Multi-Hazard Mitigation Plan

Clark County

October 2015

Multi-Hazard Mitigation Plan

Clark County, Indiana

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Acknowledgments

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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
CDP – Census Designated Place
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
Hazus-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
INDWD – Indiana Department of Workforce Development
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

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Executive Summary

The Clark 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 Clark County multi-hazard mitigation planning team, River Hills EDD & RPC, and the Polis Center at IUPUI. Clark 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.

- 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.

Section

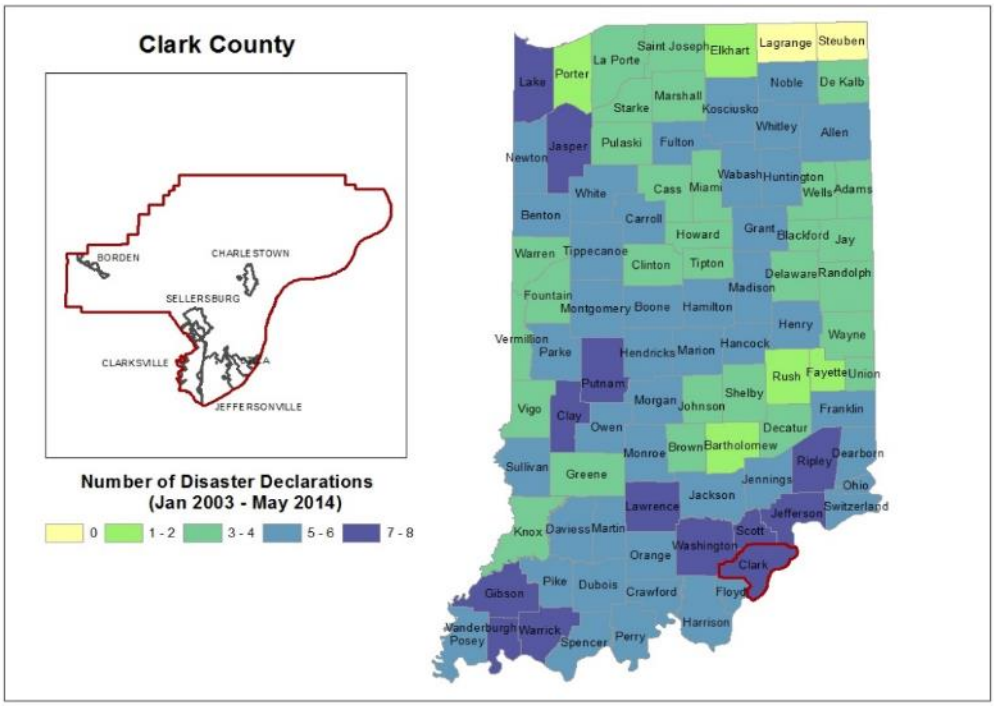
1

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 the 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.

Figure 1: FEMA Disaster Declarations for Indiana[1]



[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 (HMA).

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.

Clark County has received federal aid for seven disasters since 2004, listed in Table 1. Four disasters have been declared since the last Clark County MHMP was adopted in 2008.

Table 1: FEMA-Declared Disasters for Clark County (2004-2014)

Disaster Number	Date of Incident	Date Declared	Disaster Description	Type of Assistance
DR-1520	5/24/04-6/25/04	6/3/04	Indiana Severe Storms, Tornadoes, Flooding	IA,PA, HMGP
DR-1542	7/3/04-7/18/04	9/1/04	Indiana Tornadoes, Flooding	PA, HMGP
DR-1573	1/1/05-2/11/05	1/21/05	Indiana Winter Storm, Flooding	IA, HMGP
DR-1795	9/12/08-10/6/08	9/23/08	Indiana Severe Storms, Flooding	IA, PA, HMGP
DR-1828	1/26/09-2/28/09	3/5/09	Indiana Winter Storm	IA, PA, HMGP
DR-1997	1/11/11-6/6/11	6/23/11	Indiana Severe Storms, Tornadoes, Flooding	PA, HMGP
DR-4058	2/29/12-3/3/12	3/9/12	Indiana Severe Storms, Straight-Line Winds, Tornadoes	PA, HMGP

PA – Public Assistance program
IA – Individual Assistance program
HMGP – Hazard Mitigation Assistance (Hazard Mitigation Grant Program)

Section 2

Prerequisites

The 2015 Clark County Multi-Hazard Mitigation Plan 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 Clark 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 Clark County Commissioners adopted the plan on <insert date adopted>. Additional adoptions are included in Appendix I.

2.2 Jurisdiction Participation

Table 2 lists each jurisdiction and describes its participation status in the 2008 plan and 2015 update of the multi-hazard mitigation plan (MHMP).

Table 2: Participating Jurisdictions

Jurisdiction Name	Type	Participated in 2008 MHMP	Participated in 2015 MHMP Update
Clark County	County	Yes	Yes
Borden	Town	Yes	Yes
Charlestown	City	Yes	Yes
Clarksville	Town	No	Yes
Jeffersonville	City	Yes	Yes
Sellersburg	Town	Yes	Yes
Utica	Town	Yes	Yes

The county also invited representatives from local businesses and organizations to participate in the plan. Table 3 lists additional team members with a description of their participation. The invitation to participate is included in Appendix A.

The organizations which were invited included the American Red Cross, major businesses, and REMC operations, among others.

Table 3: Organizations Invited to Participate

Organization Name	Organization Type	Organization Representative Name	Description of Participation
The American Red Cross	Disaster Relief	Jennifer Adrio	Invited to attend planning meetings
Clark County REMC	Utility	Public Safety Manager	Invited to attend planning meetings
Clark Memorial Hospital	Health services	Martin Padgett	Invited to attend planning meetings
Clarksville Community School Corporation	Education	Kimberly Knott	Invited to attend planning meetings
Duke Energy	Utility	Public Safety Manager	Invited to attend planning meetings
Greater Clark County Schools	Education	Gary Green	Attended public meeting
Indiana American Water	Utility	Troy Bryant	Invited to attend planning meetings
Ivy Tech Community College	Higher Education	Thomas J. Snyder	Invited to attend planning meetings
American Commercial Lines/JeffBoat	Marine transportation, manufacturing	Patrick Sutton	Invited to attend planning meetings
Kitchen Kompact	Manufacturing	Manager	Invited to attend planning meetings
Koetter Woodworking, Inc.	Manufacturing	Randy Koetter	Invited to attend planning meetings
National Distributors Leasing, Inc	Transportation	Keith Vaughn	Invited to attend planning meetings
Silver Creek Water Corporation	Utility	Manager	Invited to attend planning meetings
Summitt Trucking	Transportation	Manager	Invited to attend planning meetings
Vectren Corporation	Utility	Public Safety Manager	Invited to attend planning meetings
Washington Township Water Corporation	Utility	Steve Fouts	Invited to attend planning meetings
West Clark Community Schools	Education	Monty Schneider	Invited to attend planning meetings

Section

3 Planning Process

The Clark County Emergency Management Agency (EMA), River Hills EDD & RPC, and the Polis Center (Polis) have joined efforts to develop this plan update. The planning process consisted of the following tasks:

Task 1: Organize Resources

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

3.1 Planning Team Information

The planning team is headed by the Clark County EMA. Other members of the planning team include representatives from various county departments, cities and towns, public and private utilities, and public safety and other organizations which respond to emergencies and disasters. Table 4 identifies the planning team members, organizations and jurisdictions represented.

Table 4: Multi Hazard Mitigation Planning Team Members

Name	Organization	Jurisdiction
Les Kavanaugh	Clark Co. Emergency Management Agency (EMA)	Clark County
Tom Upton	Clarksville Fire Department	Clarksville
Amir Mousavi	City of Jeffersonville	Jeffersonville
Tony Jackson	Town of Charlestown	Charlestown
Rudy Cook	Town of Bordon	Borden
Bryan Wallace	City of Jeffersonville	Jeffersonville
Hank Dorman	Town of Utica	Utica
Shane Bassett	Clarksville Police Department	Clarksville
Brittany Montgomery	Town of Clarksville	Clarksville
J Greg Dietz	Town of Sellersburg	Sellersburg
Brad Meixell	Clark County 911	Clark County
Michael D McCutcheon II	City of Jeffersonville	Jeffersonville
Chelsea Crump	River Hills RPC & EDD	Clark County Area
Larry Wallace	Building Commissioner	Jeffersonville
Ruth Sparks	Town of Bordon	Borden

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 two meetings to support the Clark County MHMP Update process. The dates and goals of the meetings are highlighted below:

Meeting 1, February 27, 2015 (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 11, 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

3.2 Review of Existing Plans

Clark 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 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 5 lists the plans and ordinances utilized in the development of the MHMP 2015 Update.

Table 5: Documents Utilized in the MHMP 2015 Update

Document Title	Year	Description	2015 Update Sections
Clark County 2008 Multi-Hazard Mitigation Plan (MHMP)	2008	Federal Disaster Mitigation Act requirement	All sections
Clark County Code of Ordinances	2013	Compilation of county and local legislation current Clark County Code of Ordinances 9-17-2013	Sec 5: Risk Assessment Sec 6: Mitigation Strategies
Clark County Transportation Plan	2012	Outlines transportation planning in the county	Sec 4: County Profile Sec 4.6 Transportation Sec 4.9 Land Use Sec 5: Risk Assessment Sec 6: Mitigation Strategies
City of Jeffersonville Stormwater Master Plan	2012	Addresses the new flooding, drainage, and water quality priorities within Jeffersonville	Sec 5: Flooding Sec 6: Mitigation Strategies

3.3 Review of Technical and Fiscal Resources

The MHMP 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 6.

Table 6: 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
2008 Clark County MHMP	Clark County EMA
Critical Facility GIS data and GIS Basemap data	Clark County GIS Department/Beacon
Community Action Potential Index (CAPI) data	FEMA
Economy and industry, land use and development planning	Clark County Plan Commission
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 11, 2015 in order 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 Clark 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 7.

Table 7: Neighboring County Participation

Participant Name	Neighboring County/Community	Organization	Participation Description
Terry Herthel	Floyd County, IN	Floyd County EMA	Received a draft of plan for review, comment
Desi Alexander	Washington County, IN	Washington County EMA	Received a draft of plan for review, comment
Linda Dawson	Scott County, IN	Scott County EMA	Received a draft of plan for review, comment
Dave Bell	Jefferson County, IN	Jefferson County EMA	Received a draft of plan for review, comment

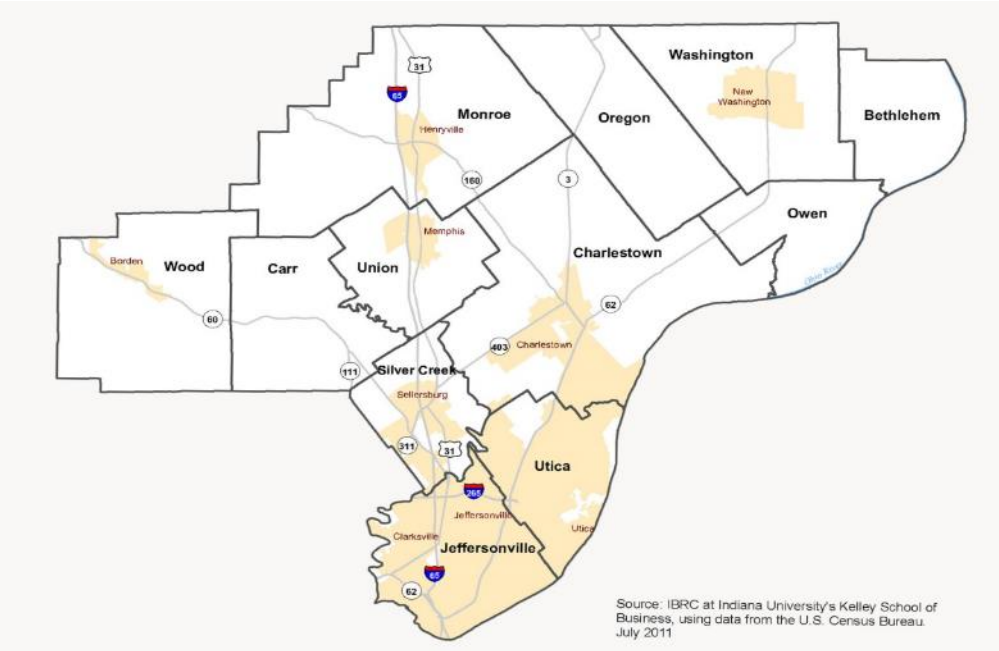
Section

4 County Profile

Clark County is located along 35 miles of Ohio River shoreline and has played a key role in the state's and region's early history, and in the growth and development of the Ohio River Valley.

The county is comprised of the Town of Borden, City of Charlestown, Town of Clarksville, City of Jeffersonville, Town of Sellersburg, and Town of Utica. The communities are distributed across 12 townships, which include Bethlehem, Carr, Chalestown, Jeffersonville, Monroe, Oregon, Owen, Silver Creek, Union, Utica, Washington, and Wood. Clark County's two largest communities, the town of Clarksville and the neighboring city and county seat of Jeffersonville, are located on the riverfront, where business and industrial activity have been concentrated since the Ohio River Valley's early settlement. These two communities along with New Albany in Floyd County, IN and across the river, Lousville, KY are known as the Falls Cities. The area was named after the Falls of the Ohio, a series of rapids and an expansive bed of rock where the river fell more than 26 feet within two and one-half miles. Figure 2 shows a map with Clark County's townships, incorporatied communities, and three unincorporated census designated places (CDPs): Henryville, Memphis, and New Washington.

Figure 2: Clark County Townships, Incorporated Communities and Census Designated Places (CDPs)



Clark County adjoins four Indiana counties and three Kentucky counties. Clark County and four other Indiana counties are included in the US Census Bureau's Louisville-Jefferson County, KY-IN Metropolitian Statistical Area (MSA) which is the nations 43rd largest, shown below in Figure 3. The MSA covers 4,135 square miles which includes 477 square miles in urban areas. The MSA's population density is 2,040 persons per square miles. Clark County's densely populated urban areas and their location along the Ohio River and the county's close proximity to a major metro area are all important considerations in planning hazard mitigation strategies. Natural geographic barriers such as major waterways or impassable terrain can restrict access to densely populated areas during evacuations and other emergency operations.

Figure 3: Louisville-Jefferson County, KY-IN Metropolitan Statistical Area (MSA)

4.1 Geography, Topography, and Climate

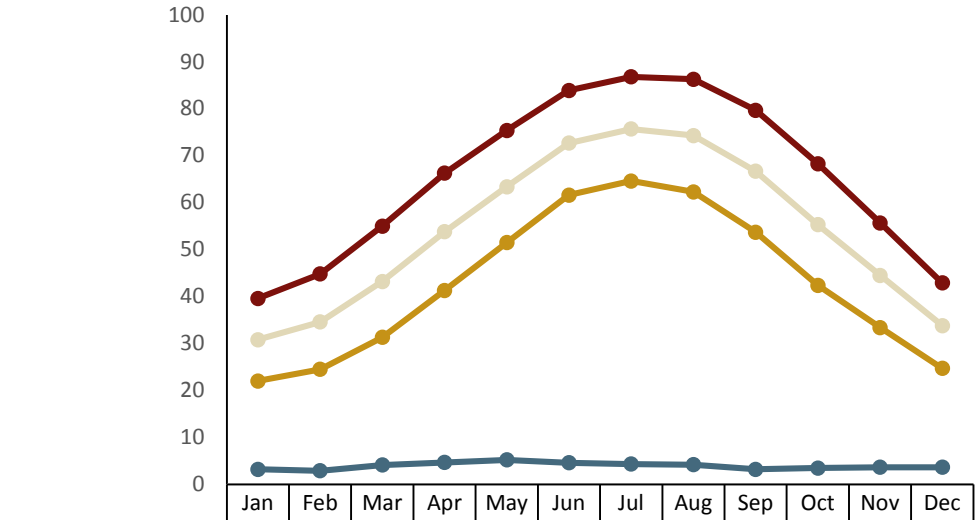
Clark County is situated in both the Scottsburg Lowland and Muscatatuck Regional Slope areas in the southern physiographic region of Indiana. The county's land area is a mixture of steep hills, particularly in the west and northwest regions, and large flat open areas. The county contains areas of karst sinkhole topography and the most notable landform is the Knobstone escarpment which crosses the county's northwest and north-central regions. The escarpment or ridge extends 150 miles from central Indiana southward to the Ohio River and ito Kentucky. The landform features a series of steep hills or "knobs." Escarpment elevations in northwestern Clark County include Round Knob at 1,001 feet above mean sea level (msl) north of Deam Lake, and 951-foot Waggoner Knob near Speed. The lowest elevations are located along the Ohio River Valley in the county's east and northeast portions with Utica at 443 feet above msl.

Other notable natural, geographic, and outdoor recreation features include the 220-acre Falls of the Ohio State Park along the Ohio River in Clarksville with its noteworthy fossil beds, wildlife, and wetlands areas. Charlestown State Park includes 15,000 acres of undeveloped land, once part of the Indiana Army

Ammunition plant and located between Charlestown and the Ohio River. The state's first state forest, 24,000-acre Clark State Forest, is in the west and northwest portions of the county. It features steep hills and deep ravines topography, the Knobstone Escarpment, and a portion of Indiana's longest footpath, the Knobstone Trail. Within the state forest is Deam Lake State Recreation area, with a 194-acre lake. The Ohio River Greenway is a 7-mile long recreation corridor along the Ohio River, connecting Jeffersonville, Clarksville, New Albany, and Kentucky utilizing the historic Big 4 Bridge in Jeffersonville and a bridge in New Albany. In Jeffersonville, Big 4 Station is a park space adjacent to the Big 4 Bridge and trail.

Clark County's climate is typical of Southern Indiana's uplands regions and areas along the Ohio River Valley. Figure 4 charts the temperature and precipitation climate norms for Clark County as recorded in Scottsburg, a city in neighboring Scott County. It's important to note that the variables of temperature, precipitation, and snowfall can vary greatly from one year to the next. Weather can also vary greatly among various geographic regions within the county, from the Ohio River Valley area in the south to the north-central and northeast uplands areas of the county.

Figure 4: Climate Norms for Clark County[2]



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip (in.)	3.18	2.87	4.12	4.66	5.20	4.59	4.33	4.18	3.20	3.47	3.64	3.63
Min Temp.(°F)	22.0	24.5	31.3	41.3	51.5	61.6	64.6	62.3	53.7	42.4	33.4	24.7
Avg Temp. (°F)	30.8	34.6	43.2	53.8	63.4	72.7	75.7	74.3	66.7	55.3	44.5	33.8
Max Temp. (°F)	39.6	44.8	55.0	66.3	75.4	83.9	86.8	86.3	79.7	68.3	55.7	42.9

The coldest month is January, with an average temperature of 30.8°F. Air temperatures reach a high point in July or August with averages for July of 75.7°F and 74.3°F in August. The coldest month was January which recorded an average temperature of 30.8°F. The wettest month was May, with 5.2 inches of precipitation.

[2] Source: http://www.ncdc.noaa.gov/cdo-web/datatools/normals

4.2 Demography

Among the demographic characteristics that are crucial to mitigation planning are population distribution among various age groups and genders, socio-economic characteristics, and population density. For Clark County hazard mitigation planning, it's particularly important to analyze the densely populated urban areas in relationship to the transportation network and the Ohio River, which can restrict direct access to densely populated areas in Clarksville and Jeffersonville.

The largest city is Jeffersonville, the county seat, with a 2010 population of 42,148. In 2010, the combined population of Clark County's two largest and neighboring cities, Clarksville and Jeffersonville, was 64,645, approximately 60% of the county's total population. Table 8 shows the 2010 population of Clark County communities, both incorporated and unincorporated census designated places (CDPs). For the decennial census, the US Census Bureau delineates CDPs as the statistical counterparts of incorporated places, such as cities, towns, and villages. The US Census Bureau states that CDPs are "delineated solely to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located."

Table 8: 2010 Population of Clark County Communities[3]

Incorporated Jurisdiction	2010 Population
Borden (town)	796
Charlestown (city)	7,472
Clarksville (town)	22,947
Jeffersonville (city)	42,148
Sellersburg (town)	6,115
Utica (town)	885
Incorporated Jurisdiction Total	**80,363**
Census Designated Place (CDP)	
Henryville (CDP)	1,905
Memphis (CDP)	695
New Washington (CDP)	566
CDP Total	**3,166**

[3] US Census Bureau, 2010 Census

The urban location of more than three-quarters of Clark County's population together with population density and the Ohio River location of its two largest cities, Jeffersonville (1,319 persons per square mile density) and Clarksville's 2,178 density are important factors in developing effective mitigation strategies.

It is important to consider minority cultures and subcultures in mitigation planning in order to indentify portentially vulnerable populations. Clark County's minority population is predominantly Black or African American at 7.3% of the county's population in 2013[4], compared to 9.5% of the state's population. The second largest minority group is Hispanic or Latino at 5.1% and the Asian population group which comprises 1% of the county's population.

Clark County has over 42,502 households with 2.58 persons on average per household. Clark County's home ownership rate is 71.6%, slightly higher than Indiana's average of 70%. Compared to the state's median value of $122,400 for owner-occupied homes, Clark County values are higher, averaging $127,400 in 2013. More than 88% of the county's residents have lived in the same house for one year or more.

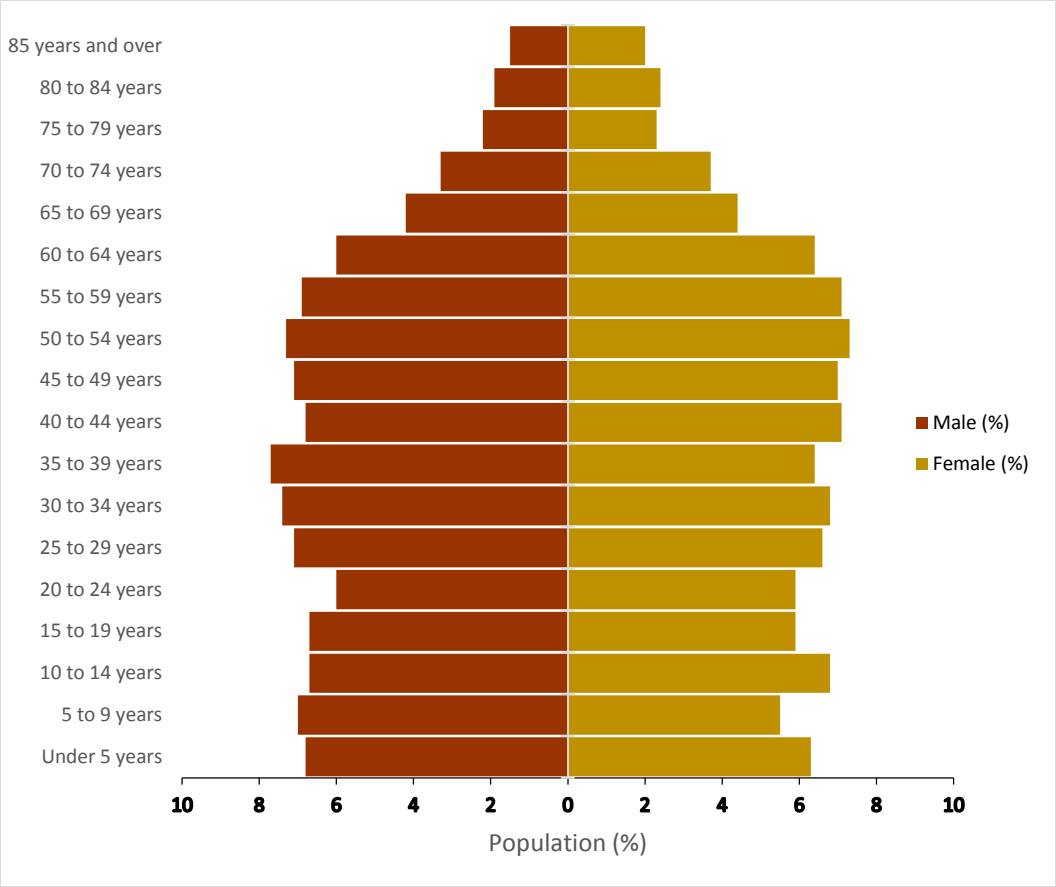
In 2013, the median age of Indiana's population was 37.1 years, comparable to Clark County's 38.3 years. Figure 5 on the next page shows Clark County's population pyramid, a visual profile that shows the distribution of the county's population by age segments and gender.

Key population characteristics such as age, particularly groups that are 18 years and under and 65 years and over, are crucial to hazard mitigation planning. For example, the increase in population for the 45 to 59 segments 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 segments. Clark County's population pyramid shows relatively stable growth for the county with long life expectancy and low infant mortality.

Figure 5: Clark County Population Pyramid[5]

[4] US Census Bureau, Quickfacts, 2013 estimates
[5] US Census Bureau 2013 5-year estimates



4.3 Population Change

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 such characteristics as net Adjusted Gross Income (AGI) as a result of migration.

According to STATS Indiana migration data for 2013, Clark County registered a positive natural population increase of 361 (more people were born than died) and a net domestic migration loss of 70 (more people moved out of the county than into the county).

Table 9 lists the breakdown of the population change in Clark County from 2000 to 2010.

Table 9: Population Change in Clark County (2000-2010)

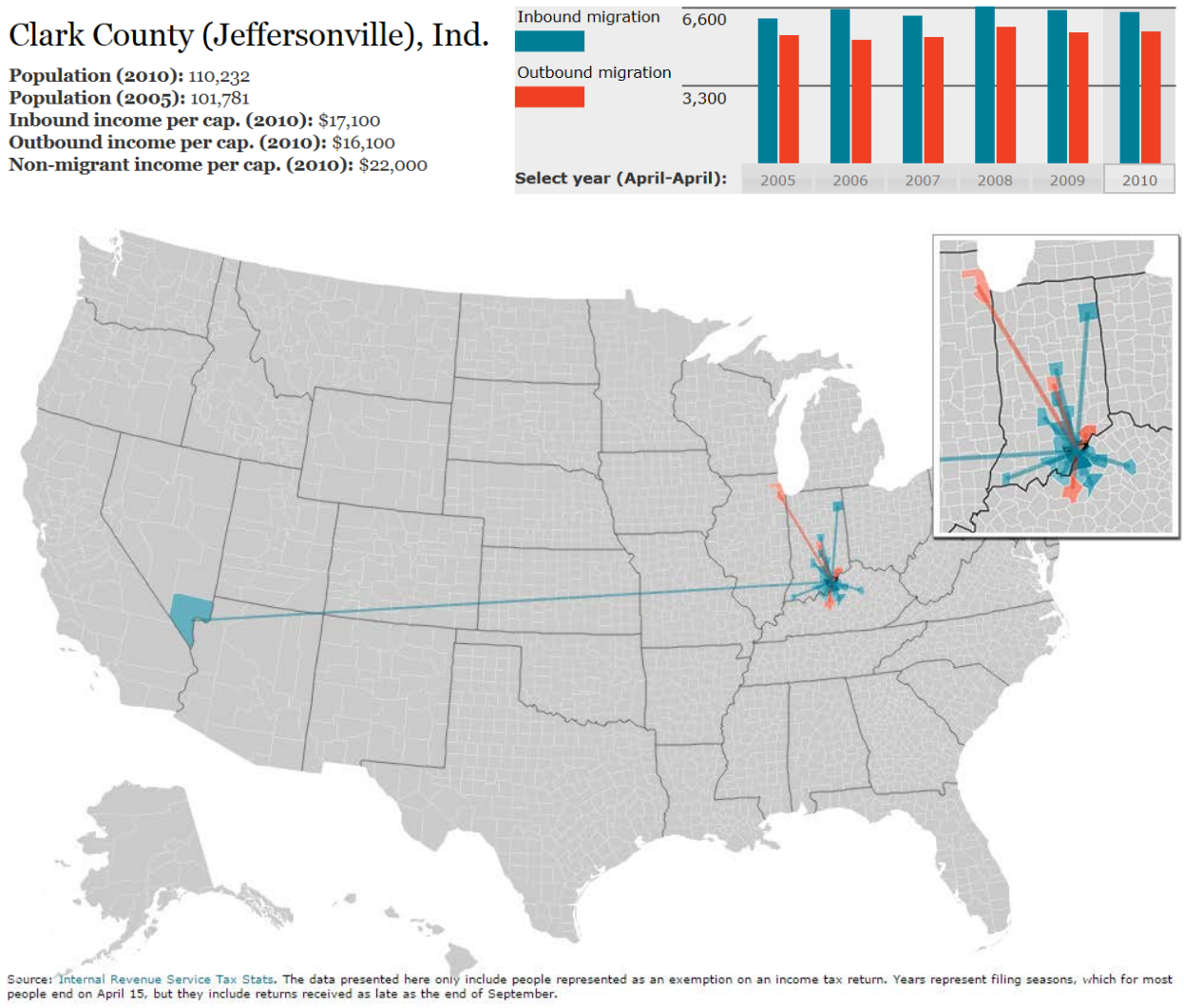
	2000[6] Population	2010[7] Population	% Change 2000-2010
Incorporated Community			
Borden	818	796	-2.7%
Charlestown	5,993	7,472	24.7%
Clarksville	21,400	22,947	7.2%
Jeffersonville	27,362	42,148	54.0%
Sellersburg*	6,071	6,115	0.7%
Utica	591	885	49.8%
Total	**62,235**	**80,363**	**15.5%**
Census Designated Place (CDP) 2000-2013			
Henryville	1,545	1,905	23.3%
Memphis	400	695	73.8%
New Washington	547	566	3.5%
Total	**2,492**	**3,166**	**27.0%**
Clark County	**96,472**	**107,381**	**11.3%**

**A Senior Code Official from Sellersburg requested that it be noted that the Sellersburg's population for 2010 was actually 8,584.*

The map in Figure 6 on the following page was generated with the Forbes American Migration Map tool and shows Clark County's migration patterns between 2005 and 2010 in terms of inbound and outbound domestic migration.

[6] US Census Bureau, 2000 Census
[7] US Census Bureau, 2010 5-year estimates

Figure 6: Clark County Migration Patterns



During the decade of 2010 to 2020, Clark County is projected to increase its population by more than 10%[8]. Clark is the only south-central county and among just nine counties in the entire state that are projected to make gains of 10% or more by 2020.

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, Clark County has identified five significant population groups with special

[8] Indiana Business Research Center, Kelley School of Business, Indiana University, March 2012

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 without a high school diploma.

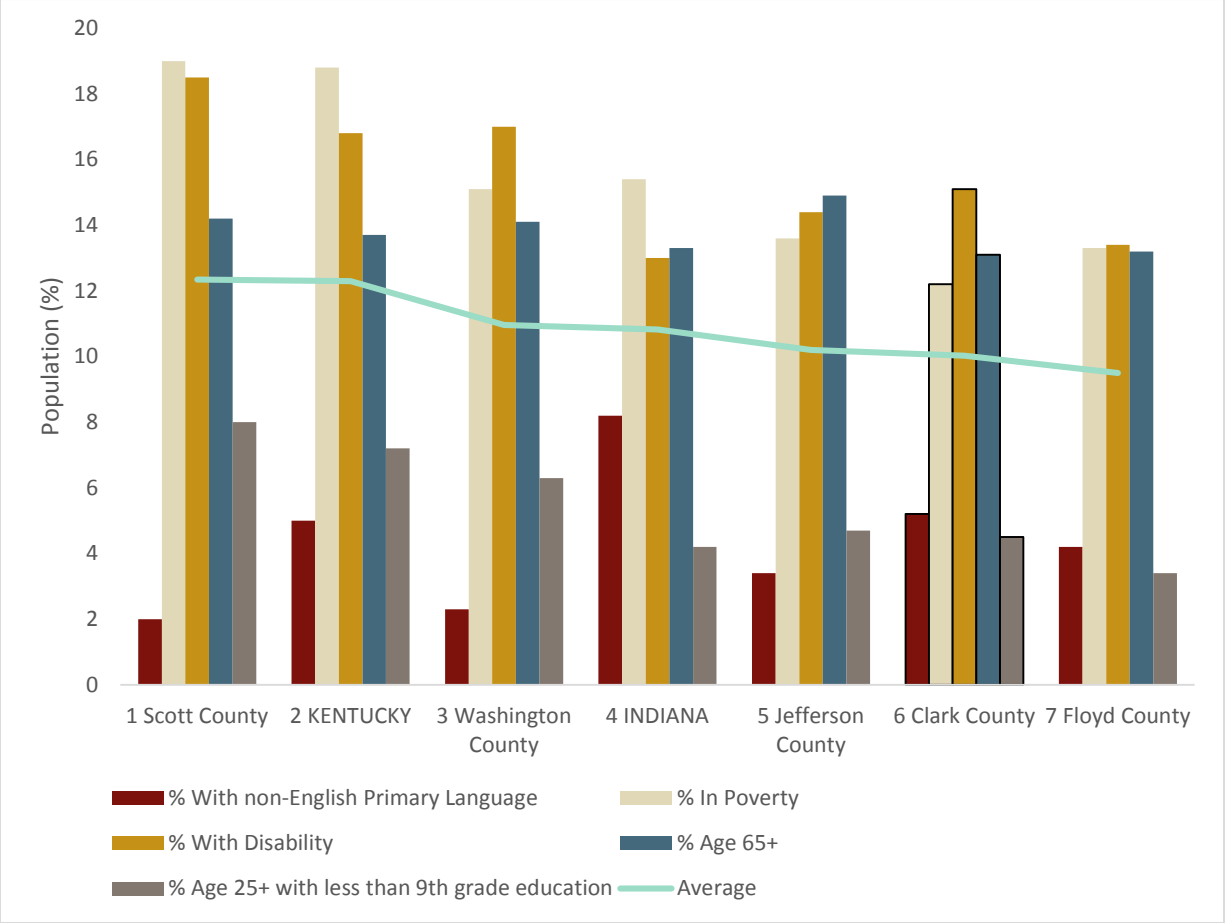
The planning team compared Clark County to nearby counties, as well as Indiana and Kentucky, by averaging the percent population of each special needs category within the county/state. Of the seven geographies we compared (two state and five counties), Clark County ranks sixth, but is comparable to most of the surrounding regions.

Figure 7 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. For example, Adams County, which is located in northeastern Indiana, has a high average of combined special needs indicators. This is due, however, to Adams County's significant Amish population, which may have special needs in terms of culture, but is not necessarily a concern in terms of safety for emergency managers and first responders. More than 17% of Adams County's population speaks a language other than English at home. But while many Amish speak Pennsylvania Dutch or German at home, they are also fluent in English. Additionally, the high percentage of population without a high school diploma (15.5%) may be explained by the fact that many Amish children only attend school through grade eight.

The special needs indicators most significant in Clark County are the population with a disability (15.1%), the population aged 65 and older (13.1%), and the population whose income in the past 12 monthes is below poverty level (12.2%). 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. Clark 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 inmate communities and elderly care facilities
- Public materials on when and how to shelter in place
- Construction of accessible safe rooms
- Training for emergency shelter staff
- Development of resource guide for seniors with available housing, medical, and basic needs services
- Development of accessible media announcements
- Ensure comprehensive siren coverage in rural areas of the county.

Figure 7: Special Needs Ranking Overall and by Indicator[9]



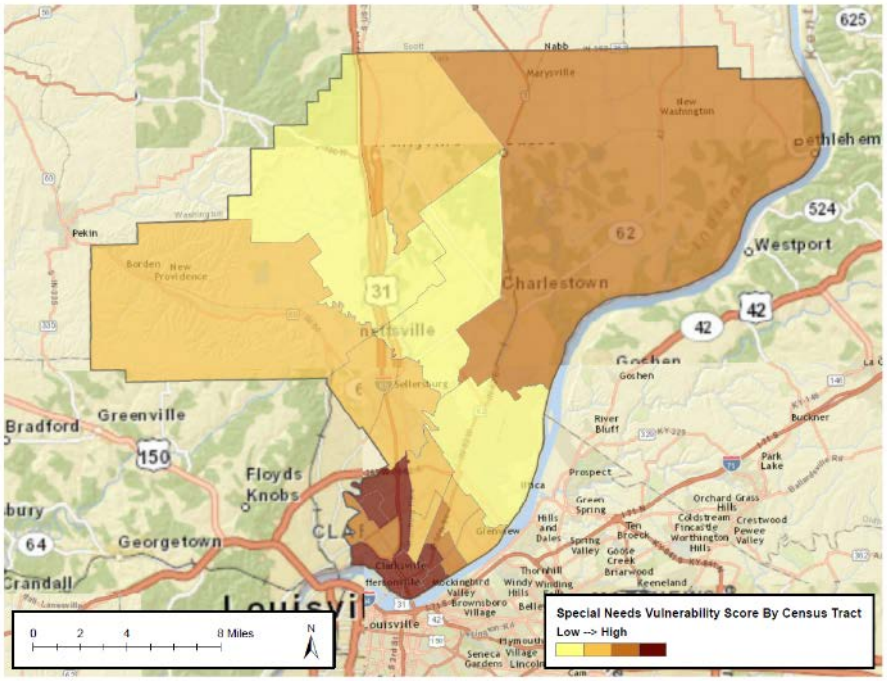
Explanation of Special Needs Indicators:

- Percent of population speaking language other than English at home
- Percent of population with a disability within the civilian non-institutionalized population
- Percent of all people whose income in the last 12 months is below poverty level
- Percent of population age 65 and over
- Percent of population age 25 and over with less than 9th grade educational attainment

[9] American Community Survey 5-Year Estimates, 2009-2013

Other factors important in mitigation planning include geographic areas with the highest vulnerability, as shown in Figure 8.

Figure 8: Clark County Vulnerability Score



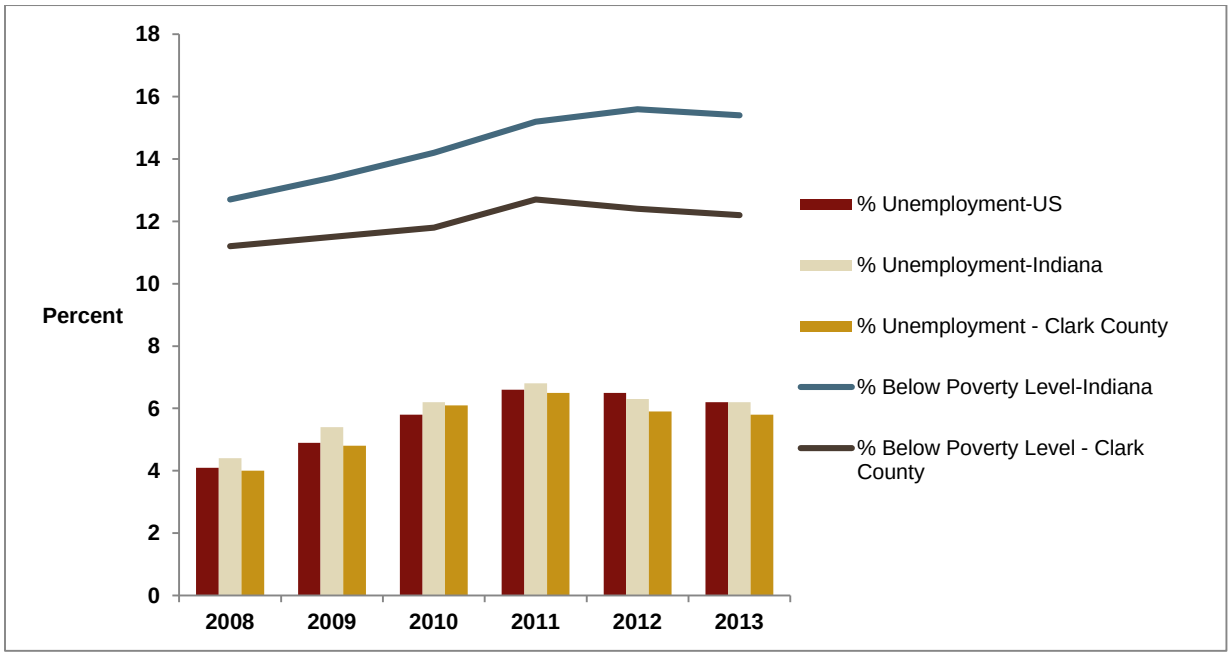
While the vulnerability map and special needs population data are not definitive or conclusive, this information points to geographic areas and population groups that could benefit from further analysis in mitigation planning. The locations of vulnerable populations in Clark County are based on census tracts. The scores for each tract are totaled to create the Special Needs Vulnerability Score. The score pertains to the degree of vulnerability (low to high) of the population in the tract.

4.5 Economy and Industry

The financial crisis of beginning in 2008 had a similar impact on Clark County as it did in Indiana and the US. Although the unemployment rate in Clark County from 2008 through 2011 reflected the state's rate, it was lower than the US unemployment by approximately .5%, except in 2010 when it was .3% higher. Figure 9 illustrates unemployment and poverty in Clark County, Indiana, and the US from 2008-2013.

Over the four-year period ending in 2011, unemployment in Indiana averaged 5.8% compared to Clark County's average of 5.3%. Clark County's unemployment from 2012 to 2013 was slightly lower, between .6% to .4%, than both state and US levels. The population below poverty level in Clark County has been at least 3.2% lower each year during the six-year period ending in 2013.

Figure 9: Unemployment and Poverty Rates (2008-2013)[10]



Note about above chart:
Unemployed data is for age 16 years and over, civilian labor force population.
Poverty level includes all people 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.

Since Clark County's early settlement, the Ohio River has been the primary economic driver, fueling significant business and industrial development in the riverfront communities of Utica, Jeffersonville and Clarksville. In 2008, Clarksville's long-time mainstay manufacturer, the Colgate-Palmolive Company closed operations. The soap factory's former site near the riverfront is being redeveloped as a mixed-use setting. The 2012 Clark's Landing North Master Plan includes business, retail, residential and recreation components.

Today, among the county's major businesses related to river commerce, industry and trade are Jeffersonville's Jeffboat, the largest inland shipbuilder in the US. Jeffboat builds barges, steamboats and other watercraft from its 68-acre shipyards on the Ohio River. Increasingly, the Port of Indiana-Jeffersonville (Clark Maritime Center) is a leading commerce and industrial force in Clark County. During the first quarter of 2015, the 1,057-acre port with 3,200 feet of river frontage reported the highest quarterly shipments in its 30-year history. The port includes 25 tenants, including 13 steel-related companies and an industrial park. The port also offers year round shipping to the Gulf of Mexico and Great Lakes through the US Inland Waterway System.

[10] US Census Bureau: 2008-2012, 3-year estimates; 2013, 5-year estimates

Clark County's median household income of $50,496 is comparable to the state's average of $48,248[11]. Table 10 describes employment in Clark County by industry sector.

Table 10: 2013 Clark County Employment by Industry Sector[12]

Industry Sector	Number of Employees*	% of Labor Force
Agriculture, forestry, fishing and hunting, and mining	267	1.2%
Construction	3,305	8.8%
Manufacturing	8,483	17.3%
Wholesale trade	1,156	3.1%
Retail trade	5,980	11.7%
Transportation and warehousing, and utilities	3,746	6.3%
Information services	769	1.1%
Finance and insurance, and real estate and rental and leasing	3,860	5.7%
Professional, scientific, and management, and administrative and waste management services	4,044	7.6%
Educational services, health care and social assistance	11,594	18.6%
Arts, entertainment, and recreation, and accommodation and food services	5,415	11.6%
Other services, except public administration	2,691	4.7%
Public administration	2,186	2.3%
Civilian employed population 16 years and over	**53,496**	**100.0%**

[11] US Census Bureau, 2013 5-year estimates

[12] US Census Bureau, 2013 5-year estimates

The major employers of Clark County are listed in Table 11.

Table 11: Clark County Major Employers[13]

Company/Employer	Product/Service	Location	Employment
Amazon.com Inc.	Retail-Warehousing	Jeffersonville	2,500
Clark Memorial Hospital	Hospitals	Jeffersonville	1,600
Greater Clark School System	Education	Jeffersonville	1,600
Afge Local 1438	Labor Organizations	Jeffersonville	1,500
US Census Bureau	Govt-Information Services	Jeffersonville	1,200
Jeffboat LLC	Boats-Manufacturers	Jeffersonville	600
National Distributors Leasing	Trucking-motor Freight	Sellersburg	435
Ivy Tech Community College	Higher Education	Sellersburg	430
West Clark School System	Education	Jeffersonville	430
Humana Inc.	Medical Insurance Plans	Jeffersonville	373
Labor Ready	Employment Contractors	Jeffersonville	400
Koetter Woodworking Inc.	Millwork-Manufacturers	Borden	399
Kitchen Kompact	Cabinets-Manufacturers	Jeffersonville	300
Da Inc.	Auto Parts & Supplies-Mfrs.	Charlestown	300
Meijer	Grocers-Retail	Jeffersonville	300
Star Of America	Bus Lines	Clarksville	300
Lifespring	Mental Health Services	Jeffersonville	287
Jeffersonville High School	Schools	Jeffersonville	280
Aig Service Net Warranty LLC	Warranty Programs	Jeffersonville	274
Harland Clarke	Business Forms and Systems	Jeffersonville	260
American Commercial Lines Inc.	Barge Lines and Terminals	Jeffersonville	250
Manitowoc Beverage Systems Inc.	Beverage Dispensing Equip.	Sellersburg	250
Holland	Trucking-Motor Freight	Jeffersonville	205
Legacy Supply Chain Service	Logistics	Jeffersonville	200
Haas Cabinet	Cabinets-Manufacturers	Sellersburg	200
Essroc	Cement-Manufacturers	Speed	200
Kindred Sellersburg Health	Rehabilitation Services	Sellersburg	200

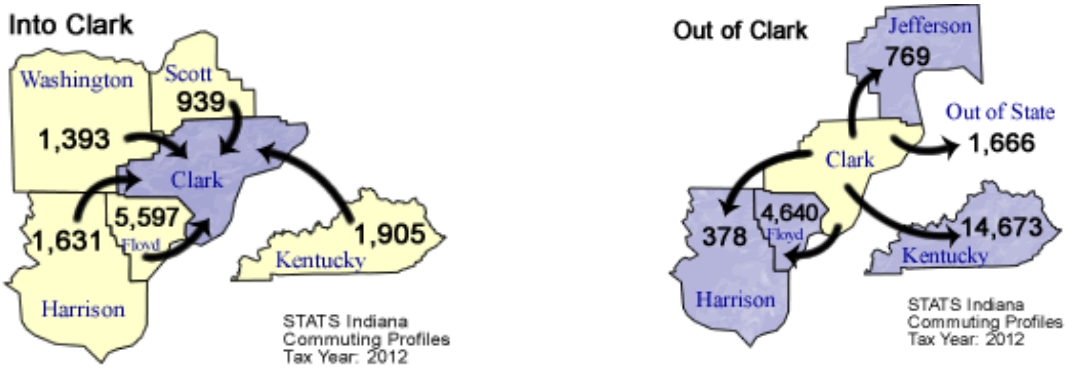
[B] Source: Business Lookup Tool, Indiana Department of Workforce Development, Q 1 2015 employers with 200 or more employees

4.6 Commuting Patterns

County-to-county commuting patterns provide a gauge of the economic connectivity of neighboring communities. The US Census reports that over 27% of US workers travel outside their residential county to travel to work.

Approximately 70,987 people who live in Clark County are also working (implied resident labor force.)[14] Of these, 23,284 or 32.8% work outside the county. An additional 12,954 people live in another county and commute to work in Clark County. Figure 10 illustrates the inbound and outbound migration of the workforce in Clark County, nearby Indiana counties and Kentucky.

Figure 10: Clark County Inbound and Outbound Commuting Patterns[15]



In 2013, the average travel time to work in Clark County was 22.5 minutes, higher than the state average of 23.3 minutes and the 24.3-minutes commute 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 Clark County's growth and development, as well as effective mitigation planning, is the transportation network. Clark County's surface transportation network includes four railroads which provide freight service only (CSX, MGR Rallroad, Louisville & Indiana, and Southern Indiana Railway) and two interstate highways, I-65 and I-265. In conjunction with the Ohio River Bridges Project, I-265 will be extended from Prospect, KY to Utica, IN and include a new bridge. Since 2010, the area between Utica and Charlestown, eight miles northeast of Jeffersonville along the Ohio River Valley, has experienced significant growth and development, and is an important consideration for effective mitigation planning.

[14] Source: STATS Indiana, Indiana IT-40 2012 tax year returns
[15] STATS Indiana, 2012

According to INDOT vehicular traffic volume data collected in 2013, the highest traffic volume in Clark County is 91,497 vehicles a day on I-65 within two miles of the Ohio River. Of those vehicles, 75% were passenger vehicles. Among the I-65 traffic volume stations, the I-65 100 N of Kentucky state line station recorded the highest commercial vehicle traffic volume with 66% commercial and 34% passenger vehicles.

Since the 2008 Clark County MHMP, there have been numerous improvements and several major expansions of the county's transportation network. Pending approval, Louisville & Indiana and CSX railroads will offer high-speed service that can accommodate heavy freight and Hazmat shipments. Clark County has also identified a "heavy-haul" roadway route which will connect the Ohio River port, River Ridge Commerce Center, and Clark Regional Airport, which extended its longest runway to 7,000 feet for expanded cargo services.

Among the most significant transportation projects launched since the 2008 MHMP is the Ohio River Bridges Project. The two project areas are Louisville Downtown Crossing, with rehabilitation of more than 20 bridges and structures, and a new I-65 bridge. The East End Crossing includes a new bridge and I-265 extension connecting the east side of Louisville, at Prospect, KY with Utica.

Although the Ohio River Scenic Byway along SR-62 in Clark 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.

4.8 Major Waterways and Watersheds

The surface water drainage of Clark County lies within the Ohio River Basin. Clark County crosses three watersheds, Blue-Sinking, Muscatatuck, and Silver-Little Kentucky[16]. The watersheds and their HUC 8 codes are listed in Table 13. Clark County's navigable waterways are listed in Table 12. Major Ohio River tributaries located in Clark County include Silver Creek, Fourteen Mile Creek, and Camp Creek.

Table 12: Clark County Navigable Waterways[17]

Navigable Waterway	Description
Bull Creek	Navigable from its junction with the Ohio River for 1.1 river miles.
Camp Creek	Navigable from its junction with the Ohio River for 1.7 river miles.
Fourteen Mile Creek	Navigable from its junction with the Ohio River for 2.9 river miles.
Lancassange Creek	Navigable from its junction with the Ohio River for 0.3 river miles.
Ohio River	Navigable throughout the county.
Silver Creek	Navigable from its junction with the Ohio River for 3 river miles.

[16] Source: EPA
[17] IDNR

Table 13: Clark County Watersheds

Watershed	HUC 8 Code
Blue-Sinking	05140104
Muscatatuck	05120207
Silver-Little Kentucky	05140101

The Blue-Sinking Watershed is located along the southwestern edge of Clark County. It covers eight Indiana counties and drains over 795,000 acres. A very small portion of the Muscatatuck Watershed dips into Oregon Township in northern Clark County. The watershed drains more than 731,300 acres and covers eight counties in south-central and southeastern Indiana. Silver-Little Kentucky Watershed drains four Indiana counties: Clark, Floyd, Scott, and Washington. More than 80% of the watershed's 97,443 acres is within Clark County. Land usage within the watershed includes 28% urban, 36% forest, and 25% agricultural usage.

4.9 Land-Use and Development Trends

The number of farms as well as acres of land used for farming and agricultural operations in Clark has been declining since 2007. By 2012, the number of farms had fallen to 515 from 585 in 2007. Land used for farming also declined by 9.3% from 86,668 acres to 78,645 acres in 2012. According to the 2007 study Rural and Urban Sustainability in Clark County by The Center for Environmental Policy and Management, University of Louisville, farmland loss is attributed primarily to the increased demand for residential, as well as commercial and industrial development.

Since 2010, the Jeffersonville and Sellersburg area, southeastern Clark County, and the Utica-Charlestown corridor have been experiencing significant population, residential, business, and industrial growth. The new I-265 bridge over the Ohio River and River Ridge Commerce Center are attracting new business and industrial operations that are creating jobs and, in turn, increasing the demand for housing and residential development.

River Ridge Commerce Center is redeveloping 6,000 acres of a former US military ammunition plant for an expansive, multi-faceted business and industrial park. According to a study conducted by Policy Analytics, LLC, River Ridge is expected to have a $1.3 billion economic impact in 2015. The study also predicts that employment will rise to 10,084 in 2015, almost double the 5,258 jobs in 2012.

To date, about 600 acres, or 10% of the complex, has been redeveloped, attracting high-profile clients such as Amazon.com Inc., The Standard Register Co., and Japanese labeling company American Fuji Seal Inc. Today, Amazon.com Inc., remains the park's largest employer, with a regular workforce of about 2,500.

River Ridge is also planning to spend $7 million in improvements and expansion of the park's road system, including River Ridge Parkway, which will be a strategic commercial connector to I-265, the east Louisville metro area, and beyond.

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 Clark County Multi-Hazard mitigation plan and the current effective FEMA Flood Insurance Flood Maps (FIRMs). The 2008 Clark County Multi-Hazard Mitigation Plan identified the following principal hazards ranked from most to least severe:

1) Flooding
2) Tornado
3) Severe Storms
4) Winter Storms
5) Hazardous Material Release
6) Earthquake
7) Drought
8) Ground Failure

In 2015, the planning team updated the county's top hazards to:

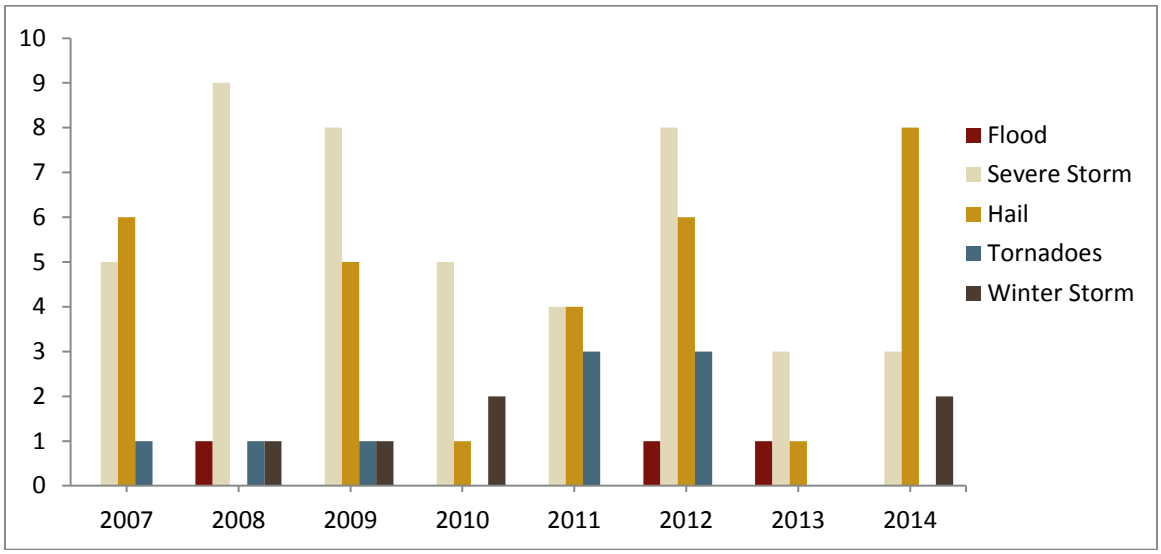
1) Flooding
2) Severe Storms
3) Tornado
4) Winter Storms
5) Hazardous Material Release

6) Fire
7) Earthquake
8) Subsidence
9) Drought

5.1.2 Historical Hazards Records

To assist the planning team, historical storm-event data from the past five years was compiled from the National Climatic Data Center (NCDC). 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 94 reported events in Clark County between January 1, 2007 and May 31, 2014.

Figure 11: NCDC Events in Clark County (2007-2014)



5.1.3 Hazard-Ranking Methodology

During Meeting 1, held on February 27, 2015, 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 Clark 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 was also 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 14 lists the criteria used to determine both probability and impact.

Table 14: Guidelines for Determining Probability and Impact

PROBABILITY	IMPACT
Highly Likely 10+ events in 10 years	**Catastrophic** >Incident results 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
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 15 lists the CPRI categories and assigned weight values.

Table 15: 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)]

Table 16 identifies the CPRI values for each hazard facing Clark County.

Table 16: Clark 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
Winter Storm	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
Severe Thunderstorm	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
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
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 12: Risk Grid Methodology

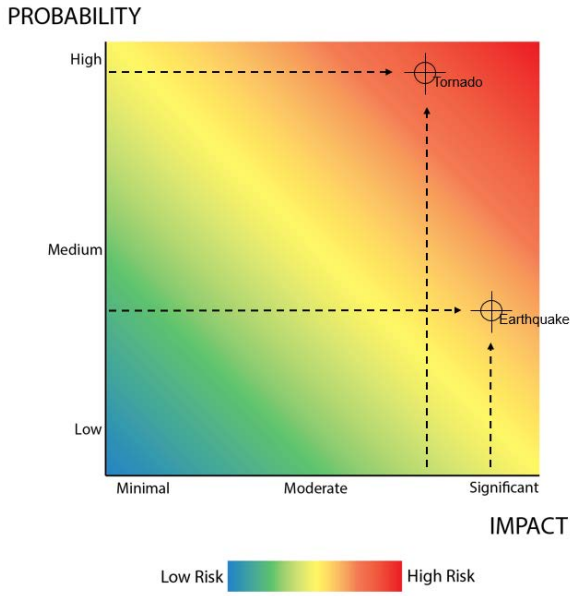
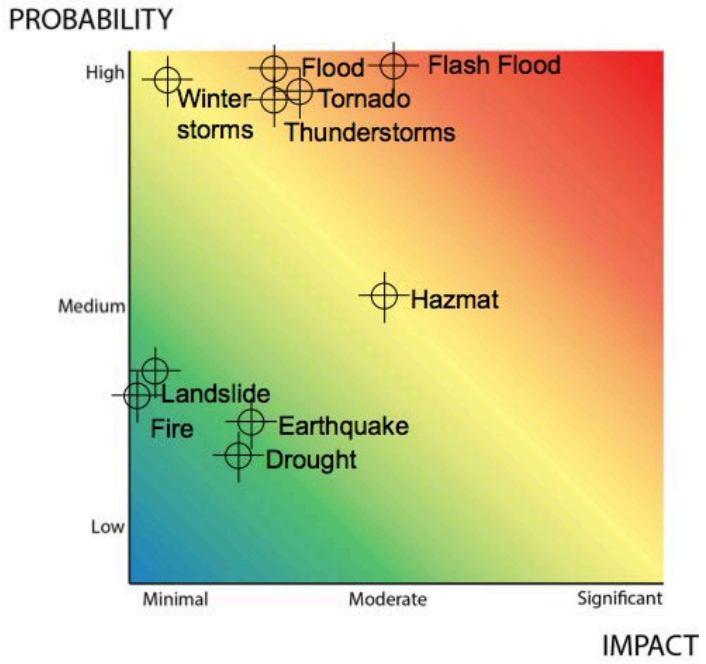


Figure 12 illustrates the risk grid methodology. In this example, a tornado has a high probability (y-axis) and a significant impact (x-axis), so overall, Indiana is at high risk for a tornado.

Clark County listed flooding, severe storms, and tornadoes as the highest-risk disasters. Figure 13 illustrates the county's risk for each hazard.

Figure 13: Clark County Risk Matrix



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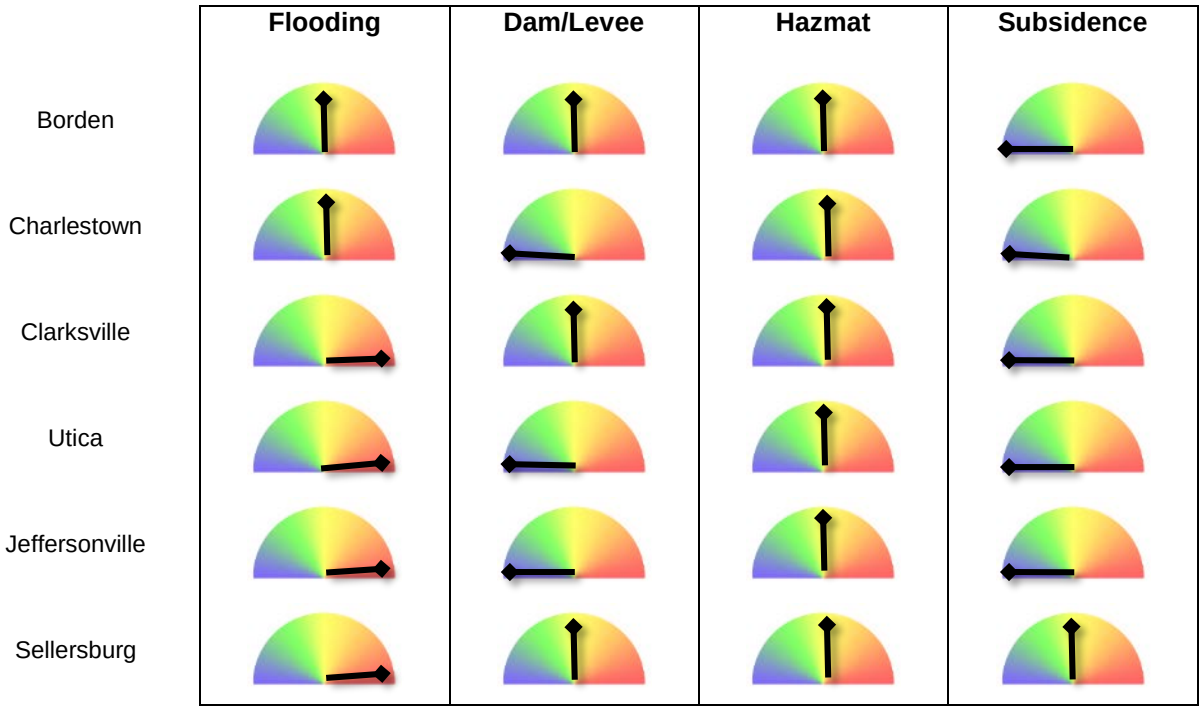
While some hazards are widespread and will impact communities similarly, e.g. winter storms, others are localized leaving certain communities at greater risk than others. The following diagram illustrates each community's risk to flooding, dam/levee failure, hazmat incidents, and ground subsidence.

Figure 14: Community Risk to Localized Hazards



5.1.4 GIS and Hazus-MH Modeling

FEMA's Pre-Disaster Mitigation (PDM) program is designed to provide assistance to local communities to develop and implement their hazard mitigation plan, thereby reducing risk to property and lives. The initial multi-hazard mitigation plan (MHMP) for Clark County, Indiana, was submitted to FEMA and approved in 2008. 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 analysis, Hazus-MH generated a combination of site-specific (flood) and aggregated loss (earthquake) estimates. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across census blocks/tracts. With this in mind, total losses tend to be more reliable over larger geographic areas than for individual census blocks/tracts. Site-specific analysis is based 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 is also 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 Clark 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

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

- **Transportation Systems** – 2 *airports, 5 railroad, 8 port facilities* – necessary for transport of people and resources including airports, highways, railways, and waterways.
- **Lifeline Utility Systems** – *7 wastewater treatment plants, 4 potable water systems, 27 communications facilities* – vital to public health and safety including potable water, wastewater, oil, natural gas, electric power, and communication systems.
- **High Potential Loss Facilities** – 16 *dams (12 High Potential and 4 Significant Potential)* – failure or miss-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** – *31 hazardous materials facilities* – involved in the production, storage, and/or transport of corrosives, explosives, flammable materials, radioactive materials, and toxins.

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

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

Table 17: Essential Facilities of Clark County

Category	Number of Facilities
Care Facilities	70
Emergency Operations Centers	1
Fire Stations	25
Police Stations	7
Schools	38
Total	**141**

5.2.2 Building Replacement Costs

The total building exposure for Clark County is identified in Table 18 along with the estimated number of buildings within each occupancy class. These counts and costs were derived from the county assessor and parcel data.

Table 18: Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure ($)
Agricultural	2,735	$407,773,654
Commercial	1,660	$1,283,363,902
Education	13	$11,476,914
Government	281	$154,386,906
Industrial	138	$272,982,324
Religious/Non-Profit	417	$267,069,982
Residential	37,076	$4,987,390,237
Total	**42,320**	**$7,384,443,919**

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 102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado. Tornadoes are classified according to the Enhanced Fujita tornado intensity scale shown in Table 19.

Table 19: Enhanced Fujita Tornado Rating[18]

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 *Gale*	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
FE1 *Moderate*	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 *Significant*	111-135 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
EF3 *Severe*	136-165 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
EF4 D*evastating*	166-200 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
EF5 *Incredible*	Over 200 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Previous Occurrences for Tornadoes

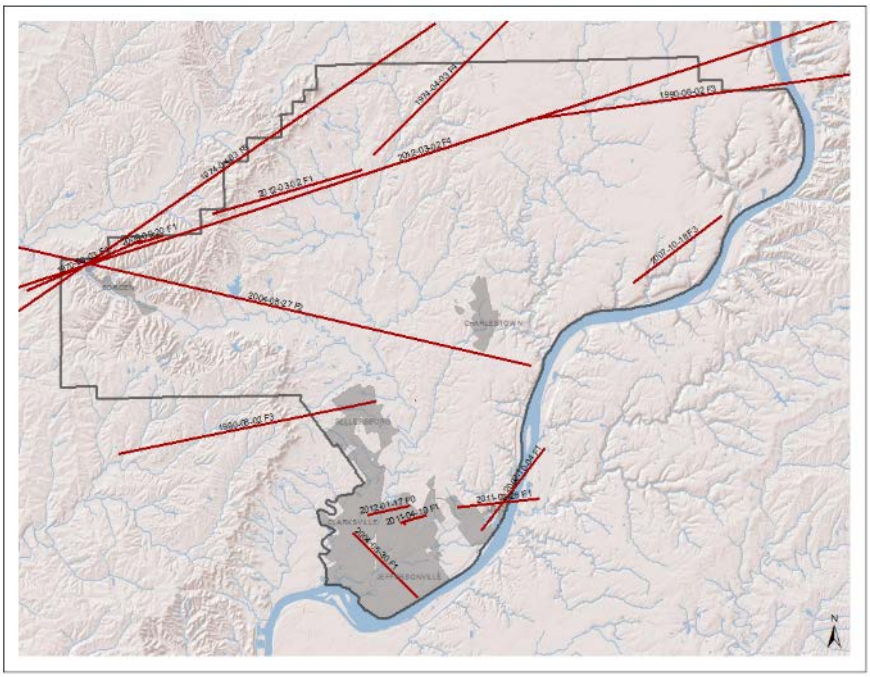
There have been seven tornadoes reported to NCDC in Clark County since January 2008 and a total of 19 in the past 50 years. According to the NCDS, March 2nd 2012 was the worst tornado outbreak since June 2nd, 1990. This event caused one fatality and more than 6 million dollars in property damages. NCDC reported tornado activity in Clark County is documented in Table 20 and Figure 15 below.

[18] NOAA Storm Prediction Center, http://www.srh.noaa.gov

Table 20: Clark County NCDC-Reported Tornadoes – 50 Years

Location	Date	F-Scale	Deaths	Injuries	Property Damage	Crop Damage
Clark County	9/3/1970	F1	0	0	$25,000	$0
Clark County	4/13/1972	F1	0	0	$25,000	$0
Clark County	6/16/1973	F1	0	0	$25,000	$0
Clark County	6/27/1973	F1	0	0	$250,000	$0
Clark County	4/3/1974	F5	1	23	$0	$0
Clark County	4/3/1974	F4	0	0	$250,000,000	$0
Clark County	6/2/1990	F3	0	4	$250,000	$0
Clark County	6/2/1990	F3	0	0	$2,500,000	$0
Borden	5/27/2004	F2	0	0	$1,000,000	$0
Clarksville	5/30/2004	F1	0	0	$500,000	$0
Vesta	10/18/2007	EF3	0	0	$1,000,000	$10,000
Henryville	1/29/2008	EF1	1	0	$50,000	$0
Borden	9/20/2009	EF1	0	0	$10,000	$0
Watson	2/28/2011	EF0	0	0	$5,000	$0
Jeffersonville Arpt	4/19/2011	EF0	0	0	$0	$0
Jeffersonville Arpt	4/19/2011	EF1	0	0	$0	$0
Jeffersonville Arpt	1/17/2012	EF0	0	0	$20,000	$0
Blue Lick	3/2/2012	EF4	1	0	$6,000,000	$0
Blue Lick	3/2/2012	EF1	0	0	$300,000	$0

Figure 15: Clark County Tornado Tracks



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

Based on historical information, the probability of a tornado in Clark County is high and the potential impact of a tornado is significant; therefore the overall risk of a tornado in Clark 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, modeling was based on a historic F3 tornado event that ran for 2.8 miles starting west of Sellersburg in 1990. The analysis estimated that 238 buildings (primarily residential) would be damaged with losses totaling $9.5 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.

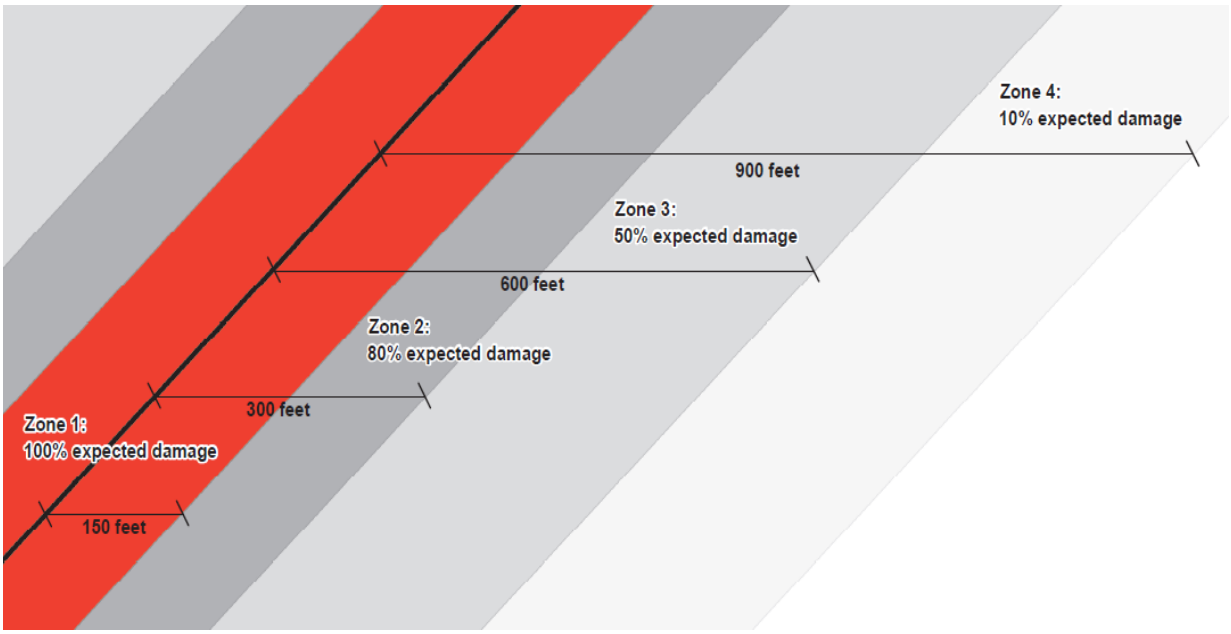
GIS overlay modeling was used to determine the potential impacts of an F4 tornado. The analysis used a hypothetical tornado path that ran for 11 miles travelling extending from Clarksville through Jeffersonville. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Table 21 depicts tornado damage curves as well as path widths.

Table 21: 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 16 and Table 22 describe the zone analysis.

Figure 16: 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). Buildings within this buffer will be damaged by approximately 10%.

Table 22: 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 17 and the damage curve buffers are in Figure 18.

Figure 17: Hypothetical F4 Tornado Path for Clark County

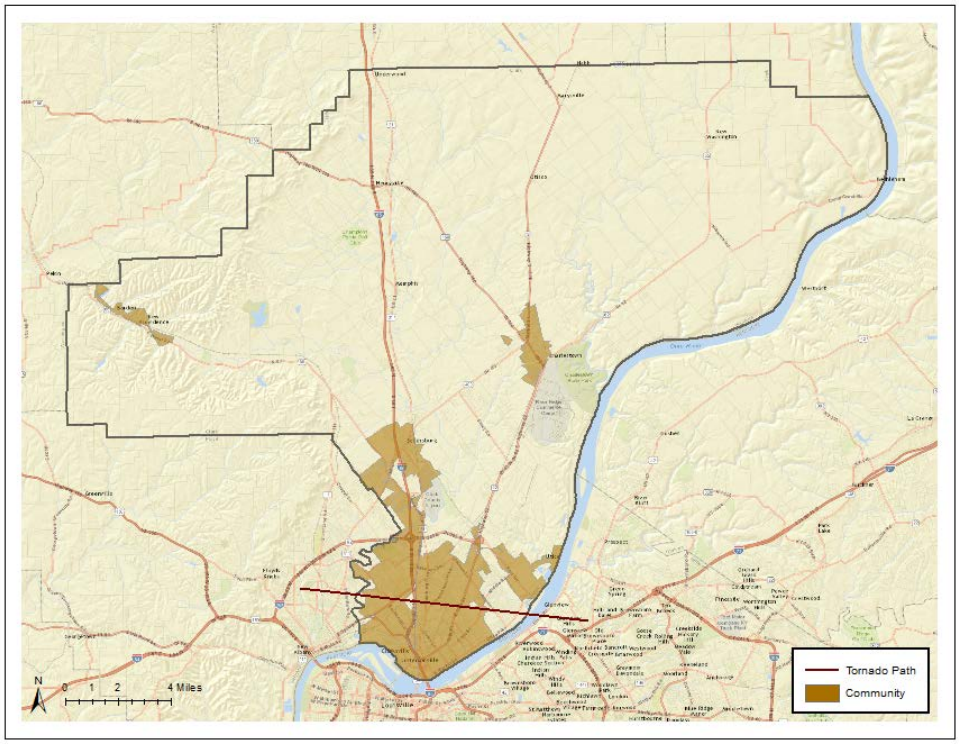


Figure 18: Modeled F4 Tornado Damage Buffers for Clark County

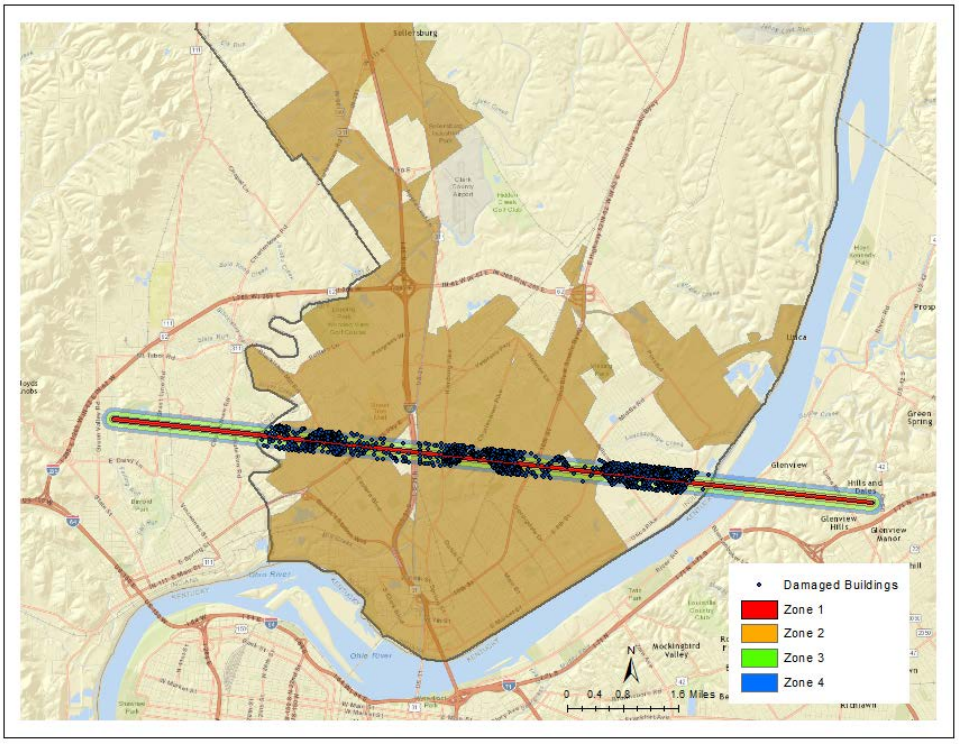
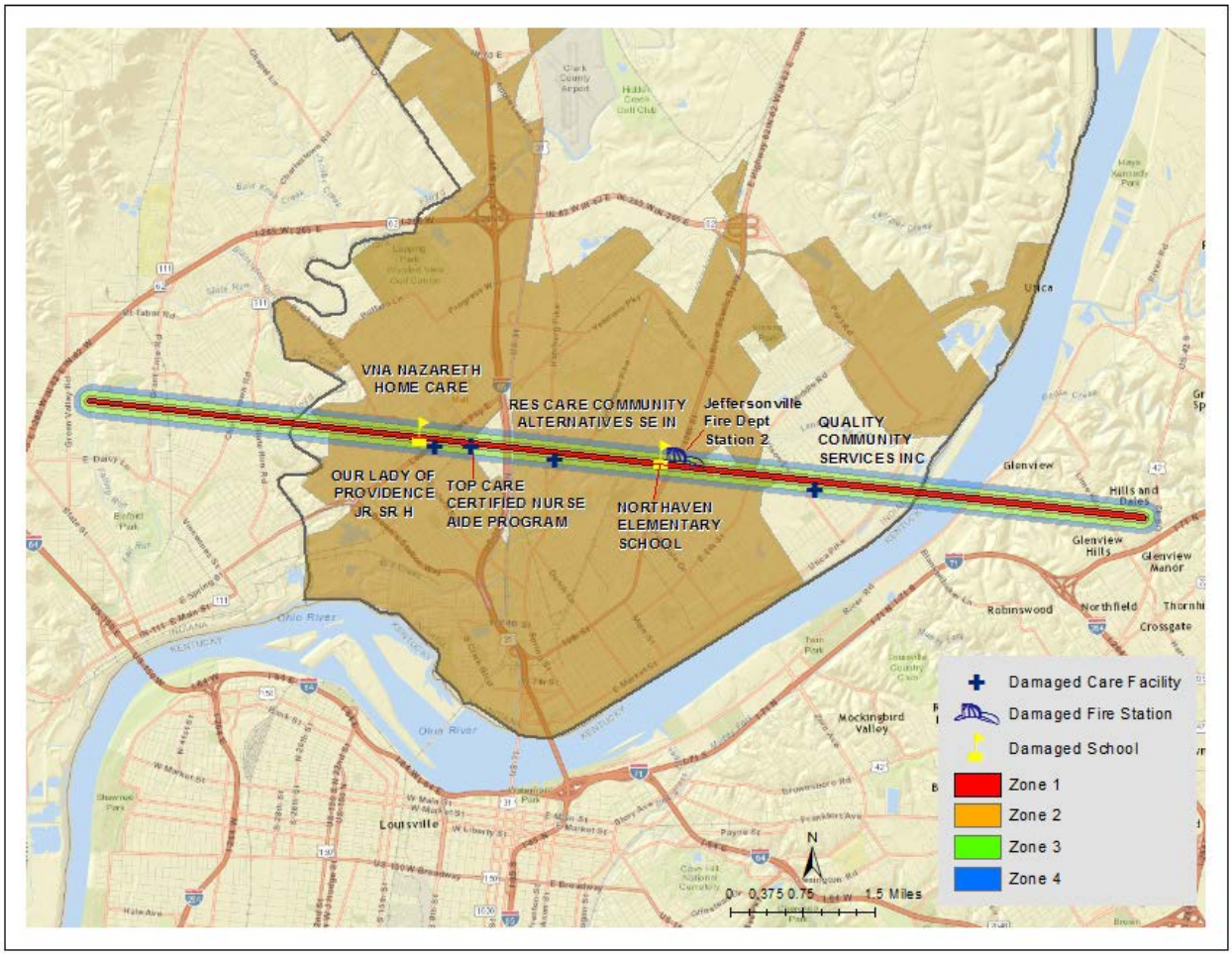


Figure 19: Modeled F4 Tornado Damage to Essential Facilities for Clark County



The results of the analysis are depicted in Table 23. The GIS analysis estimates 1,864 buildings could be damaged. The estimated potential building losses would be $171 million. The building losses are an estimate of building costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Clark 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 23: Estimated Building Losses by Occupancy Type

General Occupancy	Buildings Damaged	Building Losses
Agricultural	3	$147,209
Commercial	69	$30,155,652
Education	2	$456,198
Government	6	$4,160,897
Industrial	13	$11,486,779
Religious	16	$8,021,729
Residential	1,755	$116,435,648
Total	**1,864**	**$170,864,113**

Essential Facility Damage

There were a total of seven essential facilities damaged in this hypothetical scenario. One fire station, two schools, and care facilities were damaged. These are listed in Table 24.

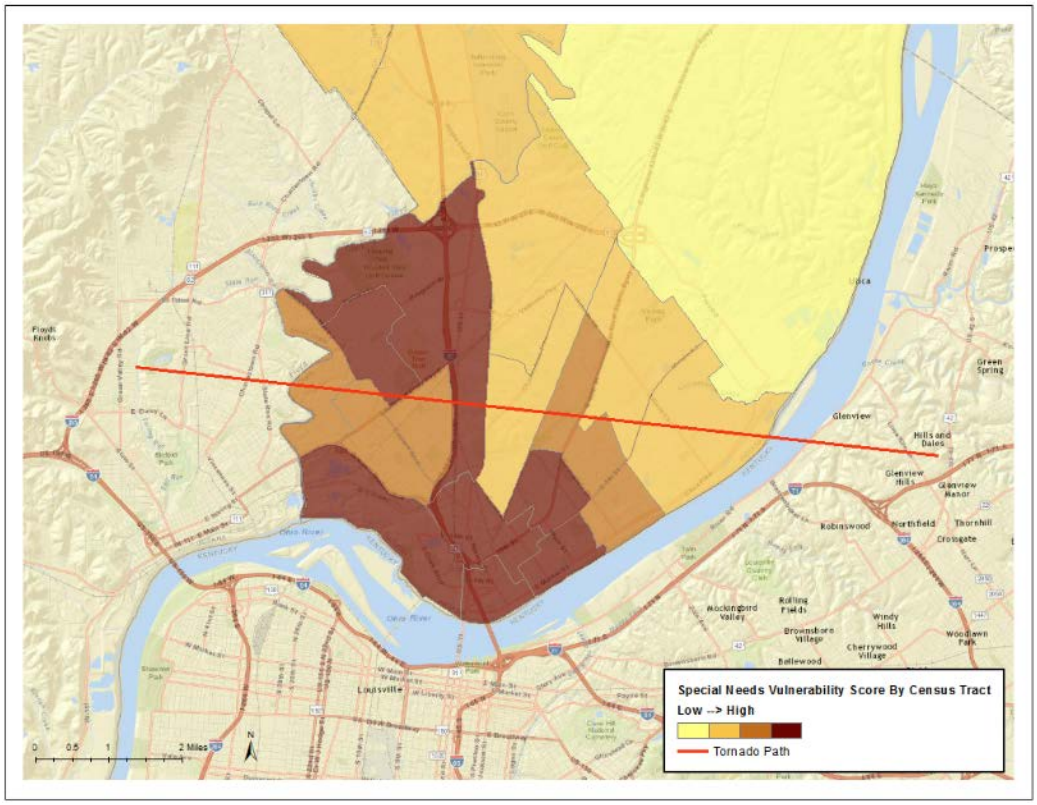
Table 24: Essential Facilities

Damaged Essential Facilities
Jeffersonville Fire Department Station 2
Northaven Elementary School
Our Lady Of Providence Jr Sr High School
Res Care Community Alternatives SE IN
Quality Community Services Inc
Top Care Certified Nurse Aide Program
Vna Nazareth Home Care

Tornado Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. Clarksville is 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 tracts which includes Clarksville has 27.8% of its residents living in poverty and 10.7% aged 65 years or older. These populations will need particular attention in the event of a disaster. Figure 20 shows those areas of the county which have a higher Special Needs Vulnerability Scores.

Figure 20: Tornado Dangers to Special Needs/Vulnerable Populations



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

Due to the unpredictability of this hazard, all buildings and infrastructure in Clark 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 Clark 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 29 flood events in Clark County since 2008. Most of these events were flash floods. Flash flooding can be very dangerous, especially for motorists who try to cross roads with flowing water. In June 2013, a three day event brought widespread substantial rains to southern Indiana producing localized flash flooding. This event caused $2,000 in property damages.

Table 25: Clark County NCDC-Reported Flood Events (2008 - 2014)

Location	Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
Bennettsville	3/18/2008	Flash Flood	0	0	$0	$0
Underwood	3/19/2008	Flash Flood	0	0	$0	$0
Sellersburg	4/4/2008	Flood	0	0	$0	$0
Parkwood	6/26/2009	Flash Flood	0	0	$0	$0
Sellersburg	6/26/2009	Flash Flood	0	0	$0	$0
Henryville	7/30/2009	Flash Flood	0	0	$0	$0
Borden	7/30/2009	Flash Flood	0	0	$0	$0
Jeffersonville	8/4/2009	Flash Flood	0	0	$0	$0
Sellersburg	8/4/2009	Flash Flood	0	0	$0	$0
Charlestown	8/4/2009	Flash Flood	0	0	$0	$0
Clarksville	8/4/2009	Flash Flood	0	0	$0	$0
Sellersburg	8/4/2009	Flash Flood	0	0	$0	$0
Cementville	8/4/2009	Flash Flood	0	0	$0	$0
Sellersburg	8/4/2009	Flash Flood	0	0	$0	$0
Charlestown	9/20/2009	Flash Flood	0	0	$0	$0
Clarksville	9/20/2009	Flash Flood	0	0	$0	$0
Bennettsville	9/20/2009	Flash Flood	0	0	$0	$0
Jeffersonville Arpt	9/20/2009	Flash Flood	0	0	$0	$0
Sellersburg	10/9/2009	Flash Flood	0	0	$0	$0
Oak Park	4/23/2011	Flash Flood	0	0	$0	$0
Borden	5/2/2011	Flash Flood	0	0	$0	$0
Clarksville	9/26/2011	Flash Flood	0	0	$0	$0
Clarksville	5/29/2012	Flash Flood	0	0	$0	$0
Clarksville	9/5/2012	Flood	0	0	$0	$0
Haps Arpt	6/26/2013	Flash Flood	0	0	$1,000	$0
Parkwood	6/26/2013	Flash Flood	0	0	$1,000	$0
Sellersburg	11/17/2013	Flood	0	0	$5,000	$0
Sellersburg	4/4/2014	Flash Flood	0	0	$0	$0
Bonnenburger	9/11/2014	Flood	0	0	$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 Clark County, the unincorporated area has the greatest overall exposure to flooding with 1,078 residential units in the 1%-annual-chance-flood-risk area (AKA 100 year floodplain). There are 316 residential units located within the floodplain in Jeffersonville; 194 within the floodplain at Clarksville; and 168 within the floodplain of Utica. Table 26 contains a summary of building damage by occupancy.

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

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 Clark County is high.

Vulnerability Analysis

2008 Flood Analysis

For the 2008 MHMP, a Hazus-MH analysis of the 1%-annual-chance flood was modeled. That analysis estimated that 303 buildings would be damaged with losses totaling $27.1 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 Clark 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 (historically referred to as the 100-year flood) would damage 2,277 buildings county-wide at a cost of $ 161.5 million. In the modeled scenario, Clark County's unincorporated areas sustained the most damage with 1,310 buildings damaged at a cost of $79.8 million. The total estimated numbers and cost of damaged buildings by community are given in Tables 26 and 27. Figure 21 depicts the Clark County buildings that fall within the 1%-annual-chance flood risk area (AKA 100-year floodplain). Figures 21 through 27 highlight damaged buildings within the floodplain areas in each flood-prone jurisdiction.

Table 26: Number of Buildings Damaged by Community and Occupancy

Community	Total Buildings Damaged	Building Occupancy Class						
		Agriculture	Commercial	Education	Government	Industrial	Religious	Residential
Clark County (Unincorporated)	1,310	142	53	1	9	3	14	1,088
Borden	16	0	0	0	2	0	2	12
Charlestown	22	0	7	0	1	0	1	13
Clarksville	247	5	35	0	8	2	1	196
Utica	184	3	6	0	4	0	3	168
Jeffersonville	347	0	19	1	4	4	2	317
Sellersburg	151	2	32	0	2	2	1	112
Total	**2,277**	**152**	**152**	**2**	**30**	**11**	**24**	**1,906**

Table 27: Cost of Buildings Damaged by Community and Occupancy

Community	Total $ Losses	Building Occupancy Class						
		Agriculture	Commercial	Education	Government	Industrial	Religious	Residential
Clark County (Unincorporated)	$79,822,874	$12,189,415	$7,228,939	$49,483	$2,320,996	$7,211,468	$2,562,855	$48,259,718
Borden	$599,120	$0	$0	$0	$26,733	$0	$169,177	$403,210
Charlestown	$2,089,912	$0	$1,452,357	$0	$21,000	$0	$11,000	$605,555
Clarksville	$25,068,298	$427,656	$13,180,570	$0	$2,394,827	$836,399	$137,540	$8,091,306
Utica	$11,195,285	$266,924	$837,062	$0	$550,723	$0	$342,578	$9,197,998
Jeffersonville	$29,384,416	$0	$6,040,675	$722,000	$3,789,295	$452,482	$143,701	$18,236,263
Sellersburg	$13,328,439	$284,976	$5,356,118	$0	$206,556	$1,272,313	$796,000	$5,412,476
Total	**$161,488,344**	**$13,168,971**	**$34,095,721**	**$771,483**	**$9,310,130**	**$9,772,662**	**$4,162,851**	**$90,206,526**

Figure 21: Clark County Buildings in Floodplain (1% Annual Chance Flood)

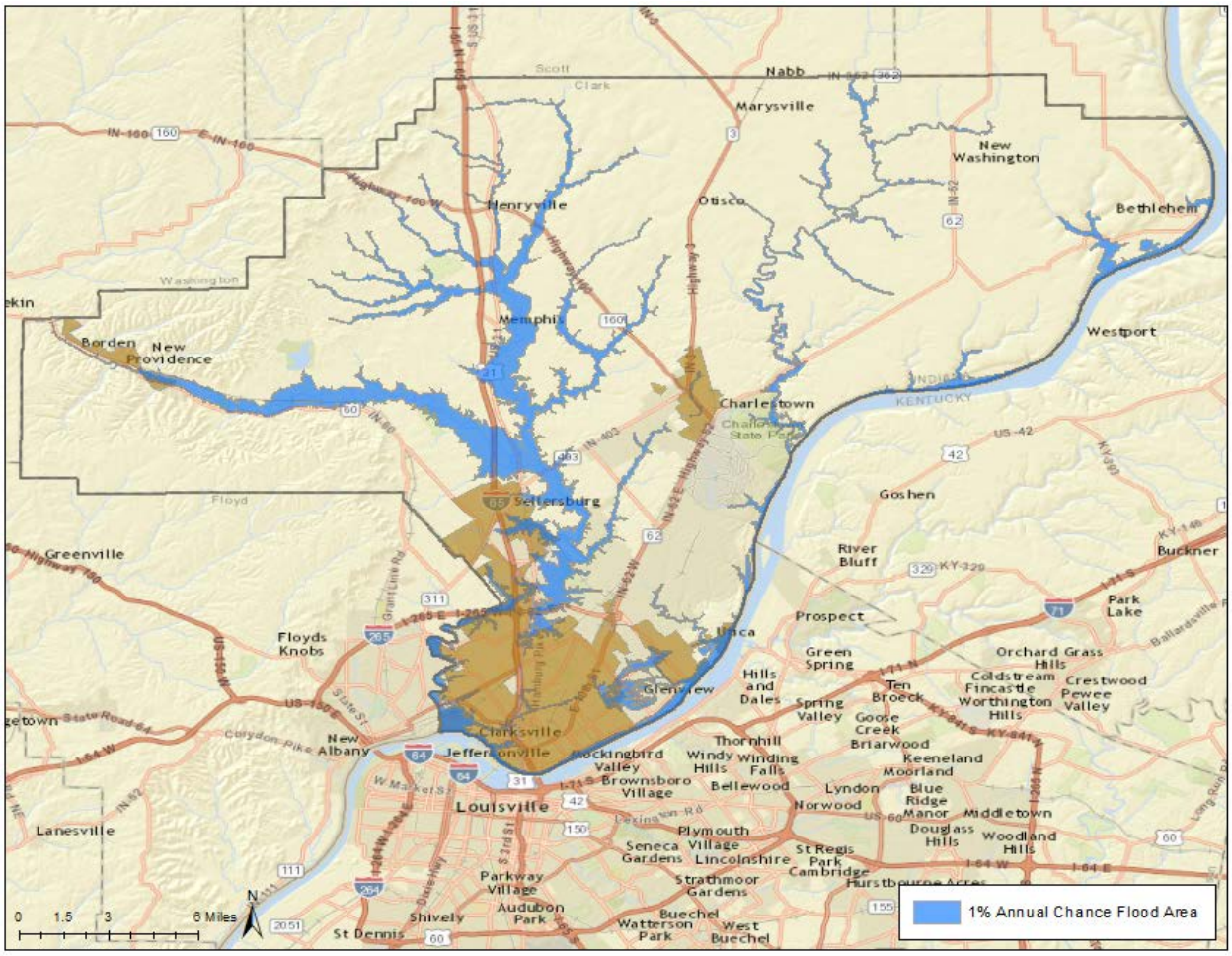


Figure 22: Borden Flood-Prone Areas (1% Annual Chance Flood)

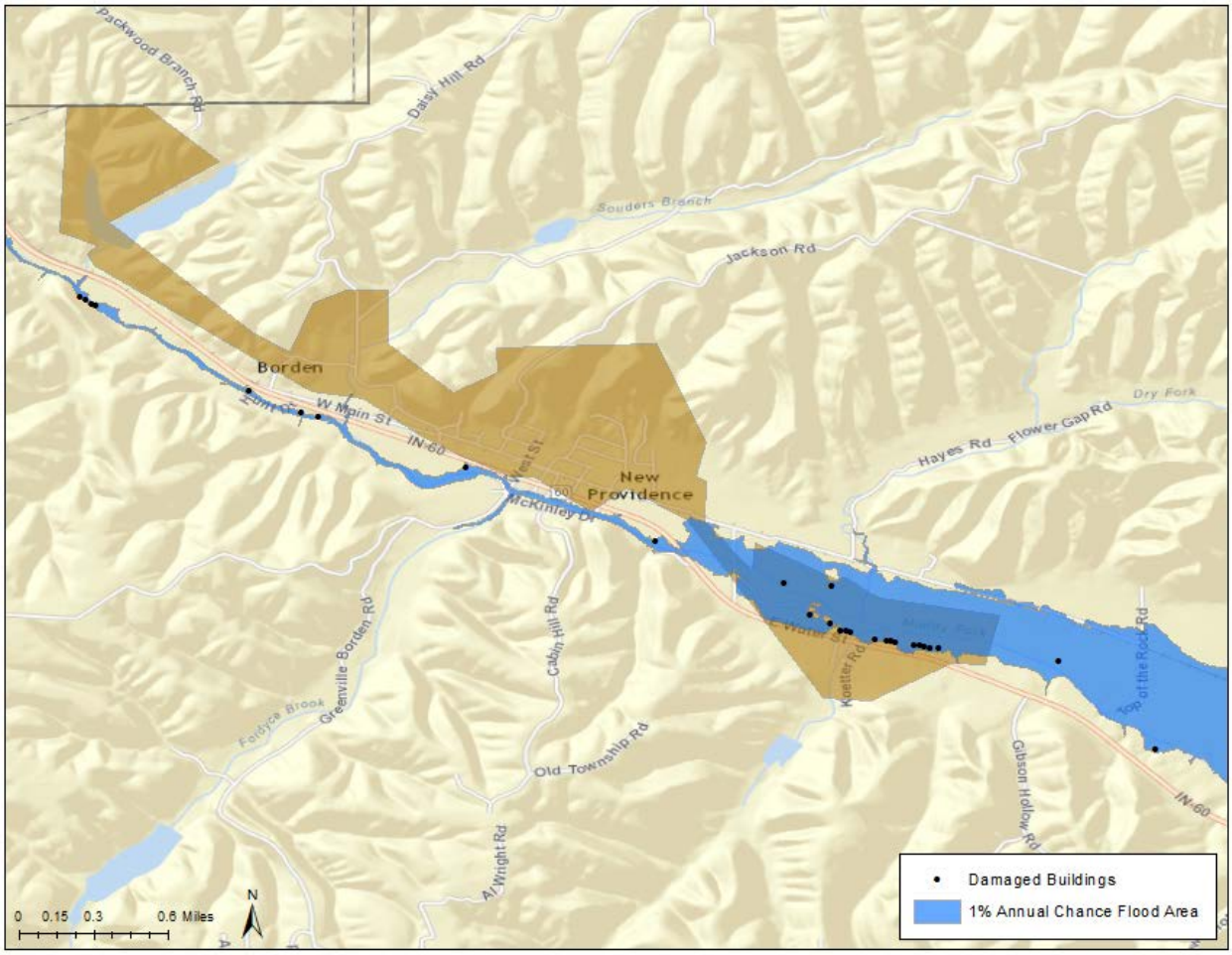


Figure 23: Charlestown Flood-Prone Areas (1% Annual Chance Flood)

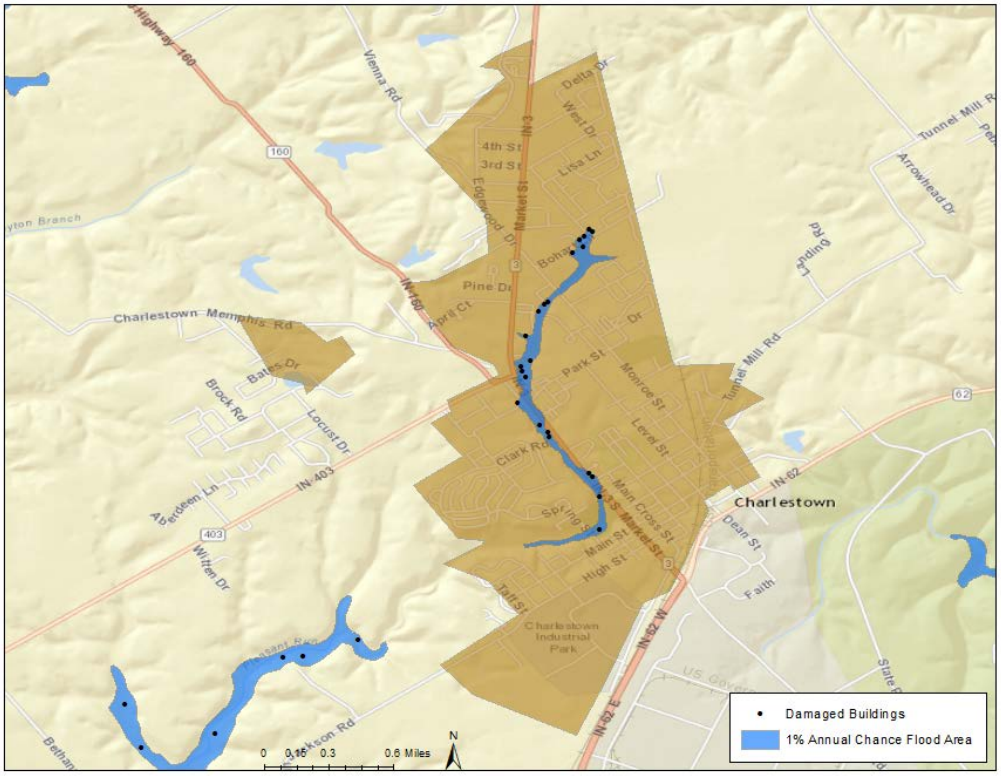


Figure 24: Clarksville Flood-Prone Areas (1% Annual Chance Flood)

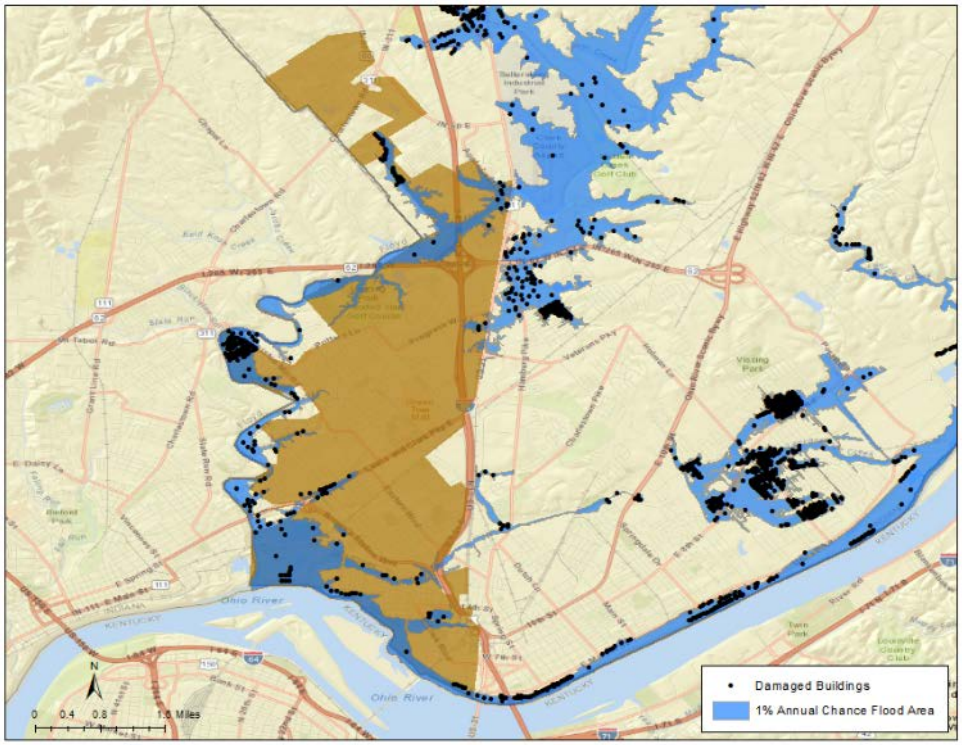


Figure 25: Utica Flood-Prone Areas (1% Annual Chance Flood)

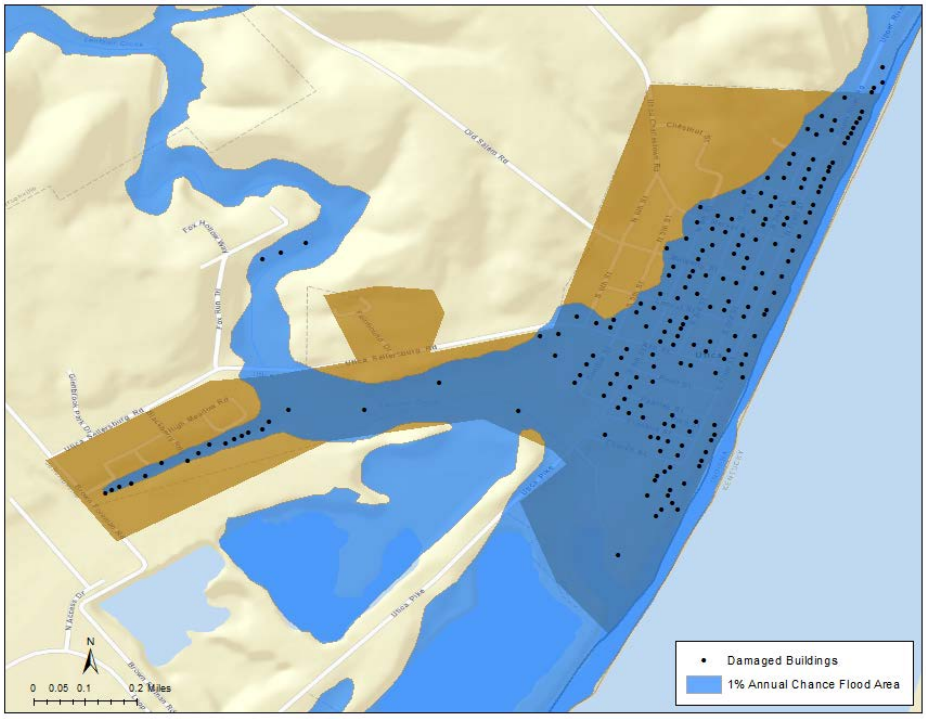


Figure 26: Jeffersonsville Flood-Prone Areas (1% Annual Chance Flood)

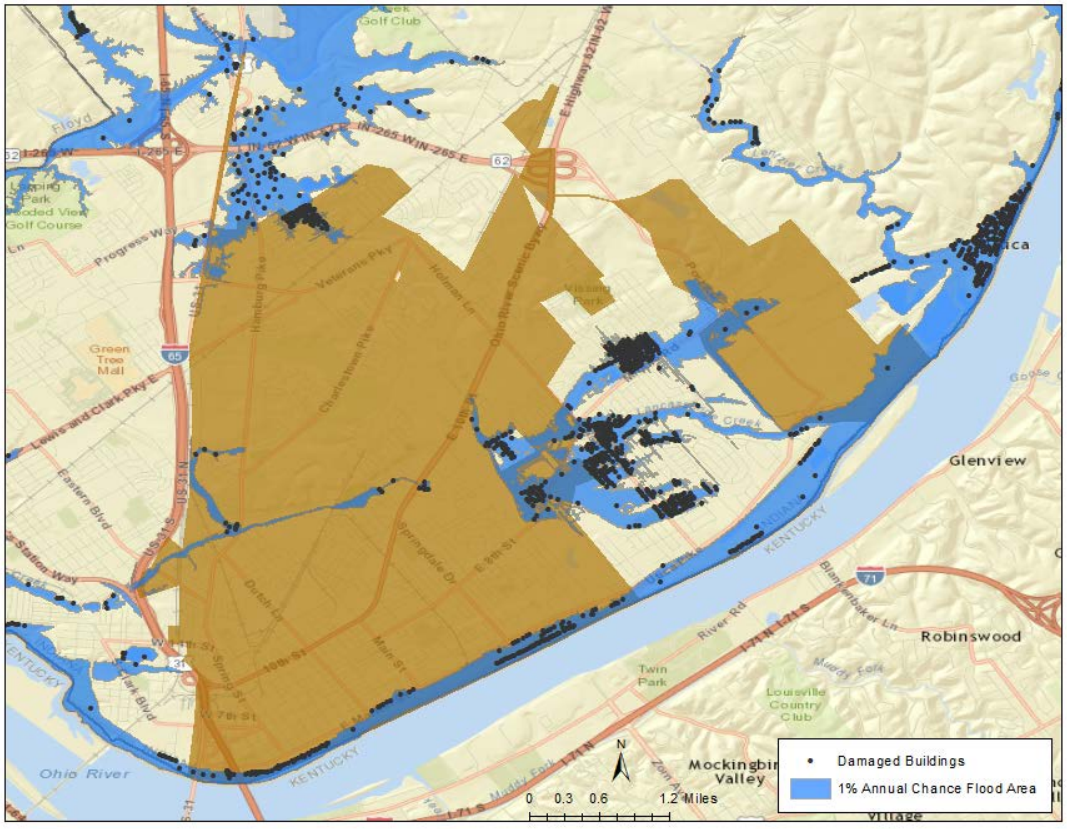
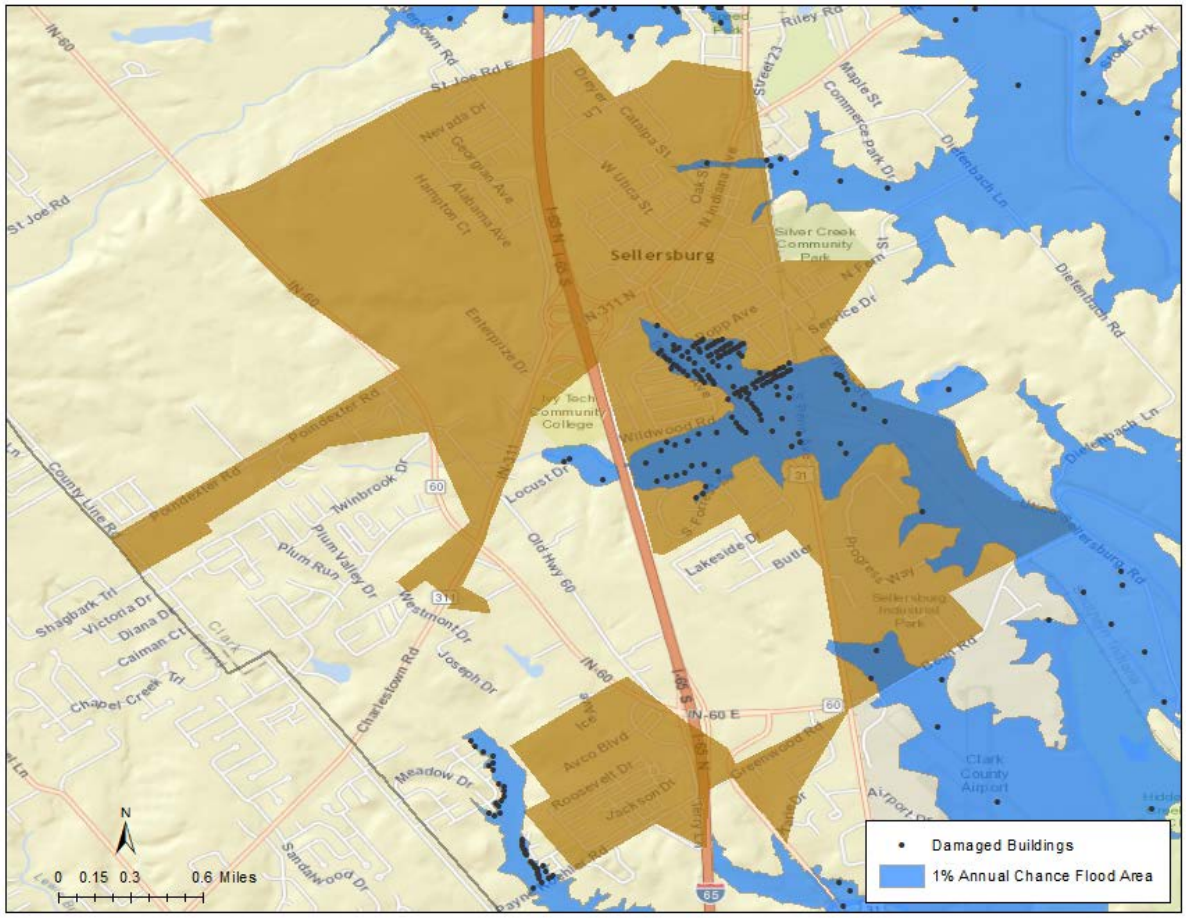


Figure 27: Sellersburg Flood-Prone Areas (1% Annual Chance Flood-Clark County only)



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 seven essential facilities in Clark County could sustain damage. Four medical care facilities would be damaged by the 1% annual flood (Jeffersonville – 2, Henryville – 1, and Utica – 1) A total of two fire Stations (Jeffersonville) and one police Station (Utica) would also be damaged. These Essential Facilities are depicted in Figures 28-30.

Figure 28: Jeffersonville and Surrounding Flood-Prone Essential Facilities

Figure 29: Henryville Flood-Prone Essential Facilities

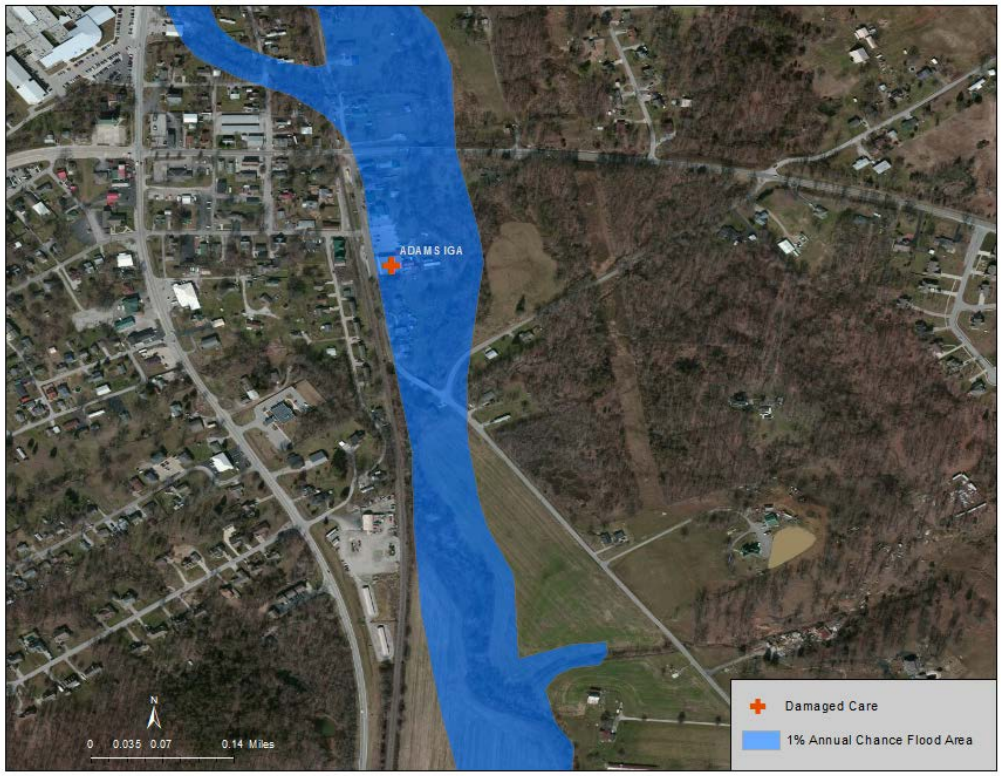


Figure 30: Henryville Flood-Prone Essential Facilities

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 31-35, the results of the overlay analysis indicate that a total of eight critical facilities in Clark County could sustain damage. The community of Borden's wastewater treatment plants is in the flood boundary. There are five hazardous materials sites in the flood boundary in Jeffersonville. Sellersburg and Speed each contain a hazardous materials site in the flood boundary

Figure 31: Borden community Flood-Prone Critical Facilities

Figure 32: Utica community Flood-Prone Critical Facilities

Figure 33: Jeffersonville community Flood-Prone Critical Facilities

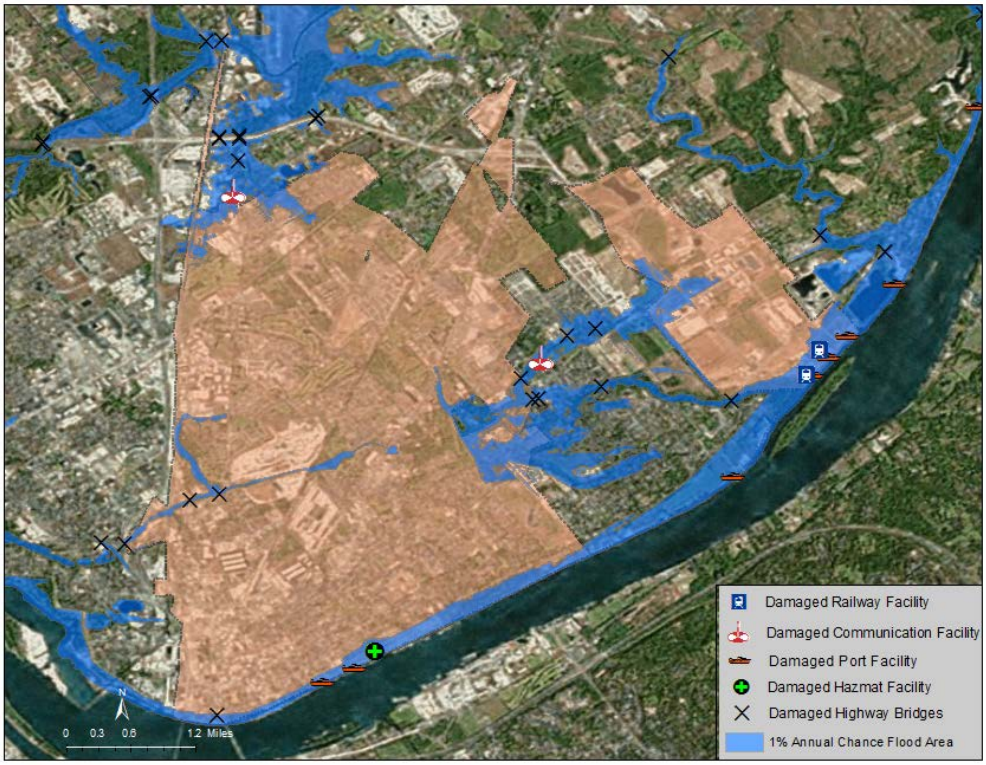


Figure 34: Sellersburg community Flood-Prone Critical Facilities

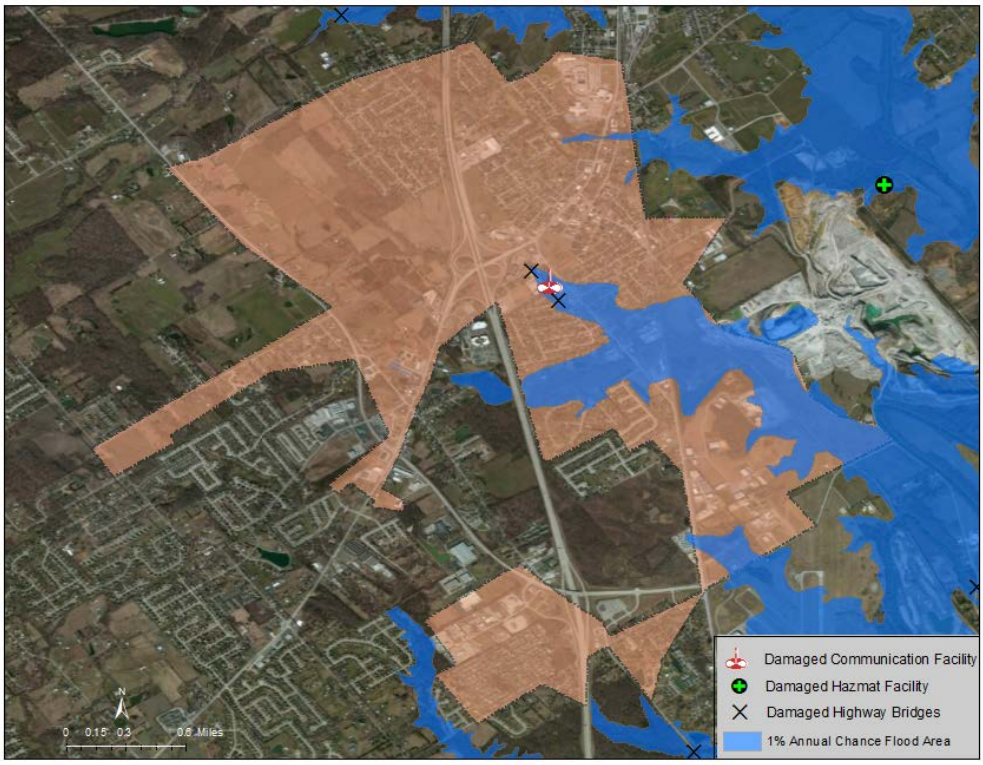
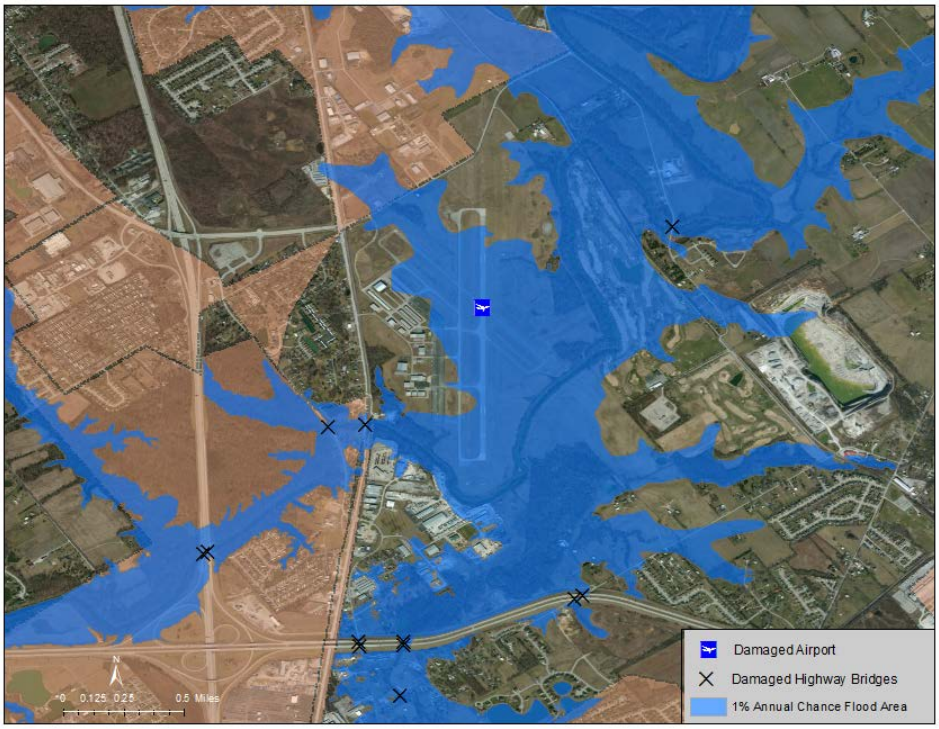


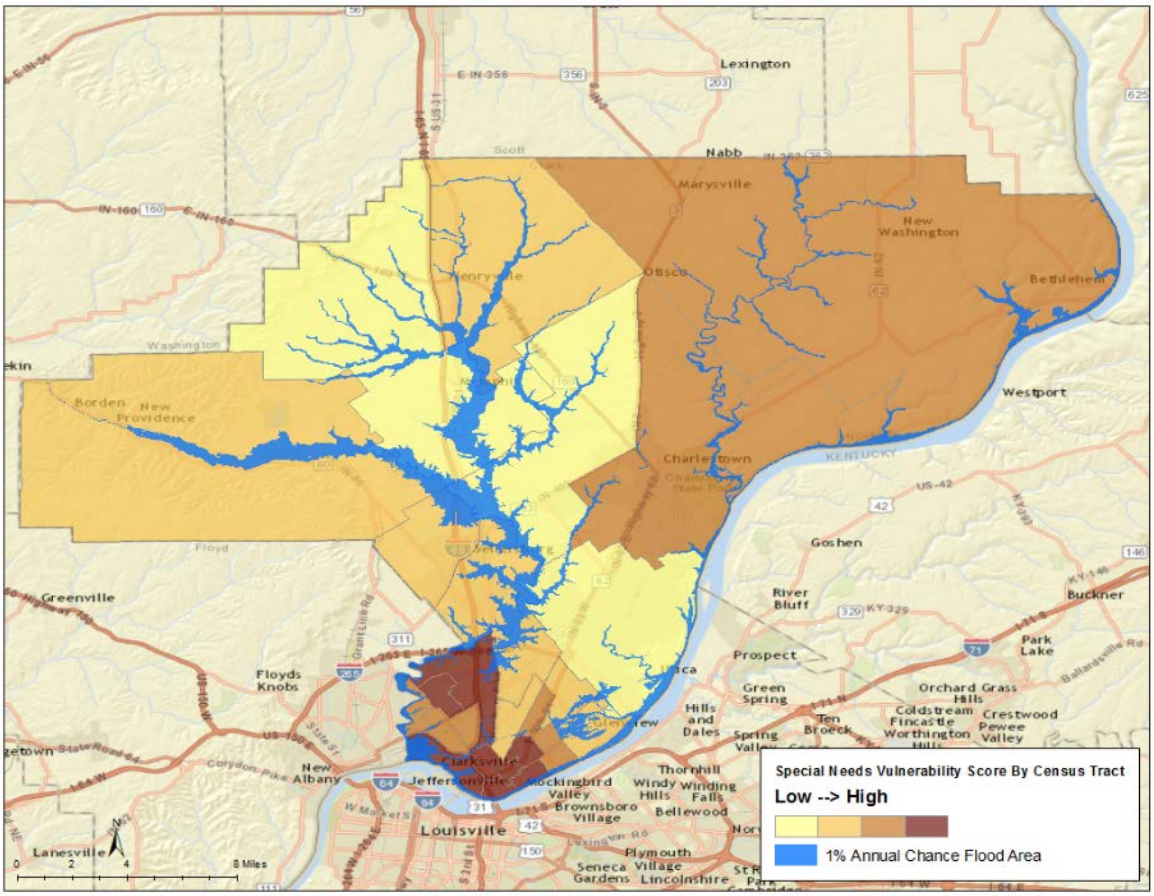
Figure 35: Flood-Prone Critical Facilities near Clarksville and Sellersburg Communities



Flood Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. As previously noted, Clarksville and Jeffersonville have a high number of flood-prone buildings. These communities are also located in an 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 Jeffersonville has 30.8% of its residents living in poverty and 11.5% aged 65 years or older. These populations will need particular attention in the event of a disaster. Figure 36 compares the 1% annual chance flood area with those areas of the county that have a higher Special Needs Vulnerability Scores.

Figure 36: 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) and 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. FEMA Region V reported 65 non-mitigated and one mitigated repetitive loss structure in Clark County. Table 28 lists the number of repetitive losses by community.

Table 28: NFIP Claims Data

Community	% of Community in SFHA	Num. Insurance Claims/ Losses	Value of Insurance Claims/Pymts	Num. Repetitive Losses	Repetitive Losses in Dollars
Clark County (Unincorporated)	8.86%	360	$4,627,121.00	35	$2,200,285.41
Borden	15.84%	5	$24,310.00	1	$6,479.98
Charlestown	2.93%	33	$152,494.00	1	$14,694.92
Clarksville	17.66%	37	$716,674.00	3	$21,193.55
Utica	62.28%	44	$1,128,882.00	6	$343,565.30
Jeffersonville	10.70%	119	$807,267.00	16	$994,424.01
Sellersburg	14.63%	12	$125,157.00	1	$106,910.40

Table 29: Additional Information on Communities Participating in the NFIP

Community	Participation Date
Clark County	9/30/1980
Borden	4/16/2014
Charlestown	11/15/1979
Clarksville	8/3/1981
Utica	9/19/1984
Jeffersonville	8/1/1979
Sellersburg	8/1/1980

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 that meet the three goals of the CRS: 1) reduce flood losses, 2) facilitate accurate insurance rating, and 3) promote the awareness of flood insurance. The communities of the Clarksville and Jeffersonville joined the CRS program in 2014 and continue to be leaders in the NFIP program. Clark County has also recently joined the CRS. Since these communities have committed improving floodplain managmenet standards, the citizens of these communities receive a flood insurance discount (Clarksville 5% and Jeffersonville 10% discount for policies located within the Special Flood Hazard Area).

Table 30: 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	Percent of Exposure Insured
Clark County (Unincorporated)	1,310	$79,822,874	549	$86,672,100	42%	109%*
Borden	16	$599,120	16	$825,100	100%	138%*
Charlestown	22	$2,089,912	6	$832,000	27%	40%
Clarksville	247	$25,068,298	40	$8,045,800	16%	35%
Utica	184	$11,195,285	51	$7,901,200	28%	74%
Jeffersonville	347	$29,384,416	439	$90,519,400	127%*	308%*
Sellersburg	151	$13,328,429	34	$5,336,500	23%	40%

**Approximate percent of Buildings Insured and Percent of Exposure Insured is greater than 100%.*

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

The Clark County Comprehensive Plan 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

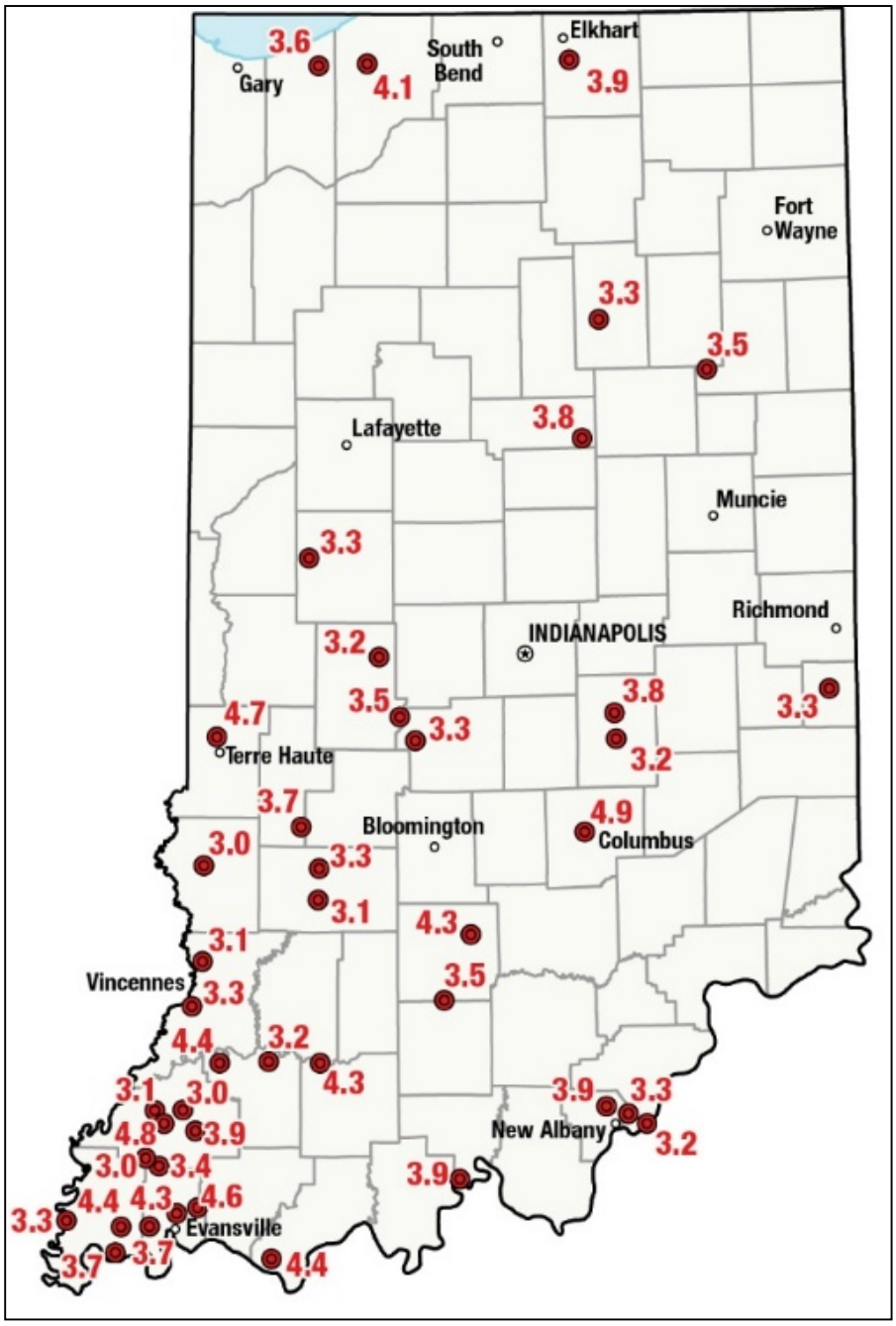
An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. 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 37 depicts Indiana's historical earthquake epicenters. Tables 31 and 32 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 37: Indiana Historical Earthquake Epicenters[19]



[19] Indiana Geological Survey

Table 31: 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 32: 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 an M3.1 centered just north of Vincennes on May 10, 2010. An 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

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 Clark 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 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 Clark 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 because 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 deterministic scenarios included an M7.7 epicenter along the New Madrid fault zone and an M6.8 epicenter in Mount Carmel, Illinois. Shake maps provided by FEMA were used in Hazus-MH to estimate losses for Clark County based on these events.

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

Modeling a deterministic scenario requires user input for a variety of parameters. One of the most critical sources of information required for accurate assessment of earthquake risk is soils data. 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.

Results for 7.7 Magnitude- New Madrid, Kentucky Earthquake Scenario

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

Building Damages

Hazus estimates that about 95 buildings will be at least moderately damaged—only 0.002% of the total buildings in the region. There are no buildings that will be damaged beyond repair. Table 33 on the following page summarizes the expected damage by general occupancy for the buildings in the region.

Table 24 identifies the total building-related losses totaled $9.76 million; 17% of the estimated losses were related to the business interruption of the region. The largest loss was sustained by the residential occupancies, which made up over 57% of the total loss.

Table 33: New Madrid Scenario - Building Damage by Occupancy

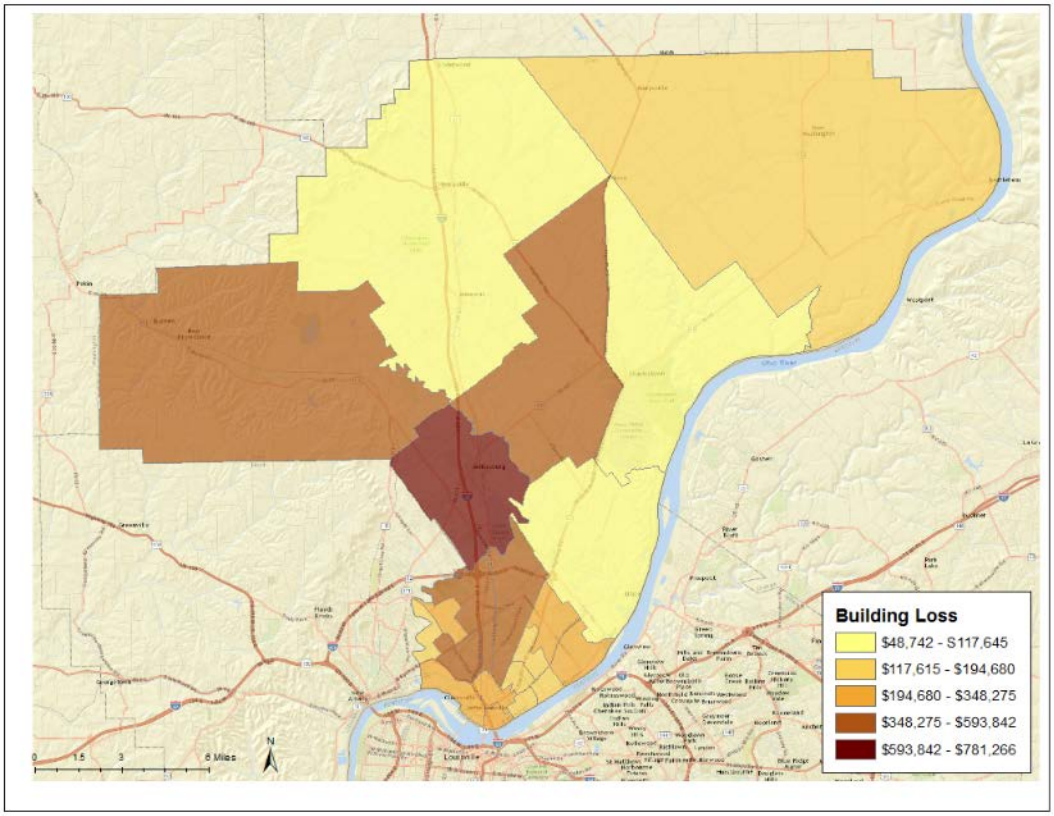
	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2,696	6.53	37	3.86	2	2.15	0	0.37	0	0.00
Commercial	1,613	3.91	42	4.39	5	5.54	0	5.40	0	81.50
Education	13	0.03	0	0.02	0	0.01	0	0.00	0	0.00
Government	274	0.66	6	0.67	1	0.61	0	0.37	0	0.00
Industrial	134	0.33	3	0.32	1	0.58	0	0.59	0	18.50
Other Residential	3,707	8.98	141	14.75	39	42.69	3	68.64	0	0.00
Religion	408	0.99	8	0.86	1	0.73	0	0.54	0	0.00
Single Family	32,426	78.57	717	75.14	44	47.69	1	24.08	0	0.00
Total	**41,271**		**954**		**91**		**4**		**0**	

Numbers reported in tables generated by Hazus may not match numbers reported in text due to Hazus rounding conventions.

Table 34: New Madrid Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.01	0.28	0.01	0.06	0.36
	Capital-Related	0.00	0.00	0.20	0.01	0.01	0.22
	Rental	0.08	0.06	0.26	0.01	0.02	0.44
	Relocation	0.22	0.12	0.22	0.03	0.07	0.66
	Subtotal	**0.30**	**0.19**	**0.96**	**0.06**	**0.16**	**1.67**
Capital Stock Losses							
	Structural	0.57	0.16	0.22	0.04	0.10	1.10
	Non_Structural	2.84	0.82	1.09	0.23	0.43	5.41
	Content	0.53	0.13	0.47	0.13	0.21	1.47
	Inventory	0.00	0.00	0.03	0.05	0.03	0.11
	Subtotal	**3.94**	**1.11**	**1.81**	**0.45**	**0.78**	**8.09**
	Total	**4.24**	**1.30**	**2.77**	**0.51**	**0.94**	**9.76**

Figure 38: New Madrid Scenario - Building Losses



Essential Facility Damage

Before the earthquake, the region had 3,200 hospital beds available for use. On the day of the earthquake, the model estimates that only 2,647 hospital beds (83%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 91% of the beds will be back in service. By 30 days, 98% will be operational.

Table 35: New Madrid Scenario - Essential Facility Damage

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	70	0	0	70
Schools	38	0	0	38
EOCs	1	0	0	1
PoliceStations	7	0	0	7
FireStations	25	0	0	25

Results for 6.8 Magnitude- Mt. Carmel, Illinois Earthquake Scenario

Hazus estimates that the damages incurred from the M6.8 Mt. Carmel earthquake scenario would be county-wide in scope.

Building Damages

Hazus estimates that about 200 buildings will be at least moderately damaged, only 0.004% of the total buildings in the region. There are no buildings that will be damaged beyond repair. The total building-related losses were $19.97 million; 17% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57% ofthe total loss.

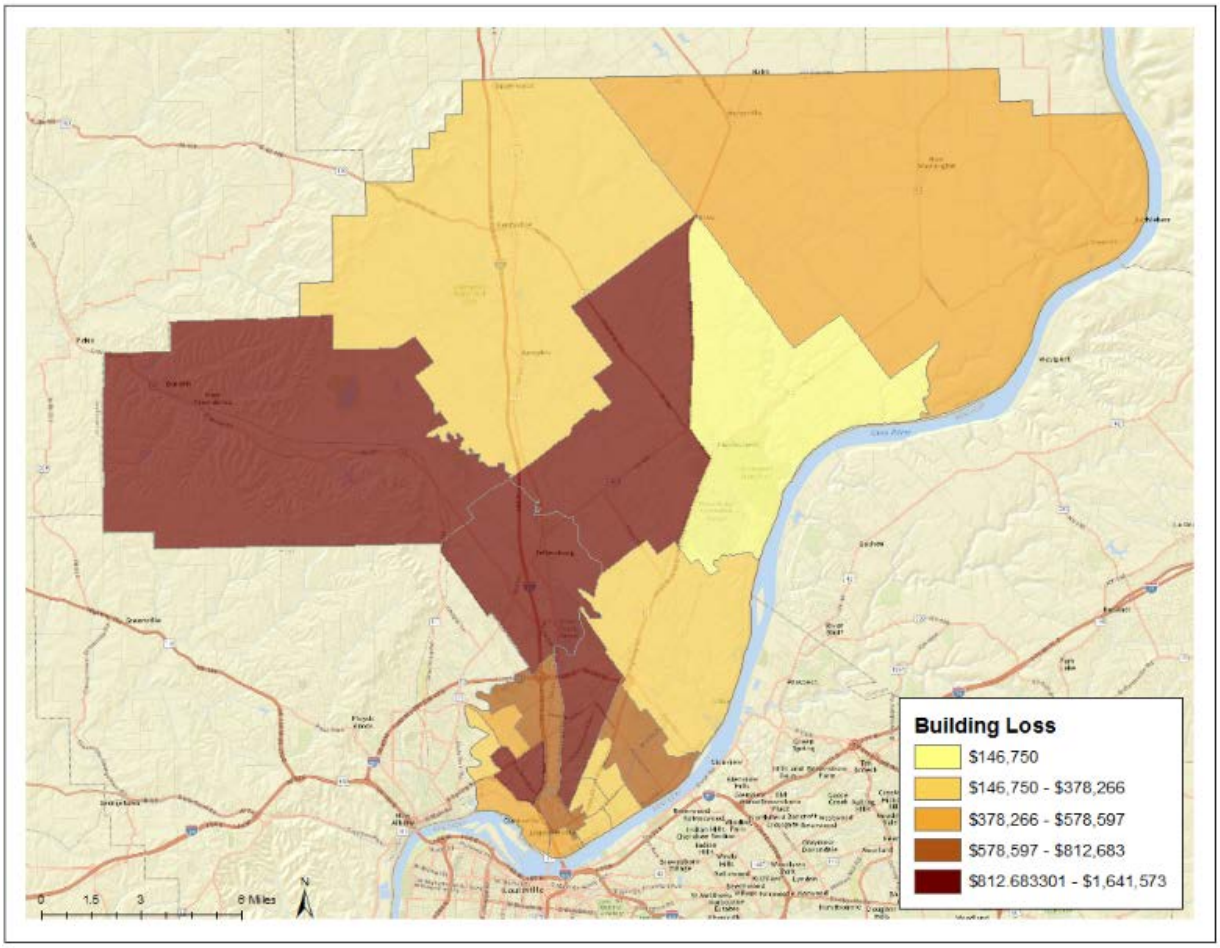
Table 36: Mt. Carmel Scenario - Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2,641	6.56	88	4.82	6	3.02	0	0.63	0	0.55
Commercial	1,574	3.91	75	4.10	10	5.33	0	5.30	0	10.50
Education	13	0.03	0	0.02	0	0.02	0	0.00	0	0.00
Government	268	0.67	12	0.64	1	0.63	0	0.41	0	0.00
Industrial	131	0.33	5	0.30	1	0.55	0	0.58	0	1.66
Other Residential	3,559	8.83	248	13.58	75	38.75	6	68.91	0	84.59
Religion	400	0.99	16	0.87	2	0.78	0	0.55	0	0.00
Single Family	31,703	78.69	1,383	75.66	99	50.91	2	23.61	0	2.71
Total	**40,289**		**1,828**		**194**		**9**		**0**	

Table 37: Mt. Carmel Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.02	0.56	0.02	0.12	0.71
	Capital-Related	0.00	0.01	0.41	0.01	0.02	0.45
	Rental	0.18	0.13	0.50	0.01	0.05	0.87
	Relocation	0.51	0.24	0.45	0.07	0.16	1.43
	Subtotal	**0.69**	**0.39**	**1.92**	**0.12**	**0.34**	**3.46**
Capital Stock Losses							
	Structural	1.16	0.31	0.42	0.08	0.24	2.21
	Non_Structural	5.80	1.61	2.10	0.46	0.92	10.90
	Content	1.17	0.27	0.95	0.28	0.48	3.16
	Inventory	0.00	0.00	0.06	0.11	0.08	0.25
	Subtotal	**8.13**	**2.19**	**3.53**	**0.93**	**1.72**	**16.51**
	Total	**8.82**	**2.58**	**5.45**	**1.05**	**2.07**	**19.97**

Figure 39: Mt. Carmel Scenario - Building Losses



Essential Facility Damage

Before the earthquake, the region had 3,200 hospital beds available for use. On the day of the earthquake, the model estimates that only 2,453 hospital beds (77%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 87% of the beds will be back in service. By 30 days, 97% will be operational.

Table 38: Mt. Carmel Scenario - Essential Facility Damage

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	70	0	0	70
Schools	38	0	0	38
EOCs	1	0	0	1
PoliceStations	7	0	0	7
FireStations	25	0	0	25

Results for Probabilistic 500-Year Earthquake Scenario

The results of the probabilistic 500-year analysis are depicted in Tables 39 and 40 and Figure 40. Hazus estimates that about 93 buildings will be at least moderately damaged. The total building-related losses was $10.27 million; 15% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57% of the total loss.

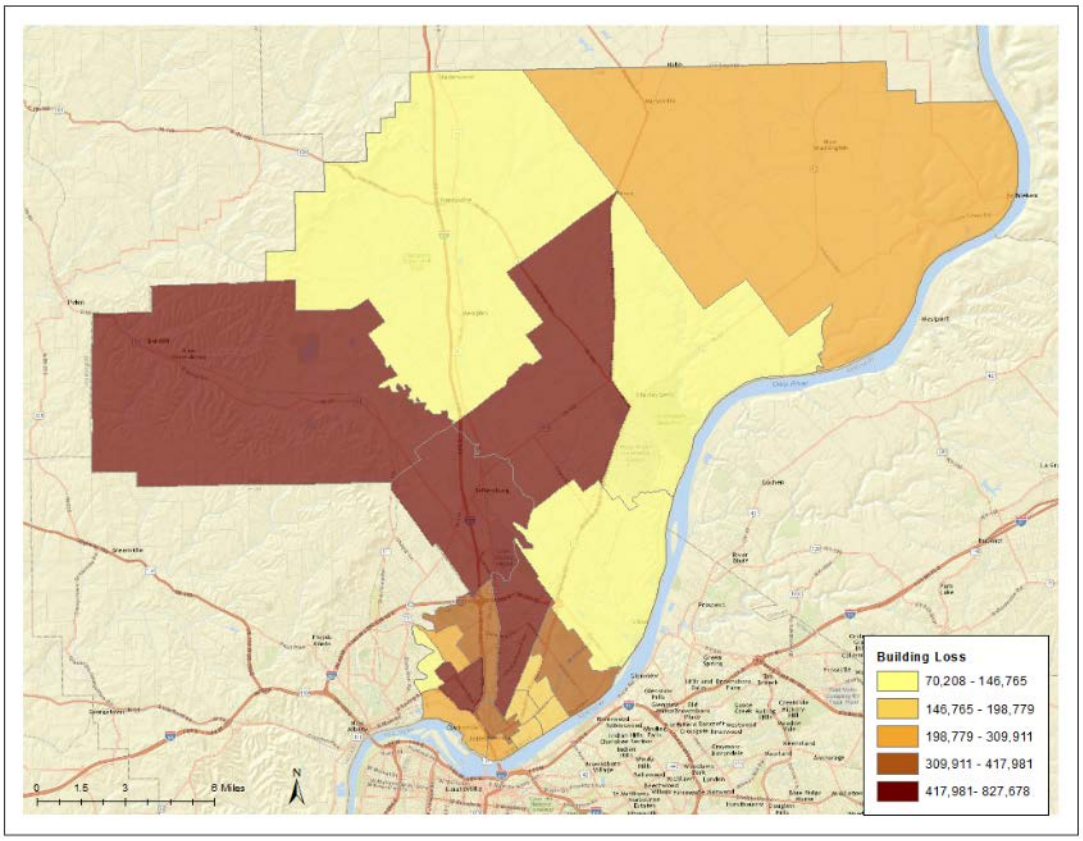
Table 39: Probabilistic 500-Year Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2,691	6.51	42	4.54	2	2.49	0	0.43	0	0.00
Commercial	1,618	3.92	38	4.12	4	4.86	0	4.57	0	73.07
Education	13	0.03	0	0.02	0	0.01	0	0.00	0	0.00
Government	275	0.66	6	0.64	0	0.55	0	0.36	0	0.00
Industrial	135	0.33	3	0.30	0	0.51	0	0.50	0	26.93
Other Residential	3,701	8.96	143	15.61	42	46.60	3	71.33	0	0.00
Religion	409	0.99	8	0.86	1	0.70	0	0.49	0	0.00
Single Family	32,469	78.60	677	73.92	40	44.27	1	22.31	0	0.00
Total	**41,310**		**916**		**90**		**4**		**0**	

Table 40: Probabilistic 500-Year Scenario-Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.01	0.24	0.01	0.06	0.31
	Capital-Related	0.00	0.00	0.18	0.01	0.01	0.19
	Rental	0.08	0.06	0.23	0.01	0.02	0.39
	Relocation	0.20	0.12	0.19	0.03	0.06	0.61
	Subtotal	**0.28**	**0.19**	**0.83**	**0.05**	**0.15**	**1.50**
Capital Stock Losses							
	Structural	0.54	0.16	0.19	0.03	0.11	1.04
	Non_Structural	2.94	0.88	1.13	0.26	0.50	5.72
	Content	0.69	0.16	0.56	0.16	0.28	1.86
	Inventory	0.00	0.00	0.03	0.06	0.05	0.14
	Subtotal	**4.18**	**1.21**	**1.92**	**0.53**	**0.93**	**8.76**
	Total	**4.46**	**1.40**	**2.75**	**0.58**	**1.08**	**10.27**

Figure 40: Probabilistic 500-Year Scenario-Building Losses



Essential Facility Damage

Before the earthquake, the region had 3,200 hospital beds available for use. On the day of the earthquake, the model estimates that only 2,673 hospital beds (84%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 92% of the beds will be back in service. By 30 days, 98% will be operational.

Table 41: 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	70	0	0	70
Schools	38	0	0	38
EOCs	1	0	0	1
PoliceStations	7	0	0	7
FireStations	25	0	0	25

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

Due to the unpredictability of this hazard, all buildings and infrastructure in Clark 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 25 NCDC reported hail events in Clark County since January 1, 2008 and these are outlined in Table 42.

Table 42: Clark County Hail Events (2008 - 2014)

Location	Date	Diameter (in)
Sellersburg	4/10/2009	0.75
Jeffersonville	4/10/2009	0.75
Charlestown	8/4/2009	1.75
Sellersburg	8/4/2009	1
Jeffersonville	8/4/2009	1
Solon	4/5/2010	1
Underwood	3/23/2011	0.88
Underwood	3/23/2011	0.88
Sellersburg	4/9/2011	0.88
Charlestown	4/23/2011	1
Otisco	3/2/2012	3
Sellersburg	3/2/2012	1
Sellersburg	3/14/2012	1
Henryville	3/15/2012	1
Utica	7/19/2012	1.5
Blue Lick	7/26/2012	0.88
Jeffersonville	6/17/2013	1
Cementville	5/10/2014	1.25
Clarksville	5/10/2014	1
Jeffersonville	5/10/2014	1
Sellersburg	5/21/2014	1
St Joseph Hill	5/21/2014	1
Sellersburg	7/27/2014	1
Sellersburg	10/6/2014	1
Memphis	10/7/2014	1

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 farenheit. Lightning is often 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 Clark County in the since the last plan update, there have not been any lightening events recorded by NCDC.

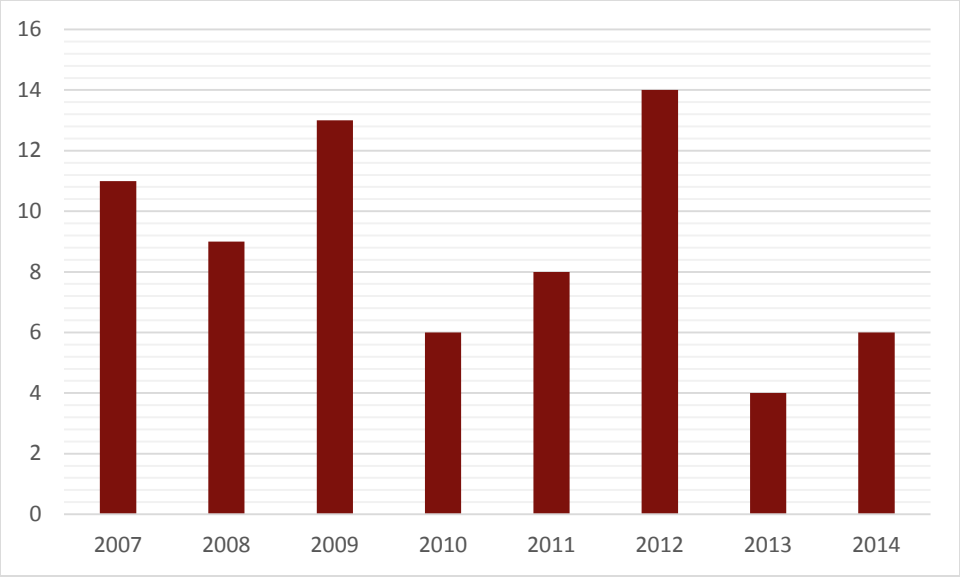
Severe Winds (Straight-Line Winds)

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 71 severe storms in Clark County since January 1, 2007 as shown in Figure 41. A storm system in early January 2013 contained winds of almost 60 mph. This storm caused $10,000 in property damage when a barn in Borden was shifted off it's foundation. Several sheds were blown several hundred feet and trees also topped.

Figure 41: Clark County Storm Events Reported to NCDC (2007-2014)



** 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

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 Clark 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 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 Clark 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 $280,000, or an average of $28,000 in property damage per year. These totals derive mainly from storms in the fall of 2007 and winter 2008. 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

Winter weather hazards are prevalent natural events that can be expected to occur every winter in Indiana. 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 43 documents the NCDC reported winter storm events since 2008. 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 43: Clark County Winter Storm Events (January 1, 2008-May 31, 2014)

Date	Type	Precipitation
2/11/2008	Winter Storm	3" snow, ¼" freezing rain
1/27/2009	Winter Storm	4" snow, icing
1/7/2010	Winter Storm	4" snow
2/4/2014	Winter Storm	½" snow and sleet, 1/3" ice
3/2/2014	Winter Storm	2/10" ice, 3" sleet and snow

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

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 Clark 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 Clark 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 Materials 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. 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

Clark 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 Clark 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. Interstate 65 is the main north/south route in the county and runs parallel to State Road 31. These two major roadways travel through Sellersburg and Clarksville.

Clark County had a lower than expected HazMat density, a rather surprising result considering all the industry in the surrounding area. Our study showed 3.78% of all commercial traffic carried placards. From our experience in Indiana, we expect about 4.5% of commercial vehicles carry hazardous materials on the roadways. Generally, HazMat densities above 6% or 7% are rather unusual, indicating a significantly greater presence of HazMat than one would normally expect to see on a given roadway. Roadways and counties, for that matter, with lower traffic densities may show higher HazMat densities, simply because HazMat shipments are present throughout any community. Fuels, like gasoline and propane, make up large parts of all HazMat shipments. There are two major rail lines running through the county. CSX and Norfolk Southern operate several rails in Clark County. Flammable liquids made up over 21% of all HazMat shipments with alcohol being the most frequent individual commodity in that category. Class 2 Gases were about 10% with Class 8 Corrosives at over 19.

In addition, Clark County is bordered on the south by the Ohio River with the towns of Jeffersonville and Utica sitting on the river's edge. The US Army Corps of Engineers reported that over 200 tons of cargo were 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

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 Clark 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

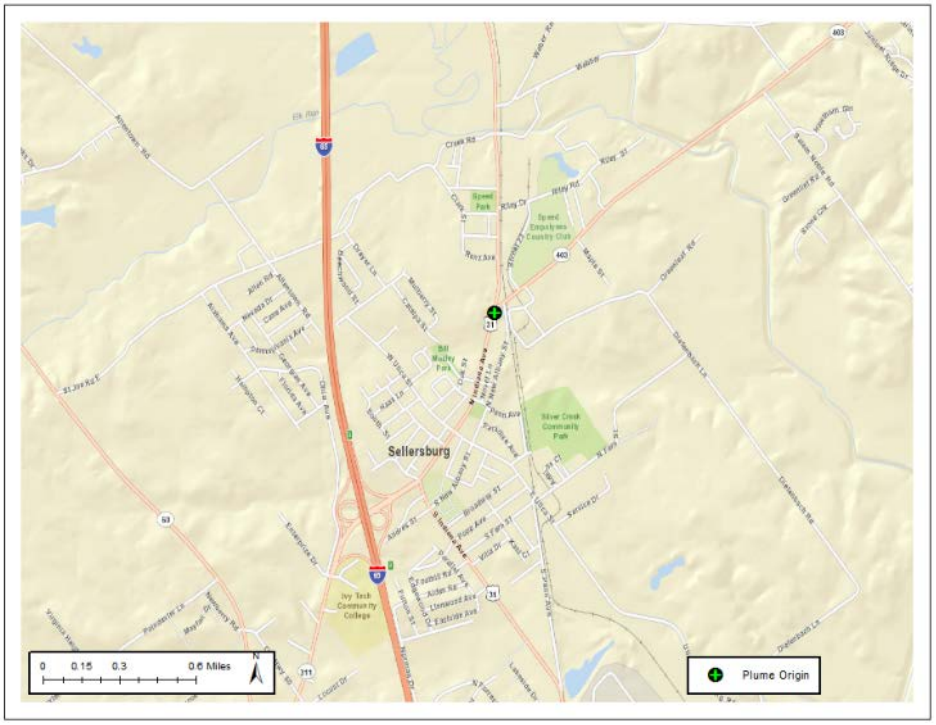
For the 2008 Report, a chlorine release in Jeffersonville was modeled. That analysis estimated that 19,218 buildings would be impacted at a potential loss of over $3.2 million. Better data collected for the 2015 plan update resulted in a more accurate estimation of damage, which is described in the following section.

The EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for an ammonia release on the north side of Sellersburg just south of the intersection of US 31 and Old Indiana 403.

Anhydrous ammonia is a clear colorless gas with a strong odor. Contact with the unconfined liquid can cause frostbite. The gas is generally regarded as nonflammable but can burn within certain vapor concentration limits with strong ignition. The fire hazard increases in the presence of oil or other combustible materials. Vapors from an anhydrous ammonia leak initially hug the ground. Prolonged exposure of containers to fire or heat may cause violent rupturing and rocketing. Long-term inhalation of low concentrations of the vapors or short-term inhalation of high concentrations has adverse health effects. Anhydrous ammonia is generally used as a fertilizer, a refrigerant, and in the manufacture of other chemicals.

ALOHA is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. Anhydrous ammonia is a common chemical used in industrial operations and can be found in either liquid or gas form. Rail and truck tankers commonly haul ammonia to and from facilities. For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the southwest were assumed. The target area was chosen due to its proximity to densely populated areas. The geographic area covered in this hypothetical analysis is depicted in Figure 42.

Figure 42: Location of Chemical Release



The ALOHA atmospheric modeling parameters, depicted in Figure 43, were based upon the actual conditions at the location when the model was run, including a southwest wind speed of 8 mph. The temperature was 80.6°F with 81% humidity and partly cloudy. 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 ammonia in its liquid state at the time of its release.

This modeled release was based on a leak from hole with a 2.5 inch diameter. According to the ALOHA parameters, approximately 8,650 pounds of material would be released per minute.

Figure 43: ALOHA Plume Modeling Parameters

```
SITE DATA:
  Location: SELLERSBURG, INDIANA
  Building Air Exchanges Per Hour: 0.59 (sheltered single storied)
  Time: June 16, 2015  0931 hours EST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: AMMONIA                  Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100 ppm
  IDLH: 300 ppm      LEL: 150000 ppm      UEL: 280000 ppm
  Ambient Boiling Point: -28.7° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 8 miles/hour from SW at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 80.6° F                Stability Class: D
  No Inversion Height                     Relative Humidity: 81%

SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Flammable chemical escaping from tank (not burning)
  Tank Diameter: 8 feet                   Tank Length: 33 feet
  Tank Volume: 12,408 gallons
  Tank contains liquid                    Internal Temperature: 80.6° F
  Chemical Mass in Tank: 31.0 tons        Tank is 100% full
  Circular Opening Diameter: 2.5 inches
  Opening is 1.00 feet from tank bottom
  Release Duration: 12 minutes
  Max Average Sustained Release Rate: 8,650 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 58,693 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:
  Model Run: Heavy Gas
  Red   : 1604 yards --- (1100 ppm = AEGL-3 [60 min])
  Orange: 3.0 miles --- (160 ppm = AEGL-2 [60 min])
  Yellow: greater than 6 miles --- (30 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.

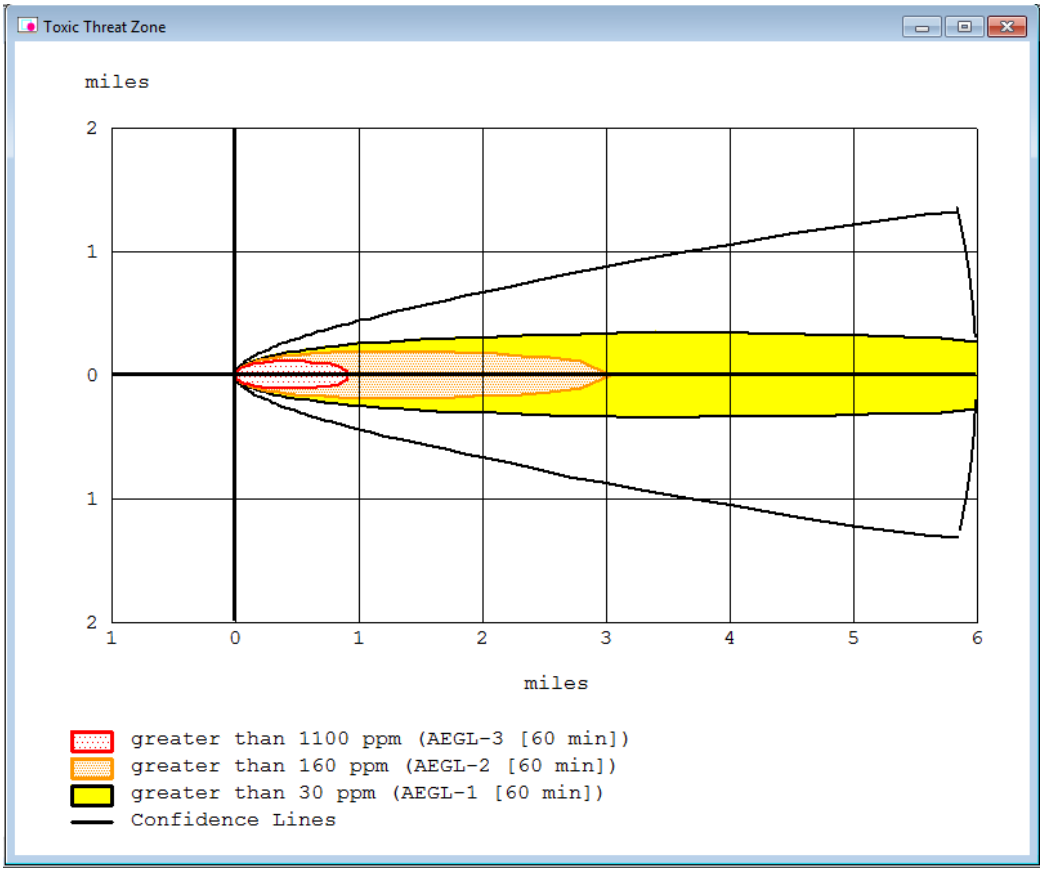
- AEGL 1: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible 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 8,650 pounds of material would be released per minute. The image in Figure 44 depicts the plume footprint generated by ALOHA.

Figure 44: Plume Footprint Generated by ALOHA

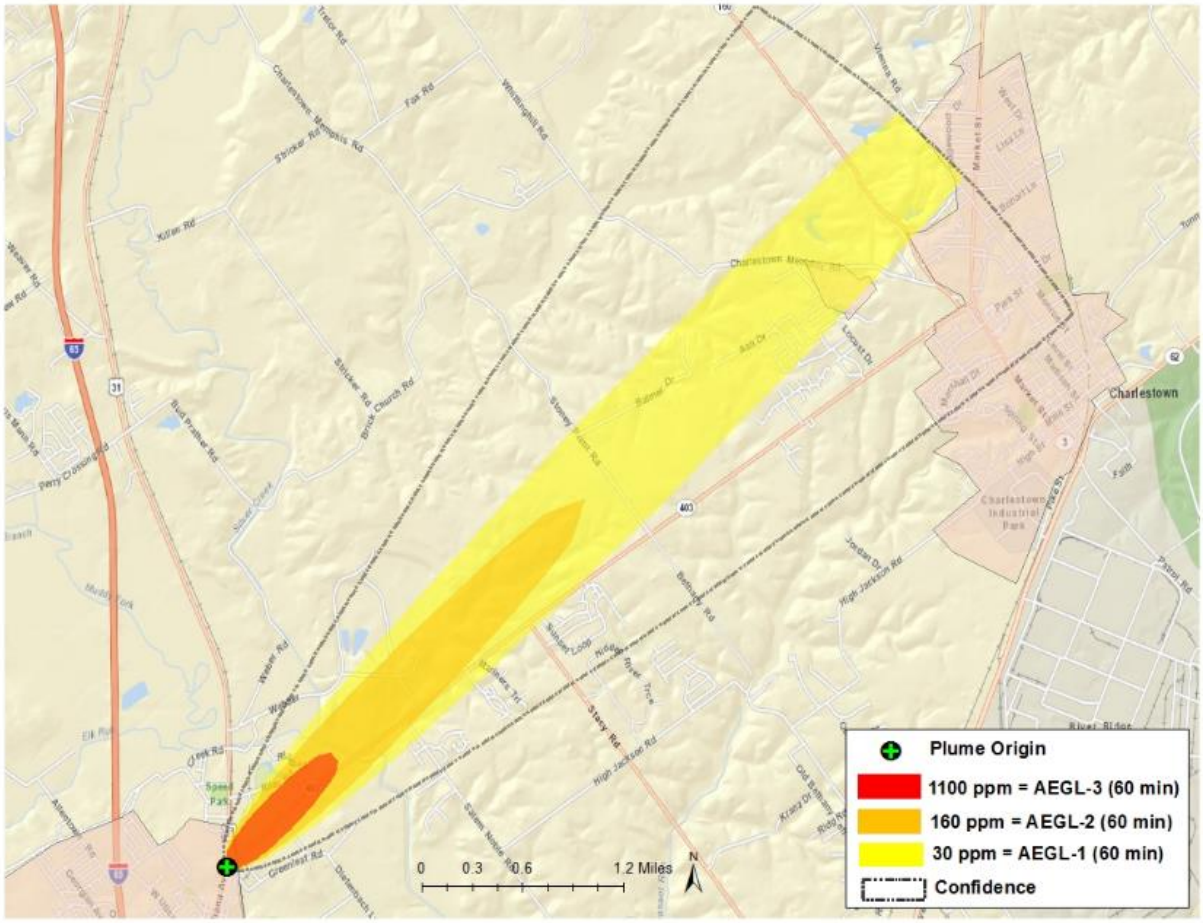


As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). For the purpose of clarification, this report will designate each level of concentration as a specific zone. The zones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

- **Zone 1** (AEGL-3): The red buffer (>=30 ppm) extends almost 1 mile from the point of release after one hour.
- **Zone 2** (AEGL-2): The orange buffer (>=160 ppm) extends more approximately 3 miles from the point of release after one hour.
- **Zone 3** (AEGL-1): The yellow buffer (>=1100 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.

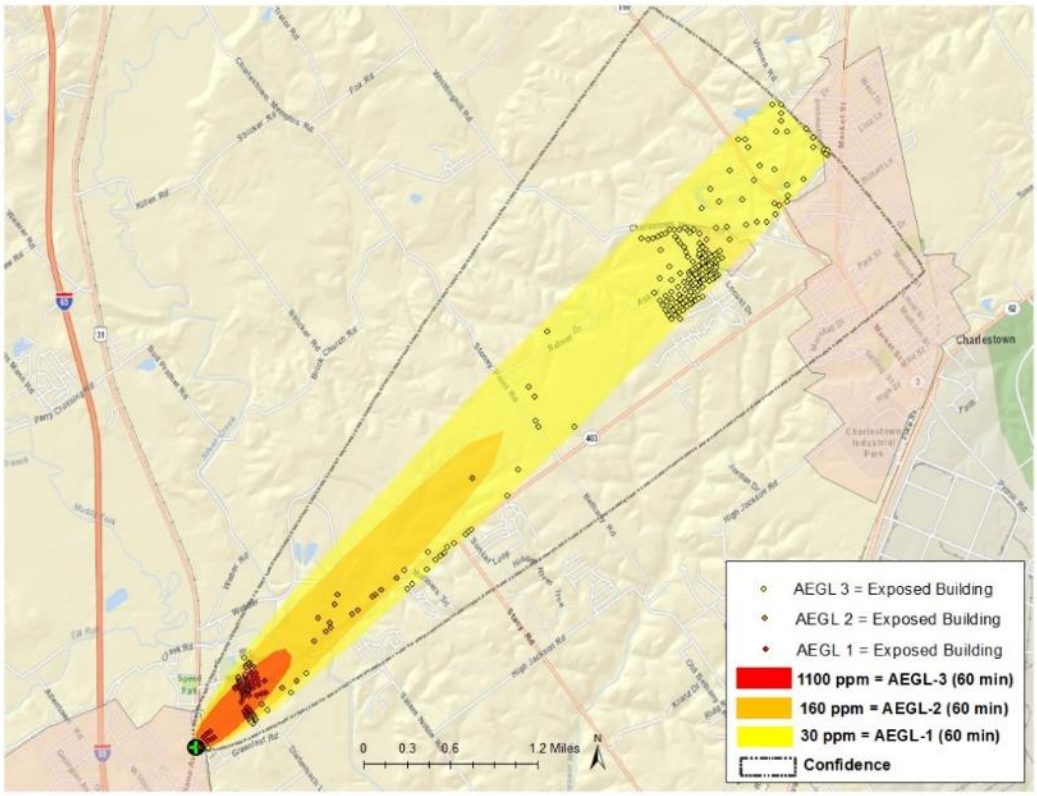
The image in Figure 45 depicts the plume footprint generated by ALOHA. The modeling program, however, does not account for terrain. In portions of southern Indiana, the terrain is very hilly. Because ammonia vapor is a very heavy gas, the vapor cloud will follow the contours of the land rather than flowing over the hills as depicted below.

Figure 45: ALOHA Plume Footprint Overlaid in ArcGIS



The Clark County Building Inventory was added to ArcMap and overlaid with the plume footprint. The Building Inventory was then intersected with each of the three footprint areas to classify each point based upon the plume footprint in which it is located. Figure 46 depicts the Clark County Building Inventory after the intersect process.

Figure 46: Clark County Building Inventory Classified By Plume Footprint



Results

By summing the Building Inventory within all AEGL zones (Zone 1: 30 ppm, Zone 2: 160 ppm, and Zone 3: 1,100 ppm), the GIS overlay analysis predicts that as many as 287 buildings and 623 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 points are depicted in Tables 44 through 47. Table 44 summarize the results of the chemical spill by combining all AEGL zones.

Table 44: Estimated Exposure for all Zones (all ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	25	$4,017,847
Commercial	0	9	$2,569,801
Education	0	0	$0
Government	0	2	$721,959
Industrial	0	1	$16,317,621
Religious	0	1	$381,540
Residential	623	249	$31,630,359
Total	**623**	**287**	**$55,639,127**

Tables 45 through 47 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 45: Estimated Exposure for Zone 3 (30 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	25	$4,017,847
Commercial	0	0	$0
Education	0	0	$0
Government	0	2	$721,959
Industrial	0	1	$16,317,621
Religious	0	1	$381,540
Residential	438	175	$23,308,376
Total	**438**	**204**	**$44,747,343**

Table 46: Estimated Exposure for Zone 2 (160 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	0	0
Commercial	0	6	$1,830,685
Education	0	0	0
Government	0	0	0
Industrial	0	0	0
Religious	0	0	0
Residential	60	24	$2,514,306
Total	**60**	**30**	**$4,344,991**

Table 47: Estimated Exposure for Zone 1 (1100 ppm)

Occupancy	Population	Building Counts	Building Exposure
Agriculture	0	0	$0
Commercial	0	2	$411,558
Education	0	0	$0
Government	0	0	$0
Industrial	0	0	$0
Religious	0	0	$0
Residential	125	50	$5,807,677
Total	**125**	**52**	**$6,219,235**

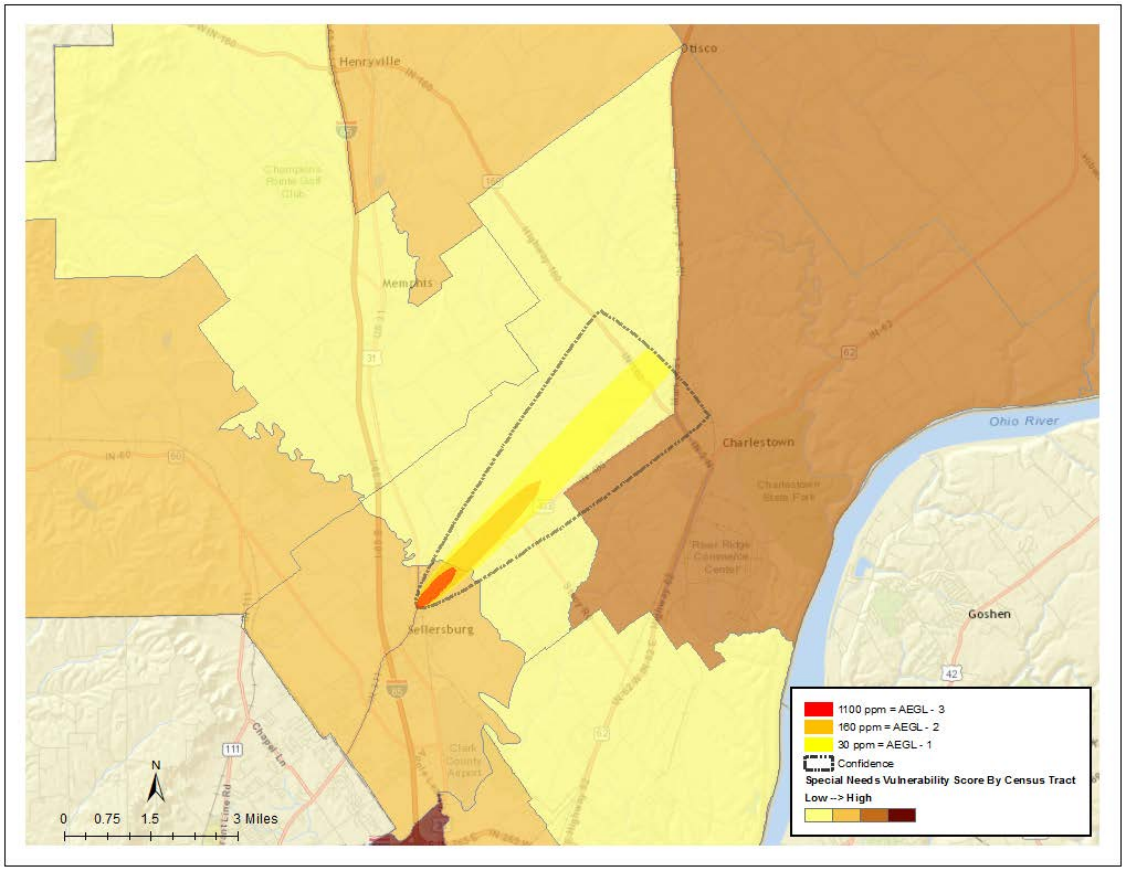
Essential Facilities Exposure

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

Hazmat Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. The particular scenario modeled involves a ammonia vapor plume in Sellersburg. This community is also located in area with a high Special Needs Vulnerability Score. This particular census tract has a low to moderate proportion of the population with special needs when compared to the rest of the county. The tract which includes Sellersburg 7.8% of its residents living in poverty and 12% age 65 years and over. In addition, 13.5% of its population has a disability. Figure 47 compares the ALOHA-generated plume with those areas of the county which have a higher Special Needs Vulnerability Scores.

Figure 47: 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 Clark County are at risk of damage including temporary or 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

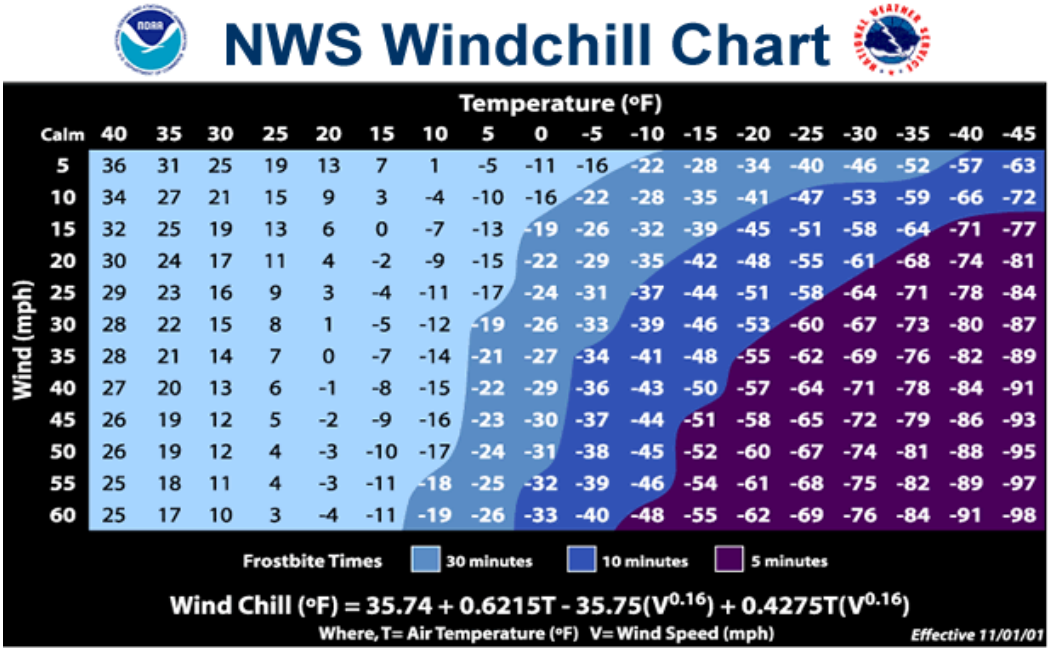
cold temperatures are typically characterized by the ambient air temperature dropping to approximately 0 degrees Fahrenheit or below.

Exposure to cold temperatures, indoors or outdoors, can lead to serious or life-threatening health problems, including hypothermia, cold stress, and 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 48, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time, will produce frostbite in humans.

Figure 47: 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 is expected wind chill reading 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 Clark 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

The planning team determined that the probability of an excessive cold hazard is low in Clark 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

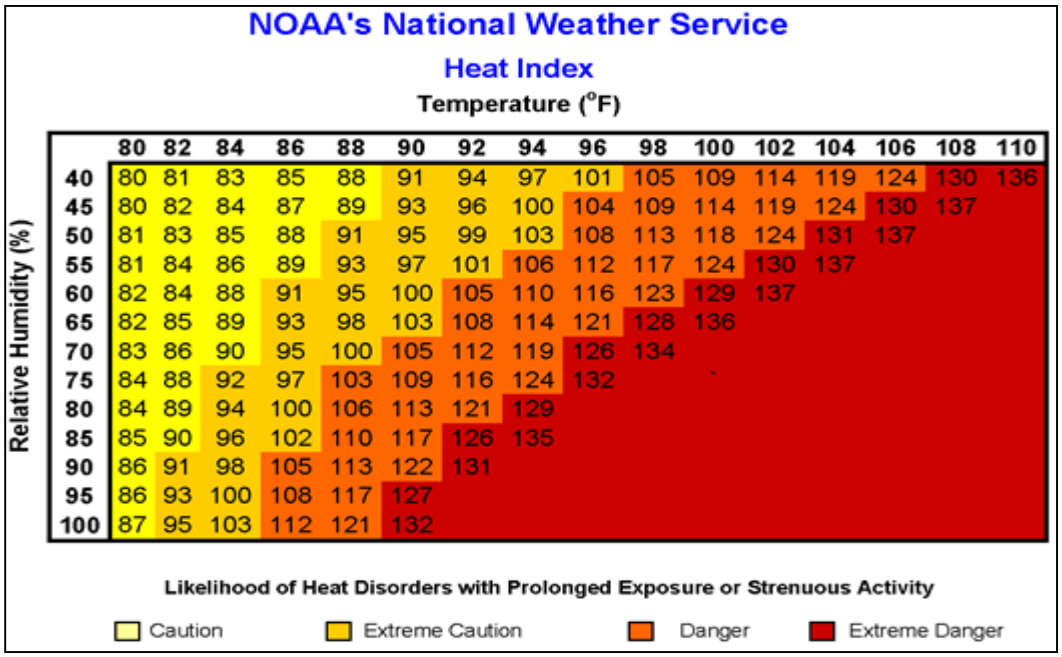
Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat wave. Most summers see EHEs in one or more parts of the US 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 49.

Figure 48: National Weather Service Heat Index[20]



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

[20] Office of Atmospheric Programs. (2006). Excessive Heat Events Guidebook. Unites States Environmental Protection Agency. Washington, D.C.

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 Clark 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

The planning team determined that the probability of an excessive heat hazard is low in Clark 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 13.1% of Clark 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

Drought is a climatic phenomenon that occurs in Clark County. 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).

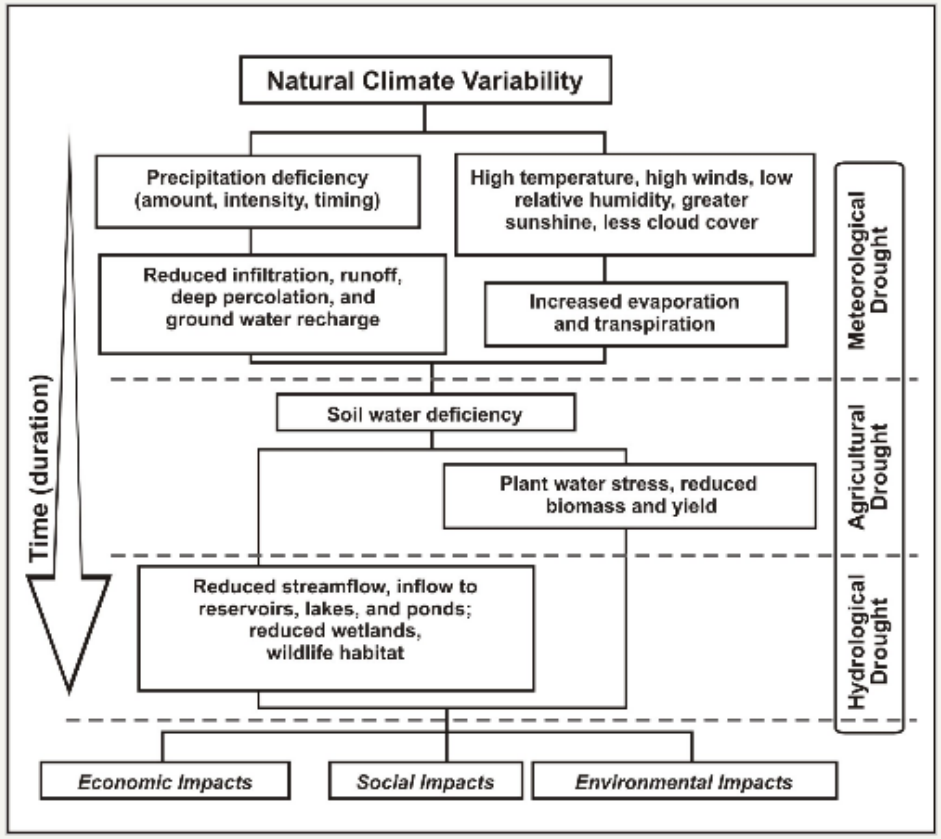
There are several common types of droughts including meteorological, hydrological, agricultural, and socioeconomic. Figure 50 describes the sequence of drought occurrence and impacts of drought types by the degree of dryness (as compared to an average) and the duration of the dry period. These are region-specific 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 50: Sequence of Drought Occurrence and Impacts



Sequence of drought occurrence and impacts for commonly accepted drought types. All droughts originate from a deficiency of precipitation or meteorological drought but other types of drought and impacts cascade from this deficiency. (Source: National Drought Mitigation Center, University of Nebraska-Lincoln, U.S.A.)

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

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that 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 48, 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 48: 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 Clark 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

The planning team determined that the probability of drought hazard is low in Clark 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 landward of the levee. Dams and levees can fail due to either 1) water heights or flows above the capacity for which the structure was designed or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, 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 assure 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 Failure

The Indiana Department of Natural Resources identified 16 dams in Clark County. Table 49 summarizes the dam information.

Table 49: Indiana Department of Natural Resources Dams

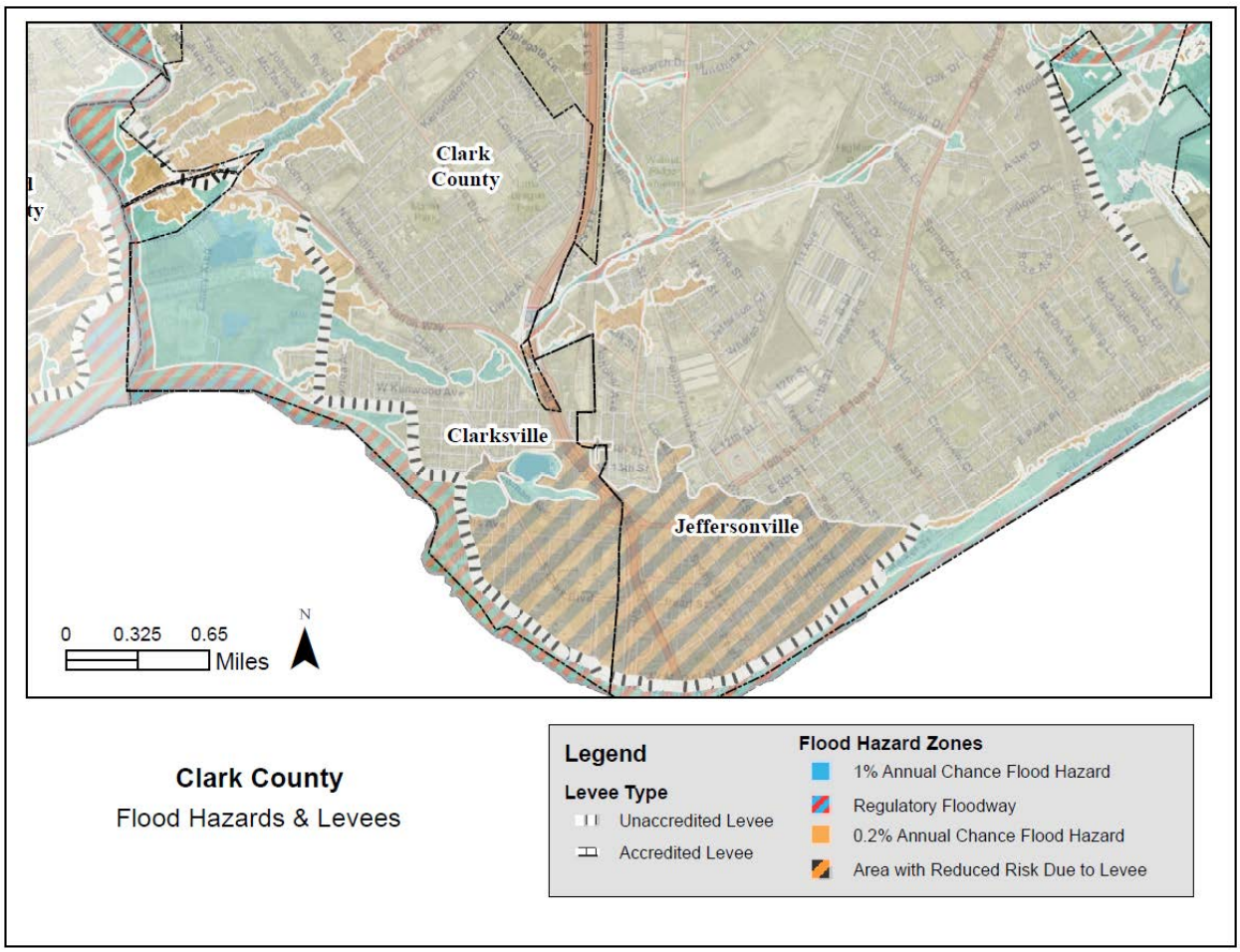
Dam Name	River/Stream	City	Hazard Level	EAP
Harry Hughes Lake Dam	Tr-Sugar Run, Sinking Fork,	Speed	Low	N
Deam Lake Dam	Big Run Tr-Muddy Fork	Carwood	High	N
Muddy Fork Structure No. 2	Souders Branch Muddy Fork	New Providence	High	N
Franke Lake	Wolf Run	Henryville	Severe	N
Country Lake Dam	Tr-West Fork Silver Creek	Underwood Area	Severe	N
Southern Hills Lake	Tr-Muddy Fork Of Silver Creek	Carwood	High	N
Muddy Fork Structure No. 1	Packwood Branch	Borden	High	N
Muddy Fork Structure No. 3	Fordyce Br Muddy Fork	New Providence	High	N
Shady Hollow Lake	Tr-Sugar Run,Sinking Fork,	Otisco	Severe	N
Ski Starlite Dam No. 1	Unt-Muddy Fork	Wilson	Low	N
Ski Starlite Dam No. 2	Unt-Muddy Fork	Wilson	Low	N
Munk Lake Dam	Silver Creek-Offstream	Speed	Low	N
Hideaway Lake Dam	Turkey Run, Tr-Muddy Fk.Ck.	Memphis	High	N
Stumler Dam	Tr-Campbell Br,Jersey Park Cr	Crandell	Low	N
Schlamm Lake Dam	Tr-Mill Branch	Henryville	Severe	N
Muddy Fork Structure No. 5	Koetter Hollow	New Providence	High	N

Geographic Location for Levee Failure

The Jeffersonville-Clarksville levees protect the both Clarksville and Jeffersonville from the Ohio River. The principal structural method for flood control in Clark County is the floodwall and levee system that protects an area of 4,190 acres, including most of the downtown portion of the City of Jeffersonville. The system is comprised of 5.1 miles of earth levee, 1.8 miles of concrete floodwall, 10 pumping plants for the removal of interior drainage during high river stages, and other necessary appurtenances. Portions of the City of Jeffersonville are impacted by an accredited levee which is shown as a moderate-risk area, and is labeled Zone X (shaded) on a FIRM. If this levee accreditation is maintained, based on the National Flood

Insurance Program (NFIP) regulations, the mandatory flood insurance purchase requirement is not required. However, FEMA recommends the purchase of flood insurance due to the risk of flooding from potential levee failure or overtopping. The City of Jeffersonville also has a levee along the Lancassange Creek, as shown depicted by FEMA in the northeast corner of Figure 51. This levee stretches along Parrin Lane between Woodland Road to Rudie Drive.

Figure 51: Clarksville and Jeffersonville Levees

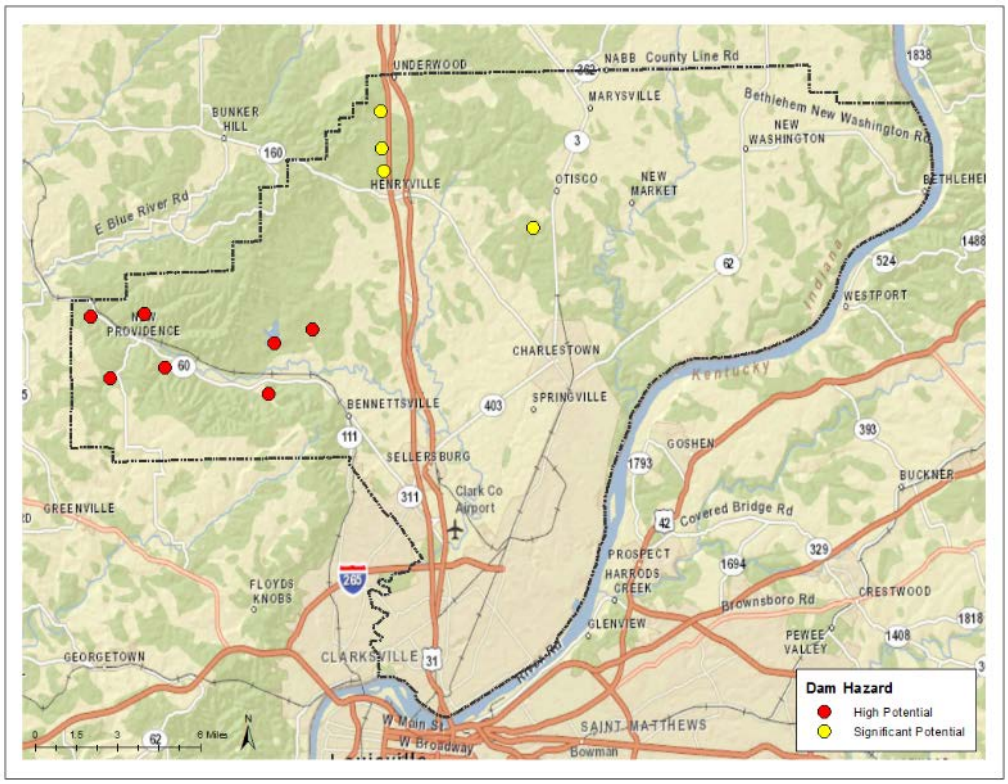


Hazard Extent for Dam and Levee Failure

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, 11 dams in Clark County are classified as high or significant hazard.

Figure 49: High and Significant Hazard Dams – Clark County



None of the dams in Clark County have an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana, but is strongly recommended in the 2007 Indiana Dam Safety & Inspection Manual.

Risk Identification for Dam/Levee Failure

Low Risk  High Risk

Based on historical information, the probability of a dam failure that would impact Clark 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 Clark County is moderately 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.

Levee Failure

A GIS overlay analysis was performed on the protected areas to estimate the potential impact of a breach of the levees located along the Ohio River. There are a total of 1,971 buildings within the areas protected by the Ohio River with a total exposure of approximately $438.6 million. Figure 53 depicts the potential buildings at risk. Additionally, there are two essential facilities in the protected areas – one police station and one fire station. Figure 54 depicts the essential and critical facilities at risk which could be damaged in the event of a breach for the Town of Clarksville, while Figure 55 shows these same facilities for the City of Jeffersonville.

Table 50: Buildings in Levee-Protected Areas

Levee	Number of Buildings	Building Exposure
Jeffersonville-Clarksville Levee	1,971	$438,590,873

Figure 53: Ohio River Levee Breech – Clarksville and Jeffersonville

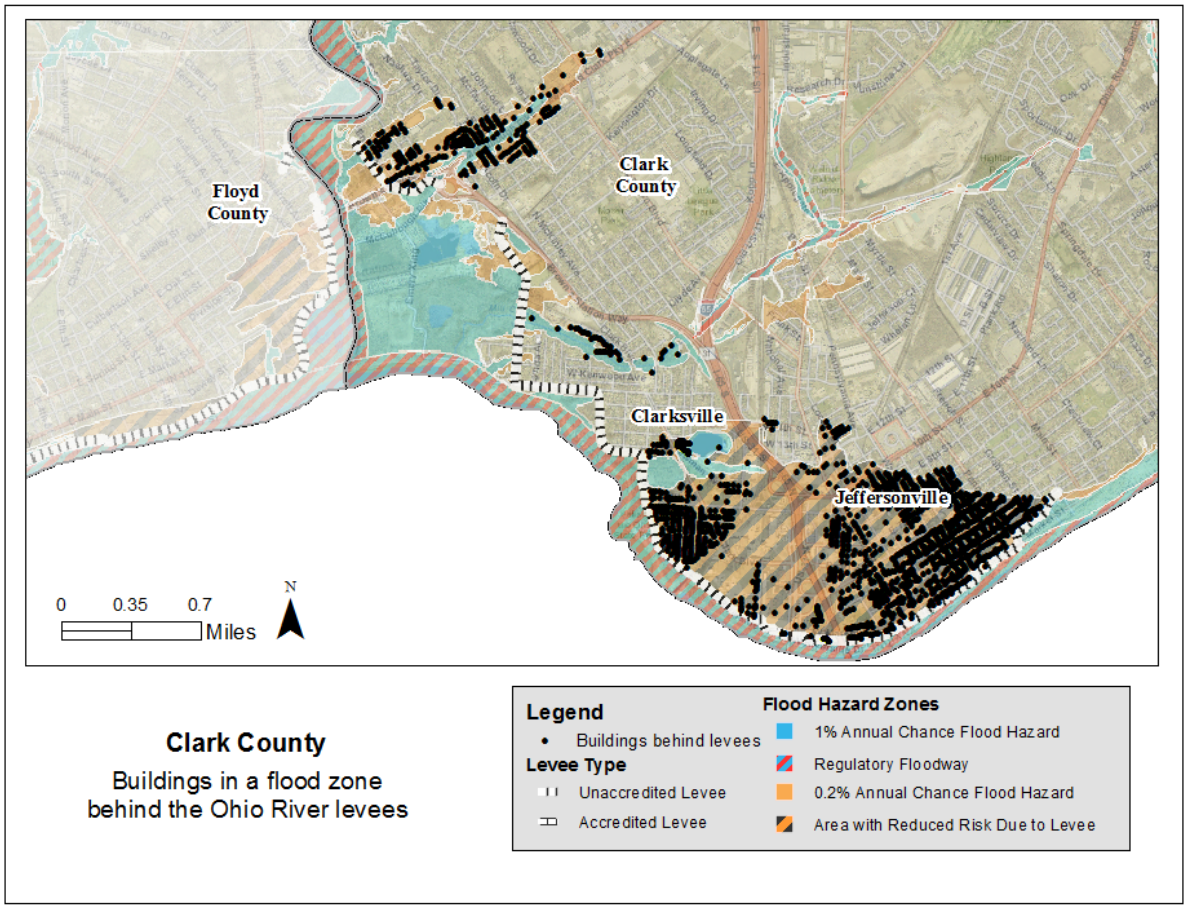


Figure 54: Exposed Essential and Critical Facilities – Clarksville

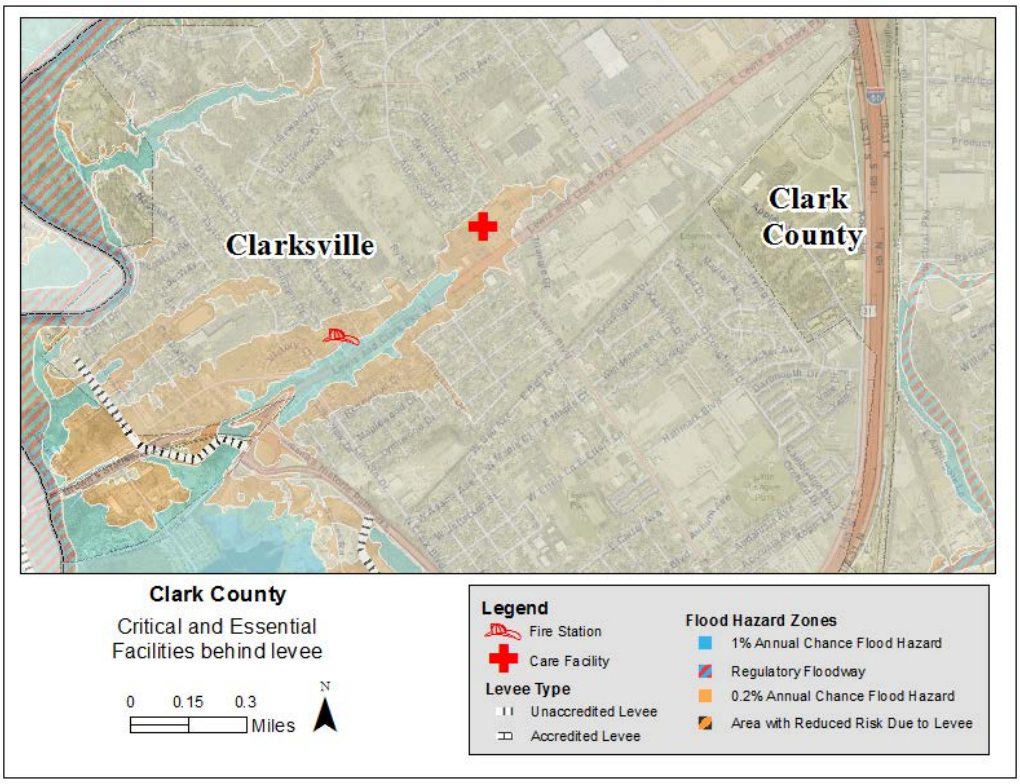
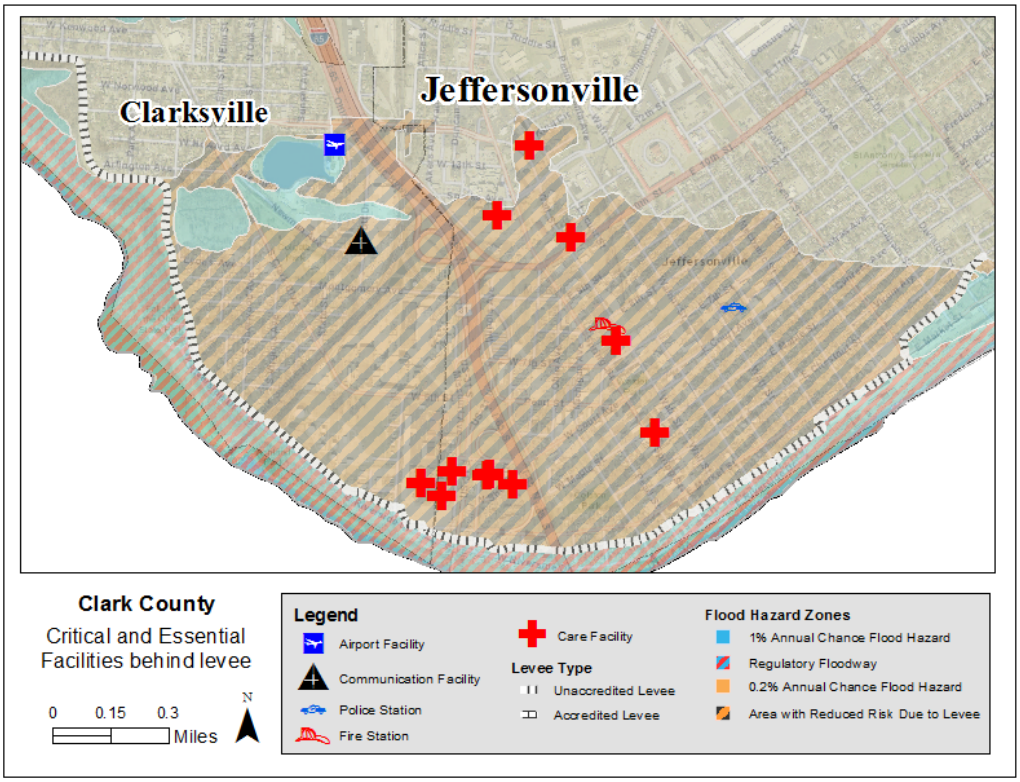


Figure 55: Exposed Essential and Critical Facilities – Jeffersonville



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. 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 groundwater, constructing tie backs, spreading rock nets, etc.

The USGS claims that landslides are a significant geologic hazard in the United States, causing $1-2 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.[21]

Previous Occurrences for Landslide/Ground Failure

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

Geographic Location for Landslide/Ground Failure

Clark 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. The regional locations of karst landscape are shown in Figure 56 on the next page.

[21] http://earthquake.usgs.gov/learn/glossary/?termID=105

Figure 50: Regional Karst Map

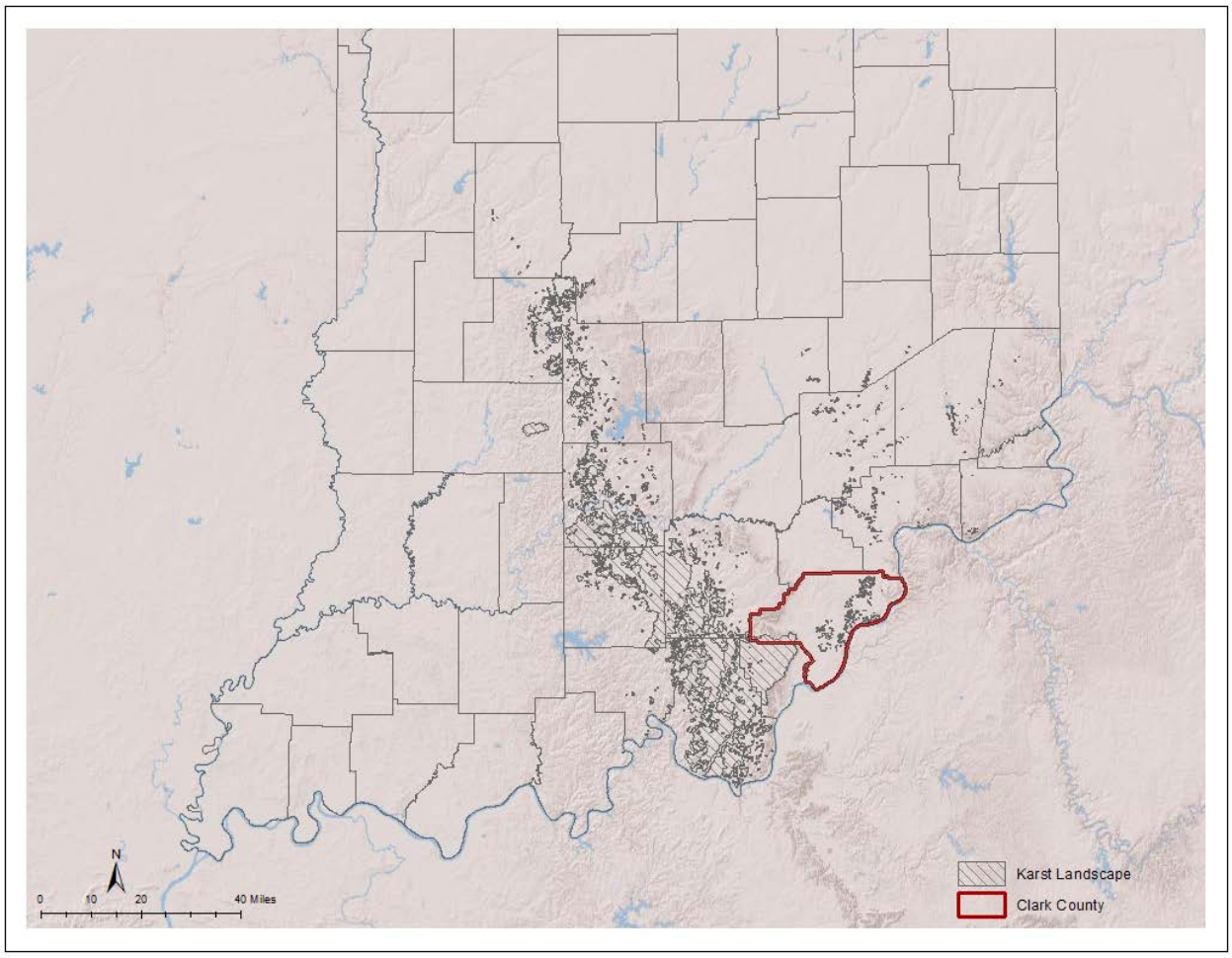
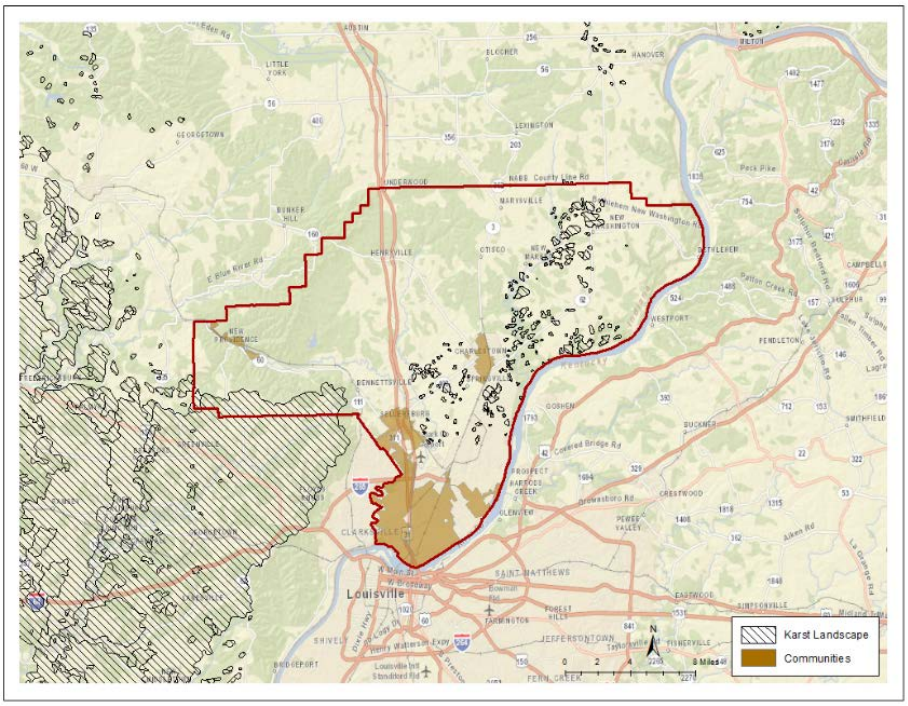


Figure 57 on the next page illustrates the intersection of populated areas and karst in Clark County. As can be seen, multiple communities in Clark County lie above known areas of karst. These communities stand a greater risk for subsidence events than do the other communities.

Figure 51: Karst Landscape and Populated Areas in Clark 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

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 Clark 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 Clark 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 51 lists the types and numbers of all the essential facilities in the area. Critical and essential facilities are included in Appendix C.

Table 501: Essential Facilities of Clark County

Category	Number of Facilities
Care Facilities	70
Emergency Operations Centers	1
Fire Stations	25
Police Stations	7
Schools	38
Total	**141**

Building Inventory

The buildings within the county can all anticipate the 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 Clark 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 infrastructure 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 for Ground Failure

All future communities, buildings, and infrastructure, will remain vulnerable to ground failure in the areas of Clark 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, Clark 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 Clark County's communities are deployed.

Table 521 lists the Indiana communities with the highest CAPI scores (the highest possible score is 131). The higher the score, the higher the potential risk the community faces in the event of a disaster. But a high score also 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 51: 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 53 lists Clark 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 below in Table 53 and Figure 58 on the following page, Clark County (unincorporated) has the highest CAPI score.

Table 52: Clark County Communities' CAPI Scores

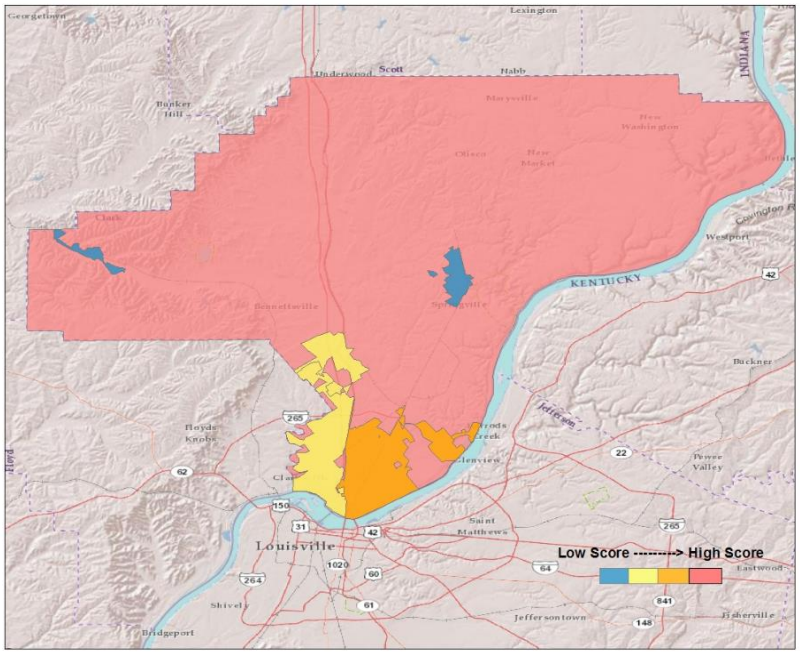
Community Name	Total CAPI Score	% Community within SFHA	Insurance claims $	Insurance claims #	Repetitive loss $	Repetitive loss #	Individual Assistance $ per Capita
Clark County	▲ 69.34	▼ 8.86	▲ 4,627,121	▲ 360	▲ 1,697,311.13	▲ 27	-
Jeffersonville	▲ 59.50	▲ 10.70	▲ 807,267	▲ 119	▲ 956,191.09	▲ 16	▼ 6.00
Utica	▲ 53.44	▲ 62.28	▲ 1,128,882	▲ 44	▲ 343,565.30	▲ 5	▼ 4.52
Sellersburg	▲ 45.65	▲ 14.63	▼ 125,157	▼ 12	▲ 106,910.40	▼ 1	▼ 10.77
Clarksville	▲ 41.84	▲ 17.66	▲ 716,674	▲ 37	▼ 21,193.55	▼ 1	▼ 1.71
Borden	▲ 37.38	▲ 15.84	▼ 24,310	▼ 5	▼ 6,479.98	▼ 1	▲ 524.42
Charlestown	▲ 30.10	▼ 2.93	▼ 152,494	▲ 33	▼ 0.00	▼ 0	▼ 14.52

KEY:

Better than State Average ▼

Worse than State Average ▲

Figure 52: CAPI Scores for Clark County and Jurisdictions



6.2 Plans and Ordinances

Clark County and its communities have several ordinances, listed in Table 54, that are relevant to emergency management and disaster planning.

Table 53: Clark County Plans and Ordinances

Community	Ordinance/Year
Clark County (unincorporated)	Clark County Zoning Ordinance, 2007 (Amendments 2012)
Charlestown	Charlestown City Ordinances, updated 2014
Clarksville	Clarksville Zoning Ordinance, 2011 Clarksville Comprehensive Plan, 1992
Jeffersonville	Jeffersonville Zoning Ordinances, Comprehensive Plan, 2030
Sellersburg	Sellersburg Zoning Ordinances, 1993 Sellersburg Building Ordinances, 2012
Utica	Utica Ordinances, 2014 (Ordinance for Flood Hazard Area)

As an element of the Subdivision Control Ordinance, Clark County has an erosion control plan to mitigate adverse land use effects.

6.3 Mitigation Goals

The MHMP planning team members understand that although hazards cannot be eliminated altogether, Clark 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 Process, Prioritization, and Implementation

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?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

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

Political:

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

Legal:

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

Economic:

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

Environmental:

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

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. In addition, Clark County jurisdictions participated in a FEMA 2012 Risk MAP Resilience meeting in which specific flood mitigation actions were documented. The planning team was presented with the task of evaluating the both of these mitigation strategies and documenting the status of each activity for their jurisdiction.

Then the team brainstormed a new list of strategies, which in some cases, reiterated 2008 and 2012 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 56. The factors were the STAPLE+E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria listed in Table 55.

Table 54: 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 seven incorporated communities, within and including Clark 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, 2012 Risk MAP Resilience actions, and 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 55 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 Clark 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 55: Mitigation Actions for Clark County

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Identify and publicize evacuation routes Originally developed as a high priority action item in 2008 MHMP	Complete	 *Action completed* The emergency evacuation routes have been identified and have been included in the recent Kentuckiana Regional Planning & Development Agency (transportation plan). Although this is completed the county is committed to updating these routes.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☒ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	KIPTA
Plum Run - possible acquisitions Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Complete	 *Action completed*	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☒ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	Clark County Storm Water Department	FEMA Local Funding

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Provide a plan for emergency distribution of food/water; identify at risk citizens Originally developed as a medium priority action item in 2008 MHMP	Complete	 *Action completed* This has been completed with the cooperation of Emergency Support Services and Community Organizations Active in a Disaster (COADs).	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☒ Winter Storm ☐ Hazmat ☒ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	Red Cross Clark County Commissioners
Harden existing critical facilities (Emergency Operations Center, fire houses, schools and churches) Originally developed as a high priority action item in 2008 MHMP	High	 *Funding secured; action in progress* Only a few critical facilities in the county have been hardened. Clark County acknowledges the need to see this as an ongoing process.	☒ Tornado ☐ Flood ☒ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	Clark County Planning Jurisdictional Funding FEMA/IDHS

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Community outreach and education Originally developed as a high priority action item in 2008 MHMP.	High	 *Funding secured; action in progress* Since 2008 Clark County has provided public education through fire department visits, distribution of FEMA documents, and Code Red information. Also, the county participates in Great Shake Out drills, and maintains public communication via Facebook and Twitter. Clark County see this as an ongoing process.	☒ Tornado ☒ Flood ☒ Earthquake ☒ Thunderstorm ☒ Winter Storm ☒ Hazmat ☒ Drought ☒ Subsidence ☒ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	Jurisdictional Funding Volunteers
Mass notification Originally developed as a high priority action item in 2008 MHMP	High	 *Funding proposed; not yet secured* The mass communication system used by Clark County is insufficient to insure public safety. Code Red is being implemented in the county and all jurisdictions. Centralized dispatch has been activated in Clark County.	☒ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☒ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	Clark County Individual Jurisdictions

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Siren/warning signal installations countywide, in particular along the riverfront. Originally developed as a high priority action item in 2008 MHMP. The county recognizes the need for additional sirens along the riverfront.	High	 *Funding secured; action in progress* Since 2008 Clark County has continued to install sirens and warning signals. Many such projects are in progress (Daisy Hill and Bethlehem) and more are planned. Jeffersonville is a NWS StormReady® Community. This is an ongoing process.	☒ Tornado ☐ Flood ☐ Earthquake ☒ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	Clark County Planning Department Jurisdictional Funding
Install an additional warning siren in the Town of Borden This is a new action item developed with the 2015 MHMP	High	 *New action; funding not secured* The town has only one siren (located on the Town Hall, adjacent to a school) and not all residents are in range of the warning. Borden residents have previously been compromised by insufficient warning of pending disaster.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	MHMP Team	IDHS/FEMA Jurisdictional Funding

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Training and support of storm watcher teams and emergency personnel Originally developed as a high priority action item in 2008 MHMP	High	 *Funding secured; action in progress* FEMA required incident management training has been administered to fire and police departments county- wide. Clark County EMA sponsors two Storm Spotter classes per year. Clark County acknowledges the need to see this as an ongoing process.	☒ Tornado ☒ Flood ☒ Earthquake ☒ Thunderstorm ☒ Winter Storm ☒ Hazmat ☒ Drought ☒ Subsidence ☒ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department Local Police and Fire Departments	Local Police and Fire Departments
Sanitary sewer construction and separation Originally developed as a high priority action item in 2008 MHMP	High	 *Funding secured; action in progress* Since 2008 many sanitary water/sewer separation projects have successfully been completed. The planning team recognizes this as a an ongoing process that will remain a high priority	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Planning Department Jeffersonville Stormwater Dept Clarksville Stormwater Dept	Jurisdictional Funding EPA

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Storm drainage improvements; including debris removal, channel widening, and monitoring Originally developed as a high priority action item in 2008 MHMP	High	 *Funding secured; action in progress* Storm Water Master Plans have been prepared for Jeffersonville, Sellersburg and Clarksville. Implementation projects are in progress.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☐ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Clarksville Stormwater	Local stormwater management fees
Buyout of flood-prone private property Originally developed as a high priority action item in 2008 MHMP	High	 *Action in progress* Waverly Court buyouts have been completed in Jeffersonville. Buyouts are planned for Sellersburg. This is an ongoing process. The City Drainage Board buyouts are in progress in Jeffersonville.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☒ Clarksville ☒Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	IDHS/FEMA
Mill Creek and Cane Run Interior drainage project (need to map area to determine additional flow from creek) Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	High	 *Funding proposed; not yet secured* A partial study/analysis has been completed, however action requires additional efforts and funding	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☒ Clarksville ☒ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	Clarksville Jeffersonville Jefferson-Clarksville Flood Control	FEMA Grant

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Oak Park Revised Hydraulic Study (need new flood study for the Oak Park area) Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	High	 *Funding proposed; not yet secured* Consultants have been contacted and this study is in progress.	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☒ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	Oak Park Conservancy District	Oak Park Conservancy District
Acquisitions -Terry Lane Gilola Subdivision Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	High	 *Funding proposed; not yet secured* Acquisitions are pending. This remains a high priority.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☒ Sellersburg ☐ Utica ☐ Clark County	Clark County Building Code Department	FEMA

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Anchors for large propane tanks in flood-prone areas Originally developed as a high priority action item in 2008 MHMP	Medium	 *Funding secured; action in progress* The county has implemented an ordinance to require anchors for all propane tanks in the floodplain. Many propane tanks throughout the county have been anchored since the 2008 plan. There are concerns that large tanks could float away in a flood so the planning team intends to make this an ongoing process.	☐ Tornado ☒ Flood ☒ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	IDHS/FEMA Private Owners
Initiate a traffic flow study once the I65 bridge is complete. This is a new action item developed for the 2015 MHMP	Medium	 *New action; funding not secured* Local traffic, bus routes, evacuation routes…have been disrupted since construction of the I65 bridge began. This will be a **MEDIUM** priority.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☒ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	INDOT Clark County

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Provide emergency generators for critical facilities (fire houses, schools, shelters) Originally developed as a medium priority action item in 2008 MHMP	Medium	 *Funding secured; action in progress* Emergency generators are available for critical facilities in all incorporated jurisdictions. Clark County considers this an ongoing process to insure continued safety of residents.	☒ Tornado ☒ Flood ☒ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	IDHS/FEMA
Swinging flood gates at flood-prone roads Originally developed as a medium priority action item in 2008 MHMP	Medium	 *Funding secured; action in progress* Flood gates have been installed at locations of prone to flash flooding and numerous other areas have warning signs installed, The planning team recognizes that swing gates are more effective than signs and would like to increase the use of gates. This is an ongoing process.	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	MHMP Team Regional Planning Commission Clark County Commissioners Clark County Planning Department	IDHS/FEMA
Re-evaluate existing snow removal plan Originally developed as a medium priority action item in 2008 MHMP	Medium	 *Funding secured; action in progress* The planning team reports improved snow removal over the past several years with fewer customer complaints. Sellersburg has recently quadrupled the snow removal fleet.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☒ Clark County	Clark County Highway Department Clark County Commissioners	Clark County

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Address erosion on Ohio River near McAlpine Loch Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Medium	 *New action; funding not secured* Although a local issue, erosion has caused serious road closures in this area.	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☒ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	US Army Corp of Engineers	US Army Corp of Engineers
Hamburg Pike Flooding (need to elevate road at Belmar Dr., Bishop Rd, and Crums Ln) Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Medium	 *New action; funding not secured* Work on mitigation of this flooding has not been started.	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☒ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	Clark County Building Code Department	FEMA Grant
Camp Run Commons Basin Levee and Gate Backwater Prevention System Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Medium	 *New action; funding not secured* Work on mitigation of this flooding has not been started.	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☒ Sellersburg ☐ Utica ☐ Clark County	Public Works	FEMA Grant

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Forest Estate Retention Pond Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Medium	 *Funding proposed; not yet secured* Upgrades are needed to eliminate highway flooding. This project has begun and should be considered in progress.	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☒ Sellersburg ☐ Utica ☐ Clark County	Public Works	Sellersburg General Fund
Upgrade Flood Control Pump Station (upgrade pump station at Mill Creek and Cane Run Creek) Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Medium	 *New action; funding not secured*	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☒ Jeffersonville ☒ Sellersburg ☐ Utica ☐ Clark County	Clarksville Jeffersonville Jeffersonville-Clarksville Flood Control	FEMA
Create a county-wide Incident Management Team including all fire chiefs. This is a new action item developed with the 2015 MHMP	Medium	 *New action; funding not secured*	☒ Tornado ☒ Flood ☒ Earthquake ☒ Thunderstorm ☒ Winter Storm ☒ Hazmat ☒ Drought ☒ Subsidence ☒ Dam/Levee	☒ Borden ☒ Charlestown ☒ Clarksville ☒ Jeffersonville ☒ Sellersburg ☒ Utica ☒ Clark County	Clark County EMA Jurisdictional Emergency Management Local Fire and Police Departments	IDHS

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Build an Ohio River ramp that would ensure access to the water in the event of local flooding This is a new action item developed with the 2015 MHMP	Low	 *New action; funding not secured*	☐ Tornado ☒ Flood ☐ Earthquake ☒ Thunderstorm ☒ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☒ Dam/Levee	☐ Borden ☐ Charlestown ☒ Clarksville ☐ Jeffersonville ☐ Sellersburg ☐ Utica ☐ Clark County	Clarksville Planning Department	
Install Double Arm Railroad Crossings This is a new action item developed with the 2015 MHMP	Low	 *New action; funding not secured*	☐ Tornado ☒ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☒ Dam/Levee	☐ Borden ☐ Charlestown ☐ Clarksville ☐ Jeffersonville ☒ Sellersburg ☐ Utica ☐ Clark County	Sellersburg Planning Department	IDHS/FEMA Jurisdictional Funding

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 planning cycle, Clark 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 begin planning for the next 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. Clark 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 Clark County EMA director and forwarded to the MHMP planning committee for discussion. Education efforts for hazard mitigation will be ongoing through the Clark 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 Clark County website, in each jurisdiction and in the Clark County EMA Office.

APPENDICES

Appendix A: Meetings

Appendix B: Newspaper Articles and Announcements

Appendix C: List and Locations of Clark County Facilities

Appendix D: Historical Disaster Photographs

Appendix E: Mitigation Photographs

Appendix F: THIRA List

Appendix G: Clarksville Flood Impact Statement

Appendix H: 2012 Stormwater Master Plan Recommended Projects

Appendix I: Adopting Resolutions

Appendix A
Meetings

CLARK COUNTY MHMP MEETING #1, FEBRUARY 27, 2015

NAME	TITLE	COMMUNITY	TOTAL HOURS INVESTED (Include transportation, research, and 1.5 hours for this meeting)
Tom UPTON	Clarksville Fire Chief	Clarksville	
Tony Jackson	Charlestown Building Commission	Charlestown	
Buddy Cook	Town Council	Borden	
BRYAN WALLACE	JEFFERSONVILLE STORMWATER COMM	JEFF	
HANK DORMAN	Utica Town Board	Utica	
Shane Bessett	Detective Clarksville Police	Clarksville PD	
Bethany Montgomery	TOC	Clarksville	
J Craig Dietz	~~Town of Sellersburg~~ Building Commissioner	Town of Sellersburg	
LES KAVANAUGH	DIRECTOR CC EMA	CLARK County Govt	
Brad Meixell	Director Clark County 911	Clark County	
Michael D. McCutcheon II	Fire Marshal City of Jeff	Jeffersonville	
Chelsea Crump	Charitable Financial Specialist	River Hills.	

MEETING #1 MINUTES

CLARK COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

February 27, 2015 – 2:00PM (local time)

John Buechler, Director of Geoinformatics, The Polis Center, introduced himself and his associate, Kavya Beerval Ravichandra, GIS Analyst, and went on to explain that the County's Multi-Hazard Mitigation Plan (MHMP) has expired and needs to be updated. Mr. Buechler then asked participants to introduce themselves. Representatives from the following communities were present: Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, and Utica. Also in attendance were representatives from Clark County Government and River Hills Economic Development District and Regional Planning Commission.

Mr. Buechler discussed the meeting's agenda and shared background information on The Polis Center. He asked that all participants keep track of their hours worked on this project as it will be used towards the local match. He then explained that the Clark County MHMP was adopted in 2008. Clark County needs this plan in order to access future funds from FEMA and that all communities must participate to access funds as well.

Mr. Buechler 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, the committee will review risk assessment results and brainstorm mitigation strategies. A portion of the second meeting will be open to the public. Mr. Buechler explained that after the second meeting, The Polis Center will take all comments and ideas and prepare a report. The committee will meet for a third time to review the plan, before it is sent to FEMA for approval.

Mr. Buechler shared a tentative schedule with the participants. The second meeting is expected to be held in approximately six weeks and the draft plan should be finished and submitted to FEMA by October of this year.

Mr. Buechler 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. Risks could include rain, hail, earthquake, etc and be unique to each community. Mr. Buechler shared Clark County's history of disasters since 2008, which include 126 severe weather reports and four federal disaster declarations.

The committee looked at the risk profile graph pulled from the last MHMP and discussed changes. Tony Jackson, Charlestown, asked if terrorist attacks on local power plants should be considered in the plan. Mr. Buechler responded that terrorism is not considered in this plan. The committee should focus more on man-made hazmat issues such as those that are related to transportation.

Brad Meixell, Clark County 911, stated that a study conducted in 2013 showed there would be an increase in hazardous materials moving through the county.

Mr. Buechler suggested that they move Hazmat up on both probability and impact on the chart. Ms. Ravichandra made note of this. Mr. Buechler asked if the Polis Center could get a copy of the study to include in the plan. Mr. Meixell said that wouldn't be a problem.

Mr. Buechler asked if there were any other comments.

Rudy Cook, Borden, asked where Tornados were listed on the graph as he couldn't see it very well. Mr. Buechler responded that it was listed at the top under Flood. Mr. Cook stated that Borden has been hit with three tornadoes since 1974. The school has been affected directly two of the three times. Mr. Buechler said that they would make note of this when they discussed Borden.

Michael McCutcheon, Jeffersonville Fire Department, asked what category straight line winds fell under. Mr. Buechler responded that they would fall under Thunderstorms. Mr. McCutcheon mentioned that these winds have been one of the biggest hazards in the community over the past few years.

Brittany Montgomery, Clarksville, asked if Flood covered both flash flooding and river line flooding. Mr. Buechler responded yes and noted that they would address this on the map. Ms. Montgomery added that flash flooding has a bigger impact on the area than river line flooding. Mr. Buechler suggested they break the two out on the graph. Ms. Ravichandra agreed.

Les Kavanaugh, Clark County EMA, asked where stormwater fit in? Mr. Buechler responded that it would be related to flash flooding and that it can be documented as an ongoing mitigation strategy.

Mr. Buechler asked if there were any other comments. There were none.

Ms. Ravichandra handed out a list of Jurisdiction Hazards to each participant. Mr. Buechler explained that The Polis Center looked at topography, roads, railroads, dams, etc. to come up with this list.

The committee then looked over the corresponding Jurisdiction Hazards slide and suggested adjustments to Borden's risk profile. Mr. Cook suggested that tornadoes should be added to the hazards list. Mr. Buechler agreed and asked if the Town had four dams. Mr. Cook said yes, and added that there is a possibility of a fifth being constructed. Hazmat should stay High as there is a highway that runs through the town, as well as a railroad.

Next, the committee suggested adjustments to Charlestown's risk profile. Mr. Jackson stated that Flooding should be moved up to a medium level due to stormwater. They also experience flooding in some subdivisions. The Hazmat category should stay where it is.

The committee then suggested adjustments to Clarksville's risk profile. Ms. Montgomery explained that Flooding should be moved to a higher level as the City is bordered by Silver Creek and the Ohio River. She added that they drain half the county or more. Ms. Montgomery asked if inadequate pumping of the levee system would fall under Dam/Levee Failure. Mr. Buechler said yes. Ms. Montgomery said that the category should be moved up to Medium as they have inadequate pumping on their levee system that causes flooding.

The committee suggested adjustments to Utica's risk profile. Hank Dorman, Utica, stated that the graph was on point with Flooding and Hazmat. They do not have any landslide issues.

Next, the committee suggested adjustments to Jeffersonville's risk profile. Mr. McCutcheon stated that he has been on the fire department for 23 years and has never experienced a hazmat event. He questioned why that category was listed High. Mr. Buechler explained that it was a subjective guess based on the highways and railways that exist there. Mr. McCutcheon said that he feels Hazmat should

be listed as Medium. Mr. Meixell stated that he felt it should be High due to the increase in transportation moving through the area. Ms. Montgomery added that river transportation should also be considered. A barge turned over in the 1980's and caused a chlorine spill. Greg Dietz, Sellersburg, stated that although the probability is low, the risk is high. Mr. Buechler said they would make note of that.

The committee then suggested adjustments to Sellersburg's risk profile. Mr. Dietz discussed problems with railroad crossings and suggested that upgrades should be considered. He stated that Flooding is on point as they get backwater flooding from Silver Creek. They would like to conduct a study and look into the possibility of flood gates or pumps as a solution. Mr. Dietz stated that the Hazmat category is ok as is, but Landslides should be moved to Medium. The town has a moderate risk under Dam/Levee Failures at Deams Lake due to backwater flooding from Silver Creek.

Mr. Buechler asked if there were any more comments. There were none.

Mr. Buechler directed the attendees to a map of the county. He explained that critical facilities and care facilities have been plotted on the map. The Polis Center can add any community assets that the committee sees fit. These assets can include industry, government facilities, historical facilities, etc. The committee members were also asked to circle any other hazards that were previously discussed.

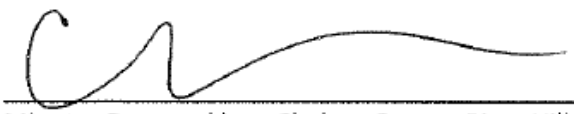
Mr. Buechler stated that the Polis Center will create a model of hazard scenarios. The scenarios will include a flood, earthquake, tornado, and hazmat situation.

Mr. Buechler tasked each community with completing the following items before the next meeting: 1) review the 2008 mitigation strategies handout, 2) gather articles, photos, count/$damage summaries, etc. related to hazards since the last update and 3) document on handout strategies implemented since the last update as well as ideas for new strategies that could be implemented.

Mr. Buechler reminded attendees that the second meeting would be open to the public, and that they should be prepared to review risk assessment results and brainstorm new mitigation strategies at this meeting.

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

Mr. Buechler thanked everyone for coming. The meeting was adjourned at 3:30 pm (local time).



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

CLARK COUNTY MHMP MEETING #2, JUNE 11, 2015

NAME	TITLE	COMMUNITY	TOTAL HOURS INVESTED (Include transportation, research, and 1.5 hours for this meeting)
J. Greg Dietz	Building Commissioner	Sellersburg	2
LES KAVANAUGH	EMA DIRECTOR	CLARK	6
GARY GREEN	School Safety	Greater Clark County Schools	
BRYAN WALLACE	STORMWATER COORDINATOR	JEFFERSONVILLE	3
Larry Wallace	Building Commissioner	Utica Jefferson	
Ruth Sparks	Town Council	Borden	
Brittany Montgomery	Project Coordinator	Clarksville	3
Michael D McCutcheon II	Jeff Fire / Fire Marshal	Jeffersonville	
Amir Mousavi	City of Jeffersonville Office of Safety Management	Jeffersonville	2

MEETING #2 MINUTES

CLARK COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

June 11, 2015 – 2:00PM (local time)

John Buechler, The Polis Center, introduced himself, and went on to explain that he and his staff pulled together information from the Clark County Emergency Management Agency, River Hills Economic Development District and Regional Planning Commission, and the local jurisdictions to draft the first five chapters of the Clark 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 stated that each participant's time spent on the planning process should be documented and would count towards the match ($5,000).

Mr. Buechler asked participants to introduce themselves: Brian Wallace, City of Jeffersonville; Larry Wallace, City of Jeffersonville and the Town of Utica; Mike McCutcheon, City of Jeffersonville Fire Department; Ruth Sparks, Town of Borden; Brittany Montgomery, Town of Clarksville; Amir Mousavi, City of Jeffersonville and Clark County EMA; Greg Dietz, Town of Sellersburg; Les Kavanaugh, Clark County EMA; Gary Green, Greater Clark County Schools; and Chelsea Crump, River Hills EDD & RPC.

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. Buechler asked Ms. Crump to reach out to the local jurisdictions that were not present to get input on the plan and strategies. Ms. Crump said that she would take care of it.

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 Clark 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

Mr. Buechler asked Ms. Crump to send the information to the County's GIS person. Mr. Mousavi asked that she send it to the City of Jeffersonville's GIS person as well. Ms. Crump said that she would take care of doing that.

Mr. Dietz explained that the hazmat model should have been located at 403 and 31 in Sellersburg, to include the schools and the 911 Center. Mr. Buechler stated that they would remodel the hazmat plume.

Mr. Buechler asked the participants to go through the draft plan and get any changes or suggestions to the Polis Center in two weeks. He reminded the participants to keep track of their time and get that information to Ms. Crump.

Mr. Kavanaugh asked how they should categorize a wind storm, such as Hurricane Ike. Mr. Buechler explained it should be categorized as straight line winds.

Ms. Montgomery asked if a levee failure was modeled. Mr. Buechler responded that there is only a 1% chance of levee failure, and so it was not modeled. Mr. Kavanaugh added that the County has experienced breaches in the highway 60 area, and have 11 or 12 other areas that are considered high risk. Mr. Buechler suggested that they include a breach analysis as a mitigation strategy. Mr. Kavanaugh added that they have previously conducted an analysis of Deam Lake.

Mr. Buechler asked if anyone had any questions. There were none.

Mr. Buechler asked Ms. Crump if she was aware of any upcoming projects in the County that could be considered a mitigation project. Ms. Crump stated that the 2013 CEDS included a priority for improved warning systems in the County. Mr. Kavanaugh explained that their current system has experienced two lightning strikes and is in need of a software update and reprogramming. However, the County is in the process of getting a new system. Mr. Mousavi added that he is looking into getting a county-wide system through Code Red.

Mr. Mousavi added that both the City of Jeffersonville and the County Government are certified through the StormReady program.

Mr. Kavanaugh stated that he has weather radios for each of the school buildings, and they will be delivered before the end of summer.

Mr. Mousavi asked if responder communication improvements, through centralized 911, would count as a mitigation strategy. Mr. Buechler said it should be documented.

Mr. Buechler asked Ms. Crump if she had anything to add. Ms. Crump stated that the Town of Borden has had several tornadoes in the past, and asked if they have warning sirens. Ms. Sparks replied that they have a siren near the Town Hall, only a few feet from the school. Mr. Kavanaugh added that Daisy Hill has petitioned for a siren, but funding is an issue. Mr. Buechler stated that they would make that a potential mitigation strategy.

Ms. Crump asked if anyone had any drainage projects. Mr. Mousavi stated that they have a large number of drainage projects going on in Jeffersonville. Mr. Wallace added that they have completed a master stormwater plan and have already begun on some of the projects. Ms. Montgomery added that Clarksville has one as well.

Mr. Dietz asked if the double crossing arms for railroads would be something to include in the strategies. Mr. Buechler replied yes. Mr. Dietz stated that CSX will be running the tracks and carrying hazardous materials.

Mr. Buechler stated that he would like to go over each of the 2008 Mitigation Strategies. The planning committee discussed the following:

- Harden existing critical facilities: some critical facilities still in flood plain and should be flood proofed
- Community outreach and education: continuous process; FEMA handouts, Facebook and Twitter accounts, flooding education, drills at schools
- Reverse 911: in process for some jurisdictions, previously discussed Code Red
- Siren/warning signal installations countywide: previously discussed Daisy Hill, several others in progress, installing cameras with voice command
- Training and support of storm watcher teams and emergency personnel: should include response training for police and fire departments, EMA currently offers two storm spotter classes a year, National Incident Management Training for fire/police/EMS completed recently, damage assessments training completed in Sellersburg
- Anchors for large propane tanks: yes, several located in flood plain
- Sanitary sewer construction: ongoing, replacing old lines, etc.
- Storm drainage improvements: ongoing, previously discussed
- Vehicle to transport debris removal workers: already have plans in place
- Buyout of flood prone private property: yes, Jeffersonville currently buying out homes, Clarksville and Sellersburg have plans for buyouts but no available funding, some homeowners not cooperating
- Identify and publicize evacuation routes: in need of a traffic study, can include evacuation routes, should get KIPDA involved
- Provide a plan for emergency distribution of food/water: COAD, VOAD, faith-based organizations, Salvation Army, other volunteers all assist with this
- Provide emergency generators for critical facilities: all of Sellersburg's facilities have them, the same goes for Jeffersonville, remove from list
- Swinging flood gates at flood prone roads: underpasses in Jeffersonville could use them, the same goes for Clarksville, currently just have warning signs, stay as a medium priority
- Re-evaluate existing snow removal plan: have better equipment now, Sellersburg has a larger fleet of snow removal vehicles, should continue to work on burying infrastructure to prevent downed lines
- Plum Run acquisitions: complete
- Erosion on Ohio River near McAlpine Loch: still an issue, road is currently closed, medium priority
- Mill Creek (Clarksville) and Cane Run (Jeffersonville/Clarksville) interior drainage projects: some analysis in stormwater plan for Mill Creek, full study conducted for levees, much infrastructure is gone, high priority
- Hamburg Pike flooding: has not been elevated
- Oak Park revised hydraulic study: completed, Lancasange Creek is currently being studied
- Camp Run Commons Basin: need levee/gate system for backwater flooding
- Servend Retention Pond (Clarksville): remove from list
- Forest Estate Retention Pond: some upgrades have been completed
- Terry Lane Giola Subdivision Acquisitions: has flooded several times, available for FEMA buy outs

- Upgrade flood control pump station: experience backwater from Silver Creek, need levee/gate system

Mr. Buechler asked if anyone had any questions or comments. There were none.
Mr. Buechler reminded everyone to send in any additional comments over the next few weeks as well as to continue tracking all time spent on the project. The committee will meet again in approximately 4-6 weeks to finalize the draft plan and submit it to FEMA for approval.

Mr. Buechler thanked everyone for coming. The meeting was adjourned at 3:25 pm (local time).

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

Clark County Multi-Hazard Mitigation Plan Public Meeting Announcement

The Clark County Hazard Mitigation Steering Committee will host a public information and strategy planning session at 2:00PM on June 11, 2015 at the office of River Hills EDD & RPC, 300 Spring Street, Suite 2A, Jeffersonville, IN 47130.

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 Clark 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 Leslie K. Kavanaugh Sr., Clark County Emergency Management Director, (812)246-5538. hsapxlp

RIVER HILLS
ECONOMIC DEVELOPMENT DISTRICT
& REGIONAL PLANNING COMMISSION

Serving the Indiana Counties of: Clark, Floyd, Harrison, Scott and Washington

June 4, 2015

American Red Cross
Louisville Area Chapter
Attn: Jennifer Adrio, CEO
PO Box 1675
Louisville, KY 40201-1675

Ms. Adrio:

The Polis Center IUPUI and River Hills Economic Development District & Regional Planning Commission are partnering with the emergency management agencies of Clark, Floyd and Harrison Counties in Indiana to update their Multi-Hazard Mitigation Plans (MHMP). The plans are unique in that they will utilize state-of-the-art FEMA modeling software to provide casualty and damage estimates, corresponding to predetermined disaster scenarios. The finished plans will then be reviewed and accepted by the Counties and sent to FEMA for federal approval. Once FEMA approves, the Counties will be eligible for emergency relief funding in the event of a natural disaster. The Counties will also be eligible for federal funding to implement the mitigation measures defined in the plans to minimize the effects of a natural disaster.

We held a public meeting in Corydon, IN on June 3, 2015 and discussed mitigation strategies for the Harrison County MHMP. We would love your input on the draft plan, as well as to note any current or future mitigation strategies that your organization is involved in within Harrison County. At your request, I would be more than happy to forward the draft document for your review.

A public meeting is being held on **Thursday, June 11 at 11:00 am** at the **Pineview Government Center, Room 102** located at **2524 Corydon Pike, New Albany, IN** to discuss Floyd County's draft plan and mitigation strategies. We are also holding a public meeting regarding Clark County's plan on **Thursday, June 11, 2015** at **2:00 pm** at the **Office of River Hills** located at **300 Spring Street, Suite 2A, Jeffersonville, IN**. We greatly appreciate any input on the plans, and would like to invite you and your staff to attend both meetings. Local participation is the key to our success.

Please do not hesitate to call me at (812) 725-3854 or send an email to ccrump@riverhills.cc should you have any questions.

Thank you,

Chelsea Crump
Charitable Financial Specialist

300 Spring Street, Suite 2A • Jeffersonville, IN 47130
Ph: 812.288.4624 • Fax: 812.288.8105
www.riverhills.cc

RIVER HILLS
ECONOMIC DEVELOPMENT DISTRICT
& REGIONAL PLANNING COMMISSION

Serving the Indiana Counties of: Clark, Floyd, Harrison, Scott and Washington

June 2, 2015

Clark County REMC
Attn: Public Safety Manager
7810 State Road
60 PO Box 411
Sellersburg, IN 47172-0411

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Please do not hesitate to call me at (812) 725-3854 should you have any questions.

Sincerely,

Chelsea Crump
Charitable Financial Specialist

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June 2, 2015

Clark Memorial Hospital
Attn: Martin Padgett, President & CEO
1220 Missouri Avenue
Jeffersonville, IN 47130

Mr. Padgett:

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June 2, 2015

Clarksville Community School Corporation
Attn: Kimberly Knott, Superintendent
200 Ettel Lane
Clarksville, IN 47129

Superintendent Knott:

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June 2, 2015

Duke Energy
Attn: Public Safety Manager
30 Jackson Street
New Albany, IN 47150

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June 2, 2015

Greater Clark County Schools
Attn: Dr. Andrew Melin
2112 Utica-Sellersburg Road
Jeffersonville, IN 47130

Dr. Melin:

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June 2, 2015

Indiana American Water
Attn: Troy Bryant
555 East County Line Road, Suite 201
Greenwood, IN 46143

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June 2, 2015

Ivy Tech Community College
Attn: Thomas J. Snyder, President
8204 Hwy 311
Sellersburg, IN 47172

Mr. Snyder:

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June 2, 2015

American Commercial Lines / JeffBoat
Attn: Patrick Sutton, Vice President
1701 E Market Street
Jeffersonville, IN 47130

Mr. Sutton:

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June 2, 2015

Kitchen Kompact
Attn: Manager
911 E 11th Street
Jeffersonville, IN 47131

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June 2, 2015

Koetter Woodworking, Inc.
Attn: Randy Koetter, President
533 Louis Smith Road
Borden, IN 47106

Mr. Koetter:

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June 2, 2015

National Distributors Leasing, Inc.
Attn: Keith Vaughn, CEO
1517 Avco Boulevard
Sellersburg, IN 47172

Mr. Vaughn:

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June 2, 2015

Silver Creek Water Corporation
Attn: Manager
PO Box 102
Sellersburg, IN 47172

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June 2, 2015

Summitt Trucking
Attn: Manager
1800 Progress Way
Clarksville, IN 47129

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June 2, 2015

Vectren Corporation
Attn: Public Safety Manager
PO Box 209
Evansville, IN 47702

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June 2, 2015

Washington Township Water Corporation
Attn: Steve Fouts
108 Pierce Street
New Washington, IN 47162

Mr. Fouts:

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June 2, 2015

West Clark Community Schools
Attn: Monty Schneider, Superintendent
601 Renz Avenue
Sellersburg, IN 47172

Superintendent Schneider:

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Appendix B

Newspaper Articles and Announcements

Officials brace for flood risk as snow melts quickly

Posted: Mar 08, 2015 3:56 PM EDT
Updated: Mar 08, 2015 6:11 PM EDT
By Gordon Boyd

LOUISVILLE, KY (WAVE) - You didn't have to walk far onto the Great Lawn of Louisville's Waterfront Park Sunday to realize that the ducks seemed to be swimming closer to shore.

There was less shore, and the boat ramp was partially underwater.

"97's the highest I've seen," Jeffersonville's Bob Earinger said. "It was up to my deck."

Earinger has lived along the Ohio River for more than forty years. He's owned his home off of Arctic Springs Road for almost thirty years.

"This is basically normal flooding right now," Earinger said.

"We are looking at a flood threat," said Mike Lanham, superintendent of the Jeffersonville-Clarksville Joint Flood Control District. "There's always a severe threat this time, when the water's this high."

The Ohio River was expected to be about 1.8 feet above flood stage Monday, cresting at 3.25 feet above at noon Tuesday. Lanham's crews have charged up Cane Run and two more of his district's ten pumping stations to prepare for it.

"The ground can't take any more. It's a saturated sponge," Lanham said. "Melting ice and snow has nowhere else to go."

Saturday and Sunday's warmer temperatures melted much of the previous week's ice-and-snow blast.

"Gradual would have been wonderful," Lanham said. "I'm looking for the spring, but now I would prefer a little winter, a little colder weather."

The Louisville Metropolitan Sewer District has focused efforts to prevent pooling, breaking up ice dams around catch basins.

"If we had to, we'd just continue energizing more pump stations and getting them ready for flood pumping," Lanham said.

A jon boat was the best way to tour flooded areas when the Ohio River overflowed in 1997, Earinger recalled.

"Went over to Cox's Park. Drove up and down River Road," he said. "Got some pretty good pictures. It was a nice adventure for the day."

He was not expecting an encore this coming week, nor was he bracing for an evacuation.

"This is my little spot on Earth," he said. "I'm staying."

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

Appendix C

List and Locations of Clark County Facilities

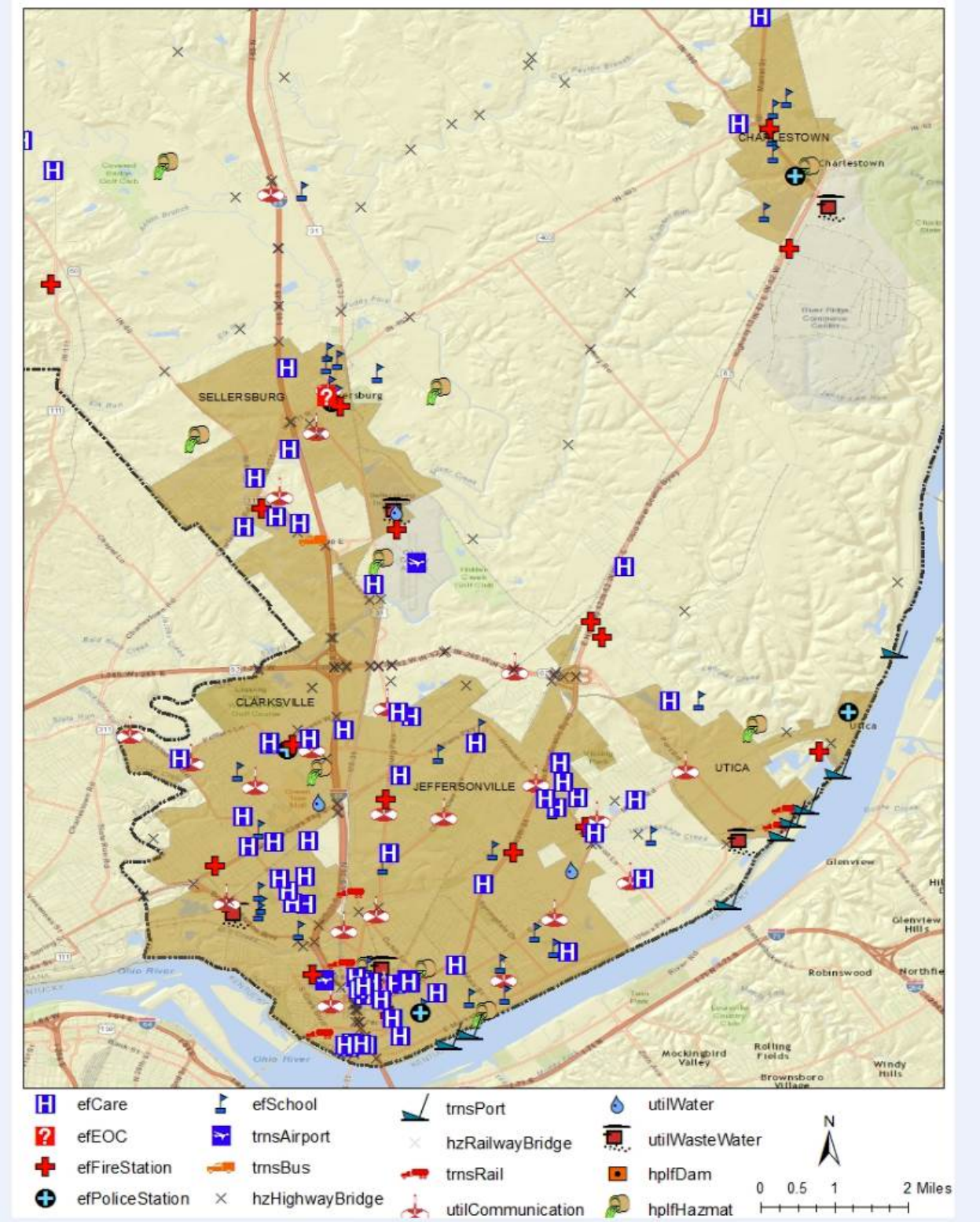
CRITICAL INFRASTRUCTURE & HIGH RISK FACILITIES IN FLOODPLAIN, JEFFERSONVILLE

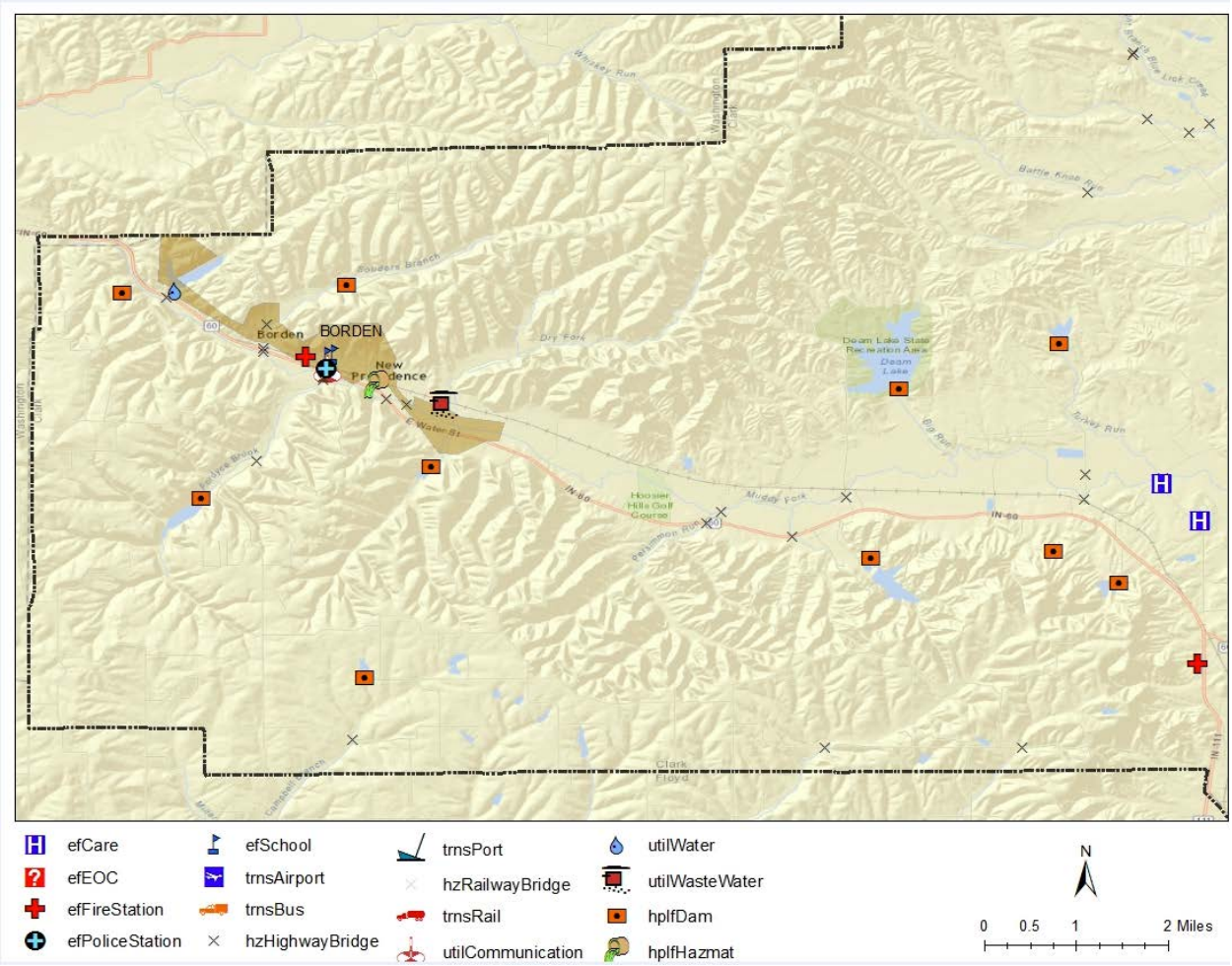
Date Modified: 2-27-15

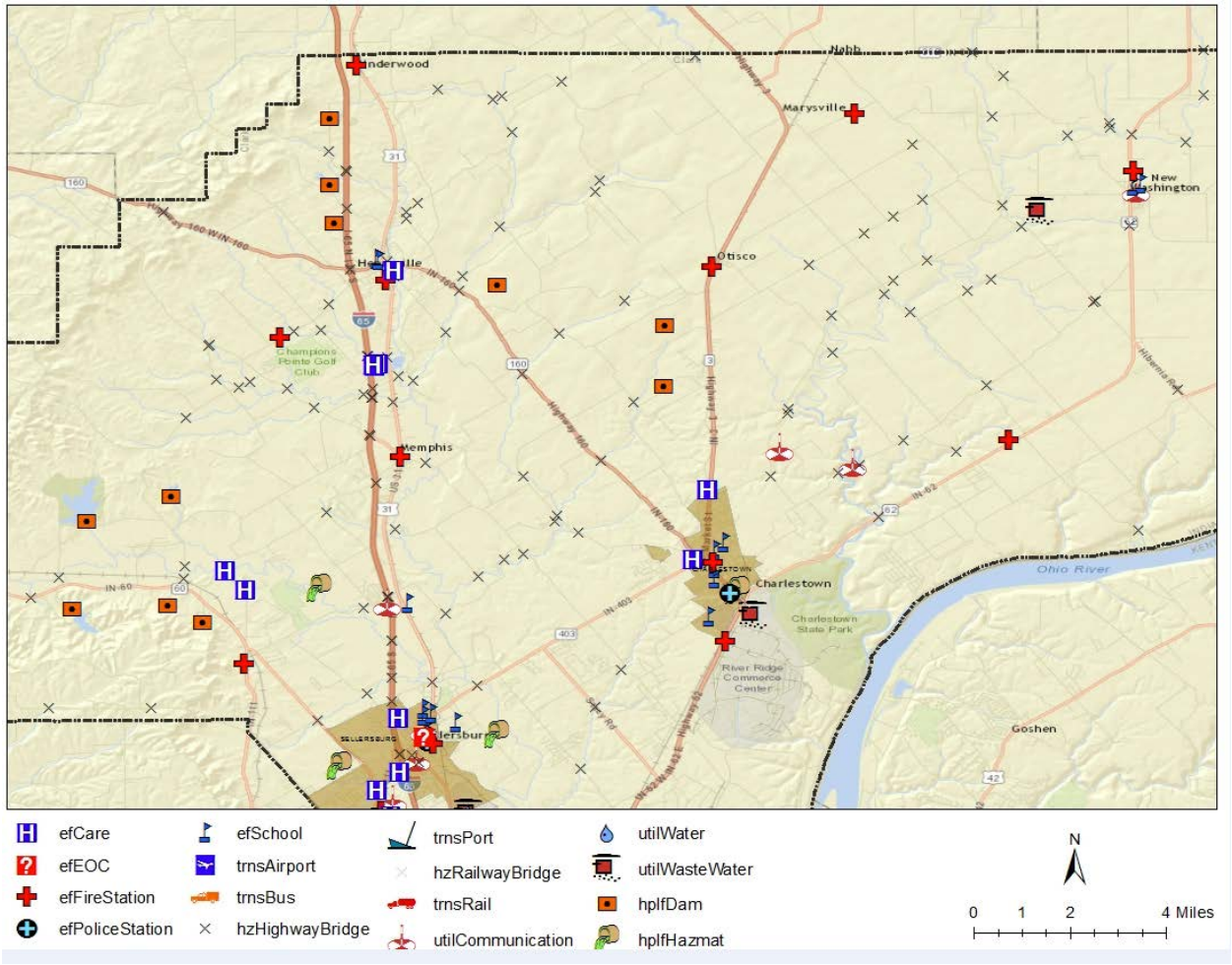
Critical Infrastructure in Floodplain	Address	Contact	Phone No.
McCulloch Fire Station	Allison Lane	Fire Chief, Eric Hedrick	(502) 376-2897
Jeffersonville Potter Road Substation	2301 Coopers Lane	Duke Energy (Emergency Line)	(800) 521-2232
Clark Maritime Substation	4010 Middle Road	Duke Energy (Emergency Line)	(800) 521-2232
French Quarter Sewer Lift Station	2000 Paddle Wheel Court	Utility Director, Len Ashack	(502) 639-0775
Allison Courtyards Sewer Lift Station	2121 Paddle Wheel Drive	Utility Director, Len Ashack	(502) 639-0775
Spring Street Sewer Lift Station	2203 Hamburg Pike	Utility Director, Len Ashack	(502) 639-0775
High Risk Facilities			
Chemtrusion (Port)	1403 Port Road	Site Manager, Denis Beckman	(502) 548-7145
Jeffboat	1030 East Market Street	Facility Manager, George Childers	(502) 777-7088
Industrial Container Services (Silver Creek Ind Park)	6213 Gheens Mill Road	Facility Manager, Cindy Setser	(812) 283-7659
SilGas (Silver Creek Ind Park)	6101 Hamburg Pike	Manager, Mike Kaelin	(502) 693-1135
High Risk Facilities Protected by Levee			
Clark Memorial Hospital	1220 Missouri Avenue	VP Support Svcs, Scott Hicks	(812) 283-2217 (502) 758-5247
		Director Engineering, Don Ingle	(812) 283-2443 (502) 718-2262
		President/CEO, Martin Padget	(812) 283-2147
Hillcrest Village Nursing Homes	203 Sparks Avenue	Executive Director, Lisa Tetrick Robert Hardin	(812) 987-3277 (502) 548-0987
Pfau Oil	800 Wall Street	Anne Pfau Chip Pfau	(812) 989-0195 (812) 987-2447
City Wastewater Lift Station	Intersection 10th St / Spring St	Utility Director, Len Ashack	(502) 639-0775
City Fire Station #1	Intersection 8th St / Wall St	Fire Chief, Eric Hedrick	(502) 376-2897
Jeffersonville Kentucky Avenue Substation	621 Kentucky Ave	Duke Energy (Emergency Line)	(800) 521-2232

Additional High Risk Facilities Protected by the levee include:

Clarksville Wastewater Treatment Plant	1 Leuthart Drive
Clarksville Pump Station 0	707 S. Sherwood Drive


CHARLESTOWN
Charlestown
SELLERSBURG
CLARKSVILLE
JEFFERSONVILLE
UTICA
Utica
Glenview
Glenview Hills
Robinswood
Northfie
Mockingbird Valley
Rolling Fields
Windy Hills
Brownsboro Village
Ohio River
efCare
efEOC
efFireStation
efPoliceStation
efSchool
trnsAirport
trnsBus
hzHighwayBridge
trnsPort
hzRailwayBridge
trnsRail
utilCommunication
utilWater
utilWasteWater
hplfDam
hplfHazmat
N
0 0.5 1 2 Miles


BORDEN
Borden
New Providence
Dry Fork
Deam Lake State Recreation Area
Deam Lake
Big Run
Turkey Run
Muddy Fork
Hoosier Hills Golf Course
Persimmon Run
Roberts Branch
Whiskey Run
Battle Knob Run
Clark
Floyd
IN-60
IN-11
efCare
efEOC
efFireStation
efPoliceStation
efSchool
trnsAirport
trnsBus
hzHighwayBridge
trnsPort
hzRailwayBridge
trnsRail
utilCommunication
utilWater
utilWasteWater
hplfDam
hplfHazmat
N
0 0.5 1 2 Miles


Underwood
Marysville
Otisco
Memphis
Charlestown
Charlestown State Park
River Ridge Commerce Center
Ohio River
Goshen
efCare
efEOC
efFireStation
efPoliceStation
efSchool
trnsAirport
trnsBus
hzHighwayBridge
trnsPort
hzRailwayBridge
trnsRail
utilCommunication
utilWater
utilWasteWater
hplfDam
hplfHazmat
N
0 1 2 4 Miles

Appendix D

Historical Disaster Photographs

Photo #1: Clark County Flooding, 2011

Source: www.crh.noaa.gov

Photo #2: Henryville Tornado, 2012

Source: www.salvationarmyusa.org

Photo #3: Henryville Tornado, 2012

Source: www.internet.monk.com

Appendix E

Mitigation Photographs

Appendix F

Threats and Hazard Identification Risk Assessment (THIRA) Checklist

Please check any of the following threats of concern to your county.

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

Sellersburg

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

Other Hazards Not Listed

- ☐ Click here to enter text.
- ☐ Click here to enter text.
- ☐ Click here to enter text.

Please list your top 5 hazards of concern

1. Click here to enter text. Tornado
2. Click here to enter text. Derecho
3. Click here to enter text. Flash Flood
4. Click here to enter text. ICE Storm
5. Click here to enter text. Rail Transportation Incident

Appendix G

Clarksville Flood Impact Statement

2011 Flood Impact Statement

The Town of Clarksville is currently in a financial crisis. Like many communities across the State, we have been hard hit by property tax caps. The new caps have limited the Town's ability to cover basic services, let alone stay competitive in this economy. The Town just received our new levy certification and the Town's General Fund was cut by 47% from the Town's certified budget. This is the second year in a row whereby the Town has had the state cut our certified budget by over 45%. However, the Town did see a slight increase in our certified rate and certified levy in 2011. This was mainly due to an increase in the Town's assessed value.

In addition to the property tax caps that has hit everyone across Indiana. The Town suffered three major disasters since 2008. The first was Hurricane Ike which caused winds over 70 miles an hour to hit our community. Hurricane Ike cost the Town almost a million dollars in repairs, debris clean up and overtime. In addition it also caused widespread power outages. Less than five months later that Town was hit with a massive ice storm that dropped over two inches of ice on the community in a few days. The ice storm came just as the community was returning to normal after Hurricane Ike. Once again the Town had to find the funds to pay for the clean-up required. The Town did receive assistance from FEMA for both of these disasters; however the assistance did not cover the full cost of the two disasters.

In August and September of 2010, the Town once again experienced two major disasters. This time flash flooding and rainfalls that exceeded 6 inches an hour flooded the community. The August flooding, led to collapse of a main roadway connecting the Town with a neighboring community. The roadway was eventually shut down for four months and had to be completely rebuilt at a cost of almost 500,000 to the community. A second set of storms hit the town in September and once again caused widespread flooding. However, unlike other disasters where FEMA came in with disaster assistance, the Town was left on its own. This was due to the fact that the flooding was localized to Clark and Floyd counties the State did not qualify for disaster assistance. This combined with the collapse of the roadway put the Town in severe financial trouble. In addition the Town's citizens were demanding action to prevent future flooding by the upgrading of the Town's stormwater system, another huge cost that the Town is just now beginning to bear.

Here it is less than two years later and the Town is dealing with another major disaster. The rainfall over the past three weeks has caused significant flooding in the Town of Clarksville. The flooding located primarily along the Ohio River, Silver Creek and Cane Run Creek has overwhelmed the Town once more. In order to prevent flood waters from entering homes and businesses, the Town had several employees working 24 hour shifts pumping water and cleaning catch basins for a week straight. In addition, the Town had to handle the closing of roadways and water rescues. By the end of the worst of it, the Town's Street and Stormwater Department had to spend over $150,000 to try to save the Town. This is money was earmarked for making drainage and street improvements.

To make matters worse, the Town is still dealing and will continue to deal with costs associated with debris clean-up and the possible loss of another roadway. The worst areas of flooding are located along the banks of the Ohio River. The rise and fall of the river levels has left several feet of driftwood, trash and other debris that must be removed and disposed of in order to allow for the safety of visitors and proper roadway traffic. It is estimated that the costs associated with the debris removal will easily be over $500,000 and this is just too much for the community to bear. Thus if the Town is unable to receive assistance from the State or federal authorities most of the debris will be left to lie. If the debris is not removed, it will cause a significant fire hazard to the community and thus cause further damage to the community.

In addition to the staff, equipment and debris removal costs, the Town is also likely facing significant roadway repairs. The worst of the roadway damage is located along Harrison Avenue, which is a roadway that is adjacent to the Ohio River. Due to the location of the McAlpine Locks and Dam, the roadway is

susceptible to erosion. Before the most recent round of the flooding, the Town was in the process of working with the Corps of Engineers to develop a plan to prevent further erosion of the roadway and prevent a full collapse. As part of the discussions it was understood that a large flood event will most likely make the erosion worse and could lead to a full collapse of the roadway.

Well, we got lucky and there has not been a full collapse, but the roadway is significantly more unstable and the Town is not going to have the luxury of developing a long-term plan to deal with the situation. Instead, the Town has decided to temporarily close the roadway until all floodwaters have receded and the Town's engineers can complete an analysis of the situation. If the analysis determines that the roadway is unsafe and must be moved, then it is expected to cost the Town over 2 million dollars. Again this is money that the Town does not have readily available. The closing of the roadway will also have a significant impact on the businesses and parks located along its path.

In closing, the Town of Clarksville has been significantly impacted by this most recent flood event. This is the fourth disaster we have suffered in less than three and a half years. These disasters have taken a toll on the Town and its residents, both financially and emotionally. Every time the Town finishes the clean-up process or tries to plan a mitigation project we are stopped by another disaster. If we continue down this path, the Town will never fully recover. This is why federal assistance is so important.

Appendix H

2012 Stormwater Master Plan Recommended Projects

2012 STORMWATER MASTER PLAN RECOMMENDED PROJECTS

CITY OF JEFFERSONVILLE
Mayor Mike Moore

Quick facts on...

Voluntary Acquisition and/or Floodproofing Program in Waverly (Master Plan Project PS-30)

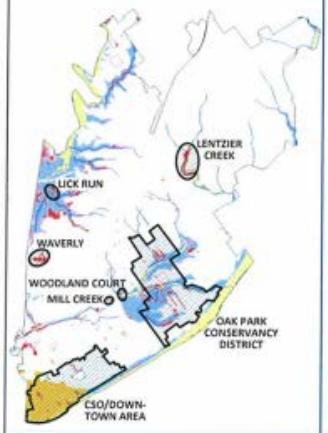
The 2012 City of Jeffersonville Stormwater Master Plan, prepared under the direction of the **Jeffersonville Drainage Board**, addresses existing and anticipated future flooding, drainage concerns and water quality problems.

This series of Fact Sheets provides a summary of the 33 recommended structural and non-structural projects listed in the Master Plan.

Target Study Areas

The larger neighborhood and regional scale problem areas identified in this Master Plan fall into the following 9 Target Study Areas:

1) Buildings in the Floodplain
2) CSO/Downtown Area
3) Mill Creek
4) Woodland Court
5) Oak Park Conservancy District
6) Waverly
7) Lick Run
8) Lentzier Creek
9) Citywide Programs & Policies



The Situation...

There are approximately 45 structures in **Waverly** that have experienced or been threatened by flooding. This is a low-lying area outside of the floodplain.

What Can We Do?

Voluntary acquisition and/or floodproofing of structures subject to flooding are proposed in the Waverly area. Removing or modifying these structures reduces the risk of future flood-related losses. Property that is acquired must forever remain as open space and serve as floodplain storage. Participation in this programs is strictly voluntary and no homeowners are ever forced to relinquish their property.

Benefits of this Project:

- Reduce flood-related losses
- Allow naturally low-lying areas to store floodwater

What are the Next Steps?

1. Implementation depends on the completion of the Prioritization Plan for Voluntary Acquisition and/or Floodproofing Program (PS-2).
2. Create outreach materials and conduct meetings with interested participants.
3. Assemble supporting materials for grant application including elevations, past flood-related losses, acquisition and/or floodproofing costs.
4. Secure mitigation funding from FEMA to acquire and/or floodproof buildings as listed in the Prioritization Plan (PS-2).

Estimated Time to Complete Next Step:	Estimated Cost to Complete Next Step:	Estimated Cost for Full Implementation of Project:
Multiple years; depends on funding & willing owners	$43,000 to develop cost share & grant administration	Varies; up to $1,500,000 (cost share portion)

Jeffersonville City Council District(s) Benefitted by the above Stormwater Master Plan Project:

District 1	**District 2**	District 3	District 4	District 5	District 6

Visit **WWW.CITYOFJEFF.NET** to view the full Stormwater Master Plan

Prepared by:
CHRISTOPHER B. BURKE ENGINEERING, LLC

Appendix I

Adopting Resolutions

Resolution #_____

ADOPTING THE CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, Clark 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, Clark 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 Clark County Commissioners hereby adopt the Clark County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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 CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Borden 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 Borden 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 Borden hereby adopts the Clark County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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 CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

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

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

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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.

_____
City Mayor

_____
City Council Member

_____
City Council Member

_____
City Council Member

_____
Attested by: City Clerk

Resolution #_____

ADOPTING THE CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Clarksville 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 Clarksville 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 Clarksville hereby adopts the Clark County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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

ADOPTING THE CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

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

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

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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.

_____
City Mayor

_____
City Council Member

_____
City Council Member

_____
City Council Member

_____
Attested by: City Clerk

Resolution #_____

ADOPTING THE CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Sellersville 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 Sellersville 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 Sellersville hereby adopts the Clark County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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 CLARK COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Town of Utica 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 Utica 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 Utica hereby adopts the Clark County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Clark County Emergency Management Agency 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