and other business assets. The SBA may increase a loan up to 20 percent of the total amount of disaster damage to real estate and/or leasehold improvements, as verified by SBA, to make improvements that lessen the risk of property damage by future disasters of the same kind.

For small businesses, small agricultural cooperatives, small businesses engaged in aquaculture and most private nonprofit organizations of all sizes, the SBA offers Economic Injury Disaster Loans to help meet working capital needs caused by the disaster. Economic Injury Disaster Loan assistance is available regardless of whether the business suffered any physical property damage.

Disaster loans up to \$200,000 are available to homeowners to repair or replace disaster damaged or destroyed real estate. Homeowners and renters are eligible for up to \$40,000 to repair or replace disaster damaged or destroyed personal property.

Applicants may apply online using the Electronic Loan Application (ELA) via SBA's secure website at <https://disasterloan.sba.gov/ela/>.

To be considered for all forms of disaster assistance, applicants should register online at www.DisasterAssistance.gov or by mobile device at m.fema.gov. If online or mobile access is unavailable, applicants should call the FEMA toll-free Helpline at 800-621-3362. Those who use 711-Relay or Video Relay Services should call 800-621-3362.

Additional details on the locations of Disaster Recovery Centers and the loan application process can be obtained by calling the SBA Customer Service Center at 800-659-2955 (800-877-8339 for the deaf and hard-of-hearing) or by sending an e-mail to disastercustomerservice@sba.gov.

The filing deadline to return applications for physical property damage is June 30, 2015. The deadline to return economic injury applications is February 1, 2016.

For more information about the SBA's Disaster Loan Program, visit <http://www.sba.gov/disaster>

Appendix F

Threats and Hazard Identification Risk Assessment (THIRA) Checklist

Man-Made International Threats

International Terrorism

- ☐ Al-Qa'ida
- ☐ Al-Qa'ida in the Arabian Peninsula (AQAP)
- ☐ Islamic State of Iraq and the Levant (ISIL)
- ☐ Hezbollah
- ☐ Al-Shabaab
- ☐ Boko Haram
- ☒ Homegrown Violent Extremists

Domestic Terrorism

- ☒ White Supremacists
- ☒ Separatist Groups
- ☒ Anarchists
- ☒ Environmental Extremists
- ☒ Animal Rights Extremists
- ☒ Lone Offenders
- ☒ Other Violent Offenders

Technological Hazards

- ☒ Communication Systems Failure

Transportation

- ☒ Highway Transportation Incident
- ☒ Commercial Air Transportation Incident
- ☒ Rail Transportation Incident
- ☒ Marine Transportation Incident

Hazardous Materials

- ☒ Hazardous Materials Transportation Incident
- ☒ Hazardous Materials Fixed-Facility

- ☐ High Hazard Dam Failure

- ☐ Major Levee Failure

- ☒ Public Utility Failure

- ☒ Explosion

- ☒ Large Fire/Conflagration

- ☒ Pipeline Transportation Incident

- ☒ Structural Collapse

Other Hazards Not Listed

- ☒ River Shutdown

- ☒ River Emergencies

- ☒ Workplace/School Violence

Electrical Grid Failure

Natural Hazards

Severe Storms

- ☐ Wind
- ☒ Lightning
- ☒ Hail
- ☒ Derecho
- ☒ Tropical Cyclone Remnants
- ☒ Flash Flood
- ☒ Major Flood
- ☒ Tornado

Winter Storm

- ☒ Heavy Snow
- ☒ Blizzard
- ☒ Lake Effect Snow
- ☒ Ice Storm
- ☒ Temperature Extremes
- ☒ Drought

Earthquake

- ☒ Magnitude 5.0 and Higher
- ☒ Magnitude 4.9 and Lower
- ☒ Animal Disease Outbreak
- ☒ Human Disease Outbreak

Invasive Species

- ☒ Plant
- ☒ Animal
- ☒ Insect
- ☒ Wildland Fire
- ☒ Geomagnetic Storm
- ☒ Ground Failure

Please list your top 5 hazards of concern

1. Weather Events
2. HAZMAT Incidents
3. Fire Hazards
4. Drought
5. Extreme Temperature

Appendix G

Adopting Resolutions

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

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

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

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

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

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

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of
the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department
of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

County Commissioner Chairman

County Commissioner

County Commissioner

County Commissioner

Attested by: County Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Corydon recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Corydon hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Crandall recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Crandall hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Elizabeth recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Elizabeth hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Laconia recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Laconia hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Lanesville recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Lanesville hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Mauckport recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Mauckport hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Milltown recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Milltown hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of New Amsterdam recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of New Amsterdam hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk

Resolution # _____

ADOPTING THE HARRISON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Palmyra recognizes the threat that natural hazards pose to people and property; and

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

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

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

NOW, THEREFORE, BE IT RESOLVED, that the Town of Palmyra hereby adopts the Harrison County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Harrison County Emergency Management Security will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS _____ Day of _____, 2015.

Town President

Town Council Member

Town Council Member

Town Council Member

Attested by: Town Clerk