

**RESOLUTION No. 8, 2021**

**A RESOLUTION OF THE COMMON COUNCIL OF THE CITY OF  
VALPARAISO, INDIANA, ADOPTING THE PORTER COUNTY MULTI-  
HAZARD MITIGATION PLAN UPDATE**

WHEREAS, the City of Valparaiso recognizes the threat that natural hazards pose to our community.

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to residents of our community and save taxpayer dollars.

WHEREAS, the City of Valparaiso participated with Porter County and other local units of government within Porter County to prepare a Multi-Hazard Mitigation Plan.

WHEREAS, on September 29, 2020, the Porter County Commissioners approved Resolution 20-10, which adopted the Multi-Hazard Mitigation Plan.

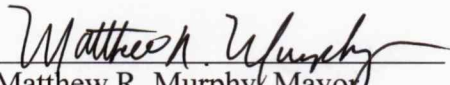
WHEREAS, upon review, the City of Valparaiso finds the approved Multi-Hazard Mitigation Plan appropriate and deems it proper to also adopt it.

NOW, THEREFORE, BE IT RESOLVED that the Common Council of the City of Valparaiso adopts the Multi-Hazard Mitigation Plan ("Plan") as an official plan. A copy of the adopted Plan is attached to this Resolution; and

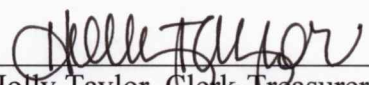
BE IT FURTHER RESOLVED that the City of Valparaiso consents to the Porter County Emergency Management Agency submitting the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

This Resolution shall be in full force and effect immediately upon its adoption by the Common Council and approval by the Mayor.

PASSED by the Common Council of the City of Valparaiso, Indiana, on the 28<sup>th</sup> day of June, 2021 by a vote of 5-0 with all members present and voting.

  
Matthew R. Murphy, Mayor

ATTEST:

  
Holly Taylor, Clerk-Treasurer

in reply to  
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J. William A. Whitely

of the





**MULTI-HAZARD  
MITIGATION PLAN  
UPDATE**

**Porter County, Indiana**

Prepared for:

**Porter County, Indiana  
Town of Beverly Shores, Indiana  
Town of Burns Harbor, Indiana  
Town of Chesterton, Indiana  
Town of Dune Acres, Indiana  
Town of Hebron, Indiana  
Town of Kouts, Indiana  
Town of Ogden Dunes, Indiana  
City of Portage, Indiana  
Town of Porter, Indiana  
Town of Pines, Indiana  
City of Valparaiso, Indiana**

*October 2019*

Prepared by

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CBBEL Project No. 18-0503

## **DISCLAIMER**

Exhibits and any GIS data used within this report are not intended to be used as legal documents or references. They are intended to serve as an aid in graphic representation only. Information shown on exhibits is not warranted for accuracy or merchantability.

## **LOCAL PROJECT CONTACT**

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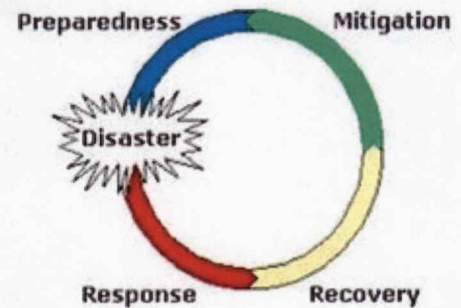
## CHAPTER 1

## INTRODUCTION

## 1.1 DISASTER LIFE CYCLE

The Federal Emergency Management Agency (FEMA) defines the disaster life cycle as the process through which emergency managers respond to disasters when they occur; help people and institutions recover from them; reduce the risk of future losses; and prepare for emergencies and disasters. The disaster life cycle,

**Figure 1-1** includes four phases:



*Figure 1-1 Disaster Life Cycle*

- **Response** – the mobilization of the necessary emergency services and first responders to the disaster area (search and rescue; emergency relief)
- **Recovery** – to restore the affected area to its previous state (rebuilding destroyed property, re-employment, and the repair of other essential infrastructure)
- **Mitigation** – to prevent or to reduce the effects of disasters (building codes and zoning, vulnerability analyses, public education)
- **Preparedness** – planning, organizing, training, equipping, exercising, evaluation and improvement activities to ensure effective coordination and the enhancement of capabilities (preparedness plans, emergency exercises/training, warning systems)

The Porter County Multi-Hazard Mitigation Plan (MHMP) focuses on the mitigation phase of the disaster life cycle. According to FEMA, mitigation is most effective when it's based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs. Recent reviews of grant programs have determined for every \$1 spent on mitigation efforts, between \$6 and \$10 are saved within the community on efforts following disasters. The MHMP planning process identifies hazards, the extent that they affect the municipality, and formulates mitigation practices to ultimately reduce the social, physical, and economic impact of the hazards.

## 1.2 PROJECT SCOPE AND PURPOSE

### **REQUIREMENT §201.6(d)(3):**

*A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.*

A MHMP is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). According to DMA 2000, the purpose of mitigation planning is for state, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of occurrences.

A FEMA-approved MHMP is required to apply for and/or receive project grants under the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). Although the Porter County MHMP meets the requirements of DMA 2000 and eligibility requirements of these grant programs, additional detailed studies may need to be completed prior to applying for these grants.

In order for National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP. The Indiana Department of Homeland Security (IDHS) and the United States Department of Homeland Security (US DHS)/FEMA Region V offices administer the MHMP program in Indiana. As noted above, it is required that local jurisdictions review, revise, and resubmit the MHMP every five years. MHMP updates must demonstrate that progress has been made in the last five years to fulfill the commitments outlined in the previously approved MHMP. The updated MHMP may validate the information in the previously approved Plan or may be a major plan rewrite. The updated MHMP is not intended to be an annex to the previously approved Plan; it stands on its own as a complete and current MHMP.

The Porter County MHMP Update is a multi-jurisdictional planning effort led by the Porter County Emergency Management Agency (EMA). This Plan was prepared in partnership with Porter County, the cities of Portage and Valparaiso, and the towns of Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Kouts, Ogden Dunes, Porter, and Town of Pines, Indiana. Representatives from these communities attended the Committee meetings, provided valuable information about their community, reviewed and commented on the draft MHMP, and assisted with local adoption of the approved plan. As each of the communities had an equal opportunity for participation and representation in the planning process, the process





used to update the Porter County MHMP satisfies the requirements of DMA 2000 in which multi-jurisdictional plans may be accepted.

Throughout this plan, activities that could count toward Community Rating System (CRS) points are identified with the NFIP/CRS logo. The CRS is a voluntary incentive program that recognizes and encourages community floodplain activities that exceed the minimum NFIP requirements. As a result, flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the 3 goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote education and awareness of flood insurance. Savings in flood insurance premiums are proportional to the points assigned to various activities. A minimum of 500 points are necessary to enter the CRS program and receive a 5% flood insurance premium discount. This MHMP could contribute as many as 382 points toward participation in the CRS. At the time of this planning effort, none of the municipalities within Porter County participate in the CRS program.

Funding to update the MHMP was made available through a FEMA/DHS PDM grant awarded to the Porter County EMA and administered by IDHS. Porter County provided the local 25% match required by the grant. Christopher B. Burke Engineering, LLC (CBBEL) was hired to facilitate the planning process and prepare the Porter County MHMP under the direction of an American Institute of Certified Planners (AICP) certified planner.

### 1.3 PLANNING PROCESS

#### **REQUIREMENT §201.6(c)(1):**

*The plan shall document the planning process used to prepare the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Preparation for the Porter County MHMP Update began in 2017 when the County EMA submitted a PDM Grant application to IDHS. The grant request was approved by FEMA and grant funds were awarded in 2018.

Once the grant was awarded, the planning process to update the 2011 MHMP took 12 months. This included a seven-month planning process, followed by a review period by IDHS and FEMA for the draft MHMP Update, and another month for Porter County and communities to adopt the final MHMP Update.

#### **1.3.1 Planning Committee and Project Team**

In April of 2019, the EMA compiled a list of Planning Committee members to guide the MHMP Update planning process. These individuals were specifically invited to serve on the Committee because they were knowledgeable of local hazards; have been involved in hazard mitigation; have the tools necessary to reduce the impact of future hazard events; and/or served as a representative on the original Planning

Committee in 2011. **Table 1-1** lists the individuals that participated on the Committee and the entity they represented.

**Table 1-1 MHMP Update Committee**

| NAME               | OFFICE                              | REPRESENTING                      |
|--------------------|-------------------------------------|-----------------------------------|
| Denise Amling      | Porter County Coroner               | Porter County                     |
| Tim Beach          | Ogden Dunes Police Department       | Towns of Ogden Dunes/ Dune Acres  |
| Lance Bella        | Porter County EMA                   | Porter County                     |
| Greg Brown         | Town Council                        | Town of Beverly Shores            |
| Mark Carlo         | Porter County EMA                   | Porter County                     |
| Kelly Caldwell     | Stormwater Department               | Porter County                     |
| Kris Contrino      | Porter County Health Department     | Porter County                     |
| Jay Craig          | Porter Fire Department              | Town of Porter                    |
| Michael Crowley    | Porter Hospital EMS                 | Porter County                     |
| Kevin DeYoung      | Portage Fire Department             | City of Portage                   |
| Daniel Henderson   | Ports of Indiana Security Manager   | Town of Burns Harbor              |
| Richard Howard     | Porter County 911                   | Porter County/Town of Ogden Dunes |
| Roger Howell       | Beach Committee                     | Town of Ogden Dunes               |
| Chris Kender       | Portage Fire Department             | City of Portage                   |
| Gina Kennedy       | Porter County 911                   | Porter County                     |
| Scott Kleckner     | Kouts Police Department             | Town of Kouts/Town of Hebron      |
| Robert Lanchsweerd | Porter County 911                   | Porter County                     |
| Tony Moore         | Porter County Health Department     | Porter County                     |
| Mike Novotney      | Porter County Stormwater Management | Porter County                     |
| Sheila Paul        | Porter County Health Department     | Porter County                     |
| David Richardson   | Valparaiso Police Department        | City of Valparaiso                |
| Mike Teeling       | Ogden Dunes Police Department       | Towns of Ogden Dunes/Dune Acres   |
| Destiny Vages      | United Way of Porter County         |                                   |
| Scott Valpatic     | Porter County 911 GIS               | Porter County                     |
| Michael Watkins    | Town of Pines Fire Department       | Town of Pines                     |
| Nate Williams      | Chesterton Fire Department          | Town of Chesterton                |
| Latty Zepeda       | Porter County Health Department     | Porter County                     |

Members of the Committee participated in the MHMP Update as a Planning Committee member or through various other group meetings. During these meetings, the Committee:

- revisited existing (in the 2011 MHMP) and identified new critical infrastructure and local hazards
- reviewed the state's mitigation goals and updated the local mitigation goals
- reviewed the most recent local hazard data, vulnerability assessment, and maps
- evaluated the effectiveness of existing mitigation measures and identified new mitigation projects
- reviewed materials for public participation.

A sign-in sheet recorded those present at each meeting to document participation. Meeting agendas and summaries are included in **Appendix 2**. Members of the



Committee reviewed a draft MHMP, provided comments and suggestions, and assisted with adoption of the Porter County MHMP Update.

### 1.3.2 Public Involvement

A draft of the Porter County MHMP Update was posted online on the county's website for public review and comment. A Press Release indicating the posting of the draft MHMP and the ability to comment was submitted for publishing to *The Valparaiso News*. Committee members were provided with an informational flyer to display in their respective offices. The media release and informational flyer are located in **Appendix 3**. No comments were received from the public.

### 1.3.3 Involvement of Other Interested Parties

Agencies (Health Department, Stormwater), academia (Valparaiso University), and nonprofits (United Way of Porter County) were invited to participate in meetings, review, and comment on the draft Porter County MHMP Update. Neighboring EMAs (Jasper, Lake, LaPorte, and Newton) as members of the District Planning Council (DPC) and were also involved through personal conversations and discussions. Information related to the planning process and the availability of the draft Porter County MHMP was directly provided to such potentially interested parties via personal conversations, informational flyer, and press releases. Successful implementation and future updates of the Porter County MHMP update will rely on the partnership and coordination of efforts between such groups.

## 1.4

## PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

### REQUIREMENT §201.6(c)(1):

*The plan shall include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

During the development of the Porter County MHMP update, several relevant sources of information were reviewed either as a document, or through discussions with local personnel. This exercise was completed to gather updated information since the development of the original Porter County MHMP, and to assist the Committee in developing potential mitigation measures to reduce the social, physical, and economic losses associated with hazards affecting Porter County.

For the purposes of this planning effort, the following materials (and others) were discussed and utilized:

- Porter County Land Use and Thoroughfare Plan, 2001
- City of Valparaiso Comprehensive Plan, *Envision Valparaiso 2030 Plan*
- City of Portage Comprehensive Plan, 2009
- Town of Chesterton Comprehensive Plan, 2010
- Porter County MHMP, 2011

Planning and building ordinances and comprehensive planning efforts for many of the other communities were also reviewed and utilized to develop portions of this MHMP or further develop potential mitigation measures to be ranked by the Planning Committee.

In addition to local agencies and offices such as those listed above, several regional and state agencies were contacted and subsequently provided data for this planning effort. Those contacts, and the information they provided, include:

- Indiana Department of Natural Resources, Division of Water – *Flood insurance policies, claims, and payment information*
- Indiana Department of Natural Resources, Division of Water – *Dam records*
- FEMA, Region V – *Repetitive loss structure counts and payments*



The CRS program credits NFIP communities a maximum of 155 points for organizing a planning committee composed of staff from various departments; involving the public in the planning process; and coordinating among other agencies and departments to resolve common problems relating to flooding and other known natural hazards.

## CHAPTER 2

## COMMUNITY INFORMATION

Although much of the information within this section is not required by DMA 2000, it is important background information about the physical, social, and economical composition of Porter County necessary to better understand the Risk Assessment discussed in **Chapter 3**.

Porter County, established in 1836, is named to honor Capt. David Porter, a naval officer during the War of 1812. Prior to 1836, the area now Porter County was part of LaPorte County. Porter County is home to the Indiana Dunes National Park which is approximately 25 miles of shoreline along Lake Michigan managed by the National Park Service. The location of Porter County within the State of Indiana is identified in **Figure 2-1**.

## 2.1 POPULATION AND DEMOGRAPHICS



*Figure 2-1 Porter County Location*

The most recent data for Porter County estimates that the 2018 population was 169,302 which ranks 9<sup>th</sup> in the state. Of that total, the City of Portage accounts for 36,806 or 21.7% of the county's population while the City of Valparaiso, the county seat, has approximately 33,729 or 19.9% of the population.

In 2018, the median age of the population in the county was 39.9 years of age. The largest demographic age groups in the county are older adults (45-64 years) with a population of 46,070, and young adults (25 to 44) with a population of 43,017. School age residents (5 to 17) are the third largest age group with a population of 28,192 individuals living in Porter County. The approximate median household income in 2017 was reported to be \$67,525 while the poverty rate in the same year was reported at 10.4% county-wide. In total, 21.9% of households are married with children, and 32.3% of households are married without children.

Nearly 92% of the adults, older than 25, within the county have reportedly completed a high school education. Further, 27.5% of those same adults have also completed a Bachelor of Arts or higher degree.

## 2.2 EMPLOYMENT

US Census data indicates that of the Porter County work force, 37.8% are employed in manufacturing employment type positions. "Other/private" positions and manufacturing account for 25.2% and 12.6% respectively. The total resident labor force according to estimates in 2018 is 86,770 with 3,336 unemployed and an unemployment rate of 3.2% or 15<sup>th</sup> in the state out of 92 counties.



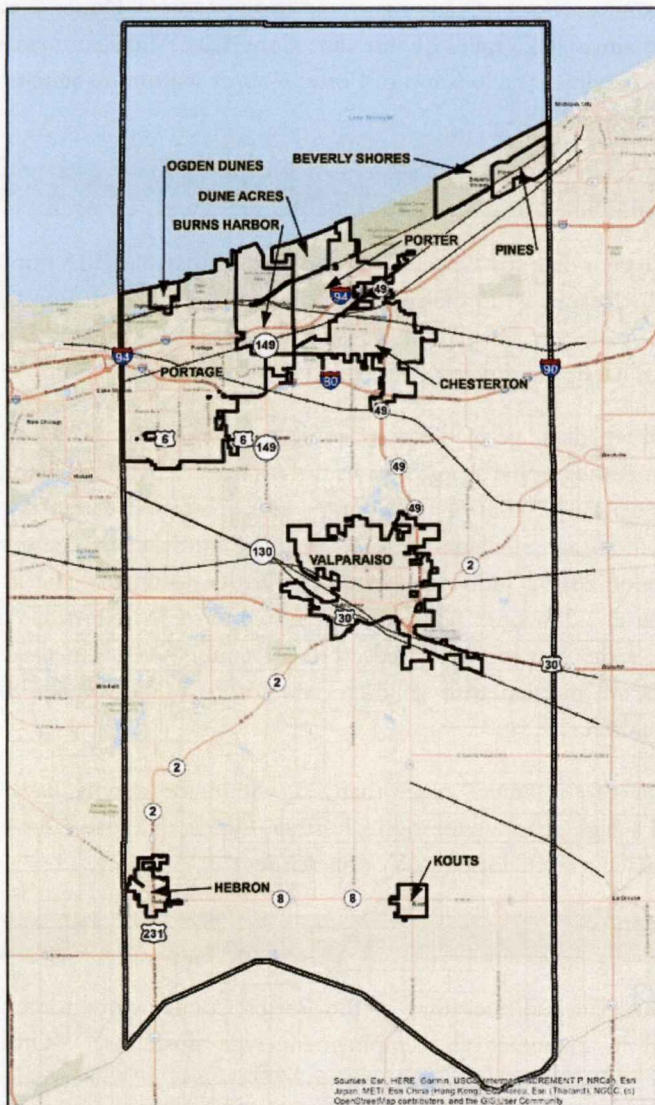
*Table 2-1 List of Major Employers*

|                                                    |                                                  |
|----------------------------------------------------|--------------------------------------------------|
| Arcelor Mittal ( <i>Burns Harbor</i> )             | Nitco ( <i>Hebron</i> )                          |
| Porter Regional Hospital ( <i>Valparaiso</i> )     | Urschel International Ltd. ( <i>Chesterton</i> ) |
| US Steel Corp ( <i>Portage</i> )                   | JLC Enterprise Inc. ( <i>Hebron</i> )            |
| St Mary Med Center Wound Clinic ( <i>Portage</i> ) | Pratt Industries ( <i>Valparaiso</i> )           |
| Regal Power Trans Solutions ( <i>Valparaiso</i> )  | Ivy Tech Community College ( <i>Valparaiso</i> ) |

(*Hoosiers by the Numbers*, 2019)

## 2.3

## TRANSPORTATION AND COMMUTING PATTERNS



*Figure 2-2 Porter County Transportation Routes*

There are several major transportation routes passing through Porter County and the municipalities within. Interstates 80, 90, and 94; US Highways 6, 12, 20, 30, and 231; and State Roads 2, 8, 49, 130, 149, and 249, serve as main routes between the various municipalities. In addition, several rail lines traverse the county. These transportation routes are identified in **Figure 2-2**.

According to the Indiana Business Research Center, nearly 12,803 people commute into Porter County on a daily basis. Approximately 50% of those commuters travel from Lake County. Further, approximately 28,697 Porter County residents commute to other counties with the majority traveling to Lake County (64%).

**Figure 2-3** indicates the number of workers 16 and older who do not live within Porter County but commute into the county for employment purposes. Similarly, **Figure 2-4** indicates the number of Porter County residents 16 and older that commute out of the county for employment.

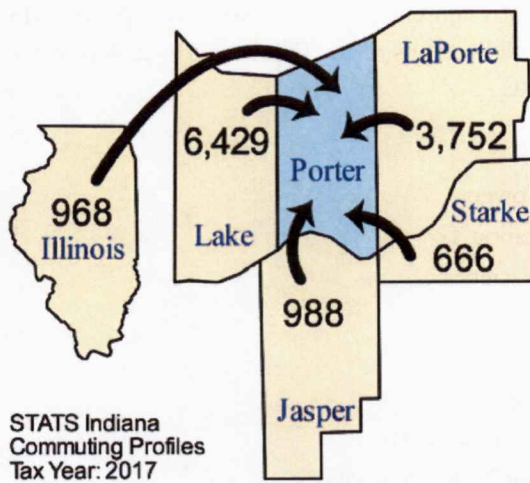


Figure 2-3 Workers Commuting into Porter County

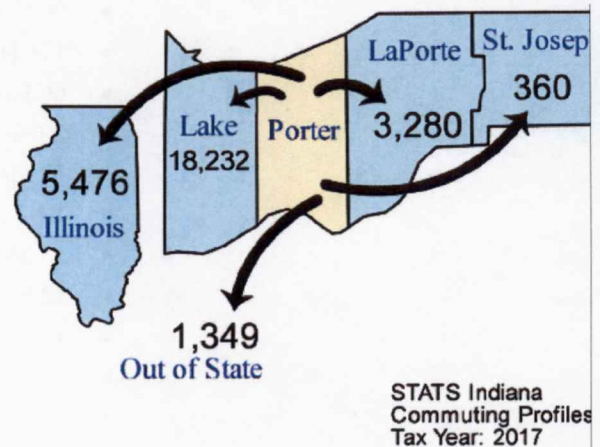


Figure 2-4 Workers Commuting out of Porter County

## 2.4

## CRITICAL AND NON-CRITICAL INFRASTRUCTURE

### REQUIREMENT §201.6(c)(2)(ii)(A):

*The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas....*

Critical facilities, or critical infrastructure, are the assets, systems, and networks, whether physical or virtual, so vital to the local governments and the United States that their incapacitation or destruction would have a debilitating effect on security, economic security, public health or safety, or any combination thereof.

These structures are vital to the community's ability to provide essential services and protect life and property, are critical to the community's response and recovery activities, and/or are the facilities the loss of which would have a severe economic or catastrophic impact. The operation of these facilities becomes especially important following a hazard event.

The Porter County EMA and Geographic Information System (GIS) Departments provided the listing and locations of the following 610 critical infrastructure points for the MHMP Update:

- 1 Airport
- 10 Cellular Towers
- 7 Communication Towers
- 17 Daycare Facilities
- 1 EMA
- 6 EMS
- 26 Fire Stations
- 90 Government Facilities
- 118 Hazardous Materials Facilities
- 66 Hospital/Care Facilities
- 2 Jails
- 15 Medical Rehabilitation Facilities
- 1 Military Installation
- 18 Mobile Home Parks
- 12 Nursing Homes
- 11 Police Stations
- 1 Port
- 4 Power Companies
- 5 Radio Stations
- 25 Red Cross Shelters
- 85 Religious Centers
- 69 Schools
- 12 Substations
- 7 Wastewater Treatment Facilities

Information provided by the EMA, GIS Department, and the MHMP Planning Committee members was utilized to identify the types and locations of critical structures throughout Porter County. Draft maps were provided to the EMA and GIS Department for their review and all comments were incorporated into the maps and associated databases.

**Exhibit 1** illustrates the critical infrastructure identified throughout Porter County. **Appendix 4** lists the critical structures in Porter County by NFIP Community. Non-critical structures include residential, industrial, commercial, and other structures not meeting the definition of a critical facility and are not required for a community to function. The development of this MHMP focused on critical structures; thus, non-critical structures are not mapped or listed.



## 2.5 MAJOR WATERWAYS AND WATERSHEDS

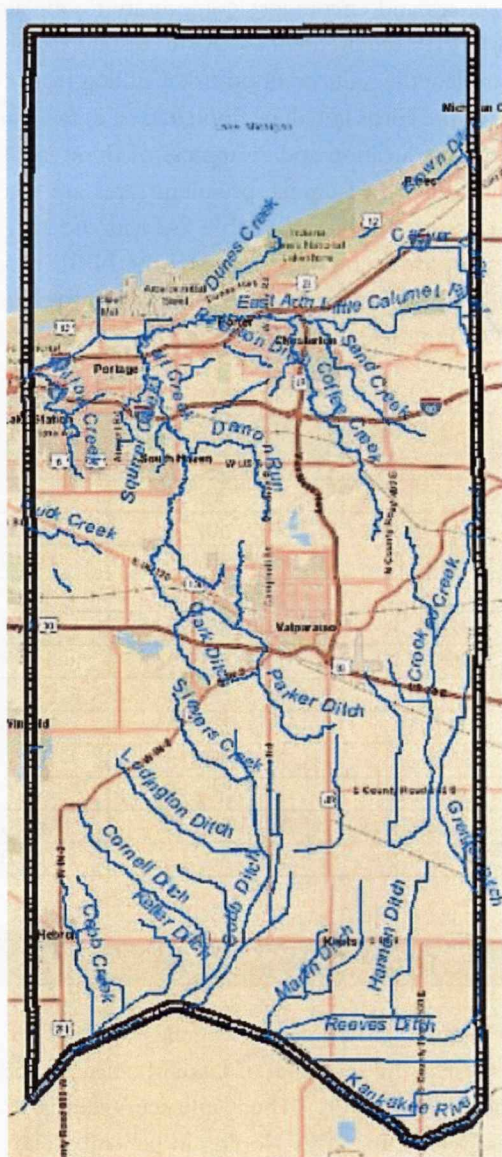


Figure 2-5 Porter County Waterways

According to the United States Geological Survey (USGS) there are 64 waterways in Porter County; they are listed in **Appendix 5**. The county's main waterway is the Elkhart River and the county lies almost entirely within two 8-digit Hydrologic Unit Codes (HUC): the Kankakee River (07120001) and the Little Calumet-Galien (04040001). This and other waterways are identified on **Figure 2-5**. Within Porter County, there are two active real-time USGS stream gages.

## 2.6 NFIP PARTICIPATION

The NFIP is a FEMA program that enables property owners in participating communities to purchase insurance protection against losses from flooding. Porter County and several municipalities are participants in the NFIP. Any smaller, unincorporated communities, such as Aberdeen and Wheeler, within Porter County may also be provided coverage by the MHMP through the county's program.

At the time of preparing this MHMP, none of the municipalities participate in the NFIP's Community Rating System (CRS) program. The CRS program is a voluntary incentive program that recognizes and encourages community floodplain activities that exceed the minimum NFIP requirements. As a result, flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the 3 goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote education and awareness of flood insurance. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% for each class level achieved. **Table 2-2** lists the NFIP number, effective map date, and the date each community joined the NFIP program. The Town of Kouts does not individually participate and therefore, information related to the town will be included within the county's information.

**Table 2-2 NFIP Participation**

| NFIP COMMUNITY         | NFIP NUMBER | EFFECTIVE MAP DATE | JOIN DATE |
|------------------------|-------------|--------------------|-----------|
| Porter County          | 180425A     | 09/30/15           | 04/01/82  |
| Town of Beverly Shores | 185173A     | 09/30/15           | 03/23/73  |
| Town of Burns Harbor   | 180207A     | 09/30/15           | 08/04/88  |
| Town of Chesterton     | 180201A     | 09/30/15           | 02/01/80  |
| Town of Dune Acres     | 1802015A    | 09/30/15           | 04/24/81  |
| Town of Hebron         | 180387A     | 09/30/15(M)        | 10/09/81  |
| Town of Kouts          |             |                    |           |
| Town of Ogden Dunes    | 180206A     | 09/30/15           | 08/05/86  |
| City of Portage        | 180202A     | 09/30/15           | 06/01/82  |
| Town of Porter         | 180208A     | 09/30/15           | 06/04/80  |
| Town of Town of Pines  | 180388A     | 09/30/15(M)        | 08/09/11  |
| City of Valparaiso     | 180204A     | 09/30/15           | 03/02/79  |

(FEMA, 2019)

## 2.7 TOPOGRAPHY

Porter County's elevation is highest approximately 3.5 miles north of Valparaiso, at 888 ft above sea level. Conversely, the shoreline of Lake Michigan, at 585 ft above sea level is the lowest elevation in the county. The Kankakee Valley in the southern reaches of the county is nearly level to gently sloping in general. The Valparaiso Moraine in the northern and western areas is gently sloping to moderately steep. This moraine also serves as the dividing line between the Gulf of Mexico watershed and the Lake Michigan watershed.

## 2.8 CLIMATE

The Midwestern Regional Climate Center (MRCC) provided climate data that includes information retrieved from a weather station located in Wanatah, IN (USC00129222). This station was used since it is the closest station to Porter County. The average annual precipitation is 38.59 inches per year, with the wettest month being July averaging 4.31 inches of precipitation and the driest month being February



with an average of 1.74 inches of precipitation. The highest 1-day maximum precipitation was recorded in July of 1983 with 5.2 inches of rain. On average, there are 74.3 days of precipitation greater than or equal to 0.1 inches; 23.6 days with greater than or equal to 0.5 inches; and 8.9 days with greater than or equal to 1.0 inch of precipitation.

Studies have recently been completed by the Indiana Climate Change Impacts Assessment, which is overseen by Purdue University Climate Change Research Center and comprised of a Steering Committee and several topic-oriented Working Groups. These studies indicate that average annual precipitation for Indiana is increasing seasonally during the winter and spring. Conversely, summers and autumns are trending toward less precipitation. In addition, their report shows changes in rain intensity and duration, along with frost-free days and growing seasons. These changes in climate, especially in Indiana, will impact natural hazards and how municipalities prepare for them.



## CHAPTER 3

## RISK ASSESSMENT

### REQUIREMENT §201.6(c)(2):

*[The risk assessment shall provide the] factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessment must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

A risk assessment measures the potential loss from a hazard incident by assessing the vulnerability of buildings, infrastructure, and people in a community. It identifies the characteristics and potential consequences of hazards, how much of the community may be affected by a hazard, and the impact on community assets. The risk assessment conducted for Porter County and the communities is based on the methodology described in the Local Multi-Hazard Mitigation Planning Guidance published by FEMA in 2011 and is incorporated into the following sections:

**Section 3.1: Hazard Identification** lists the natural, technological, and political hazards selected by the Planning Committee as having the greatest direct and indirect impact to the county as well as the system used to rank and prioritize the hazards.

**Section 3.2: Hazard Profile** for each hazard, discusses 1) historic data relevant to the county where applicable; 2) vulnerability in terms of number and types of structures, repetitive loss properties (flood only), estimation of potential losses, and impact based on an analysis of development trends; and 3) the relationship to other hazards identified by the Planning Committee.

**Section 3.3: Hazard Summary** provides an overview of the risk assessment process; a comparative hazard ranking with other methodologies used by the Porter County EMA; a table summarizing the relationship of the hazards; and a composite map to illustrate areas impacted by the hazards.

### 3.1 HAZARD IDENTIFICATION

#### 3.1.1 Hazard Selection

The MHMP Planning Committee reviewed the list of natural and technological hazards from the 2011 Porter County MHMP and discussed recent and the potential for future hazard events. The Committee identified those hazards that affected Porter County and the communities and selected the hazards to study in detail as part of this planning effort. As shown in **Table 3-1** these include: dam/levee failure; drought; earthquake; extreme temperature; fire, flooding; hailstorms, thunderstorms, and windstorms; hazardous materials incident; land subsidence; snow storms and ice storms; and tornado.

All hazards studied with the 2011 Porter County MHMP are included in the update.

*Table 3-1 Hazard Identification*

| TYPE OF HAZARD | LIST OF HAZARDS             | DETAILED STUDY |             |
|----------------|-----------------------------|----------------|-------------|
|                |                             | 2011 MHMP      | MHMP UPDATE |
| Natural        | Coastal Storm/Erosion       | No             | Yes         |
|                | Drought                     | Yes            | Yes         |
|                | Earthquake                  | Yes            | Yes         |
|                | Extreme Temperature         | Yes            | Yes         |
|                | Fire                        | Yes            | Yes         |
|                | Flood                       | Yes            | Yes         |
|                | Hail/Thunder/Wind           | Yes            | Yes         |
|                | Land Subsidence             | No             | Yes         |
|                | Snow / Ice Storm            | Yes            | Yes         |
|                | Tornado                     | Yes            | Yes         |
| Technological  | Dam/Levee Failure           | Yes            | Yes         |
|                | Hazardous Material Incident | Yes            | Yes         |

## 3.2 HAZARD RANKING

The Planning Committee ranked the selected hazards in terms of importance and potential for disruption to the community using a modified version of the Calculated Priority Risk Index (CPRI). The CPRI, adapted from MitigationPlan.com, is a tool by which individual hazards are evaluated and ranked according to an indexing system. The CPRI value (as modified by CBBEL) can be obtained by assigning varying degrees of risk probability, magnitude/severity, warning time, and the duration of the incident for each event, and then calculating an index value based on a weighted scheme. For ease of communications, simple graphical scales are used.

### 3.2.1 Probability



Probability is defined as the likelihood of the hazard occurring over a given period. The probability can be specified in one of the following categories:

- Unlikely – incident is possible, but not probable, within the next 10 years (1)
- Possible – incident is probable within the next five years (2)
- Likely - incident is probable within the next three years (3)
- Highly Likely – incident is probable within the next calendar year (4)

### 3.2.2 Magnitude / Severity



Magnitude/severity is defined by the extent of the injuries, shutdown of critical infrastructure, the extent of property damage sustained, and the duration of the incident response. The magnitude can be specified in one of the following categories:



- Negligible – few injuries OR critical infrastructure shutdown for 24 hours or less OR less than 10% property damaged OR average response duration of less than six hours (1)
- Limited – few injuries OR critical infrastructure shut down for more than one week OR more than 10% property damaged OR average response duration of less than one day (2)
- Significant – multiple injuries OR critical infrastructure shut down of at least two weeks OR more than 25% property damaged OR average response duration of less than one week (3)
- Critical – multiple deaths OR critical infrastructure shut down for one month or more OR more than 50% property damaged OR average response duration of less than one month (4)

### 3.2.3 Warning Time



Warning time is defined as the length of time before the event occurs and can be specified in one of the following categories:

- More than 24 hours (1)
- 12-24 hours (2)
- six-12 hours (3)
- Less than six hours (4)

### 3.2.4 Duration



Duration is defined as the length of time that the actual event occurs. This does not include response or recovery efforts. The duration of the event can be specified in one of the following categories:

- Less than six hours (1)
- Less than one day (2)
- Less than one week (3)
- Greater than one week (4)

### 3.2.5 Calculating the CPRI



The following calculation illustrates how the index values are weighted and the CPRI value is calculated.  $CPRI = Probability \times 0.45 + Magnitude/Severity \times 0.30 + Warning\ Time \times 0.15 + Duration \times 0.10$ . For the purposes of this planning effort, the calculated risk is defined as:

- **Low** if the CPRI value is between 1 and 2
- **Elevated** if the CPRI value is between 2 and 3
- **Severe** if the CPRI value is between 3 and 4



The CPRI value provides a means to assess the impact of one hazard relative to other hazards within the community. A CPRI value for each hazard was determined for each community in Porter County, and then a weighted CPRI value was computed based on the population size of each community. **Table 3-2** presents each community, population, and the weight applied to individual CPRI values to arrive at a combined value for the entire county. Weight was calculated based on the average percentage of each community's population in relation to the total population of the county. Thus, the results reflect the relative population influence of each community on the overall priority rank.

**Table 3-2 Determination of Weighted Value for Communities**

| COMMUNITY              | POPULATION<br>(2018) | % OF TOTAL<br>POPULATION | WEIGHTED<br>VALUE |
|------------------------|----------------------|--------------------------|-------------------|
| Porter County          | 71,301               | 42.0%                    | 0.42              |
| Town of Beverly Shores | 605                  | 0.4%                     | 0.00              |
| Town of Burns Harbor   | 1,727                | 1.0%                     | 0.01              |
| Town of Chesterton     | 13,503               | 8.0%                     | 0.08              |
| Town of Dune Acres     | 181                  | 0.1%                     | 0.00              |
| Town of Hebron         | 3,671                | 2.2%                     | 0.02              |
| Town of Kouts          | 1,949                | 1.1%                     | 0.01              |
| Town of Ogden Dunes    | 1,094                | 0.6%                     | 0.01              |
| City of Portage        | 36,672               | 21.6%                    | 0.22              |
| Town of Porter         | 4,818                | 2.8%                     | 0.03              |
| Town of Town of Pines  | 697                  | 0.4%                     | 0.00              |
| City of Valparaiso     | 33,376               | 19.7%                    | 0.20              |
| <b>Total</b>           | <b>169,594</b>       | <b>100.0%</b>            | <b>1.00</b>       |

### 3.3 HAZARD PROFILES

The hazards studied for this report are not equally threatening to all communities throughout Porter County. While it would be difficult to predict the probability of an earthquake or tornado affected a specific community, it is much easier to predict where the most damage would occur in a known hazard area such as a floodplain or near a facility utilizing an Extremely Hazardous Substance (EHS). The magnitude and severity of the same hazard may cause varying levels of damages in different communities.

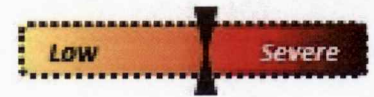
This section describes each of the hazards that were identified by the Planning Committee for detailed study as a part of this MHMP Update. The discussion is divided into the following subsections:

- **Hazard Overview** provides a general overview of the causes, effects, and characteristics that the hazard represents
- **Historic Data** presents the research gathered from local and national sources on the hazard extent and lists historic occurrences and probability of future incident occurrence

- **Assessing Vulnerability** describes, in general terms, the current exposure, or risk, to the community regarding potential losses to critical infrastructure and the implications to future land use decisions and anticipated development trends
- **Relationship to Other Hazards** explores the influence one hazard may have on another hazard.

## Natural Hazards

### 3.3.1 Coastal Storm/ Erosion



#### Coastal Storm / Erosion: Overview

Coastal storm systems can affect low-lying coastal areas, buffeting the shoreline with strong winds, heavy rain, and sometimes ice and snow. Associated with coastal storms is shoreline erosion as these storms may generate high waves that can expend great energy on an erodible shoreline, potentially transforming it drastically. Destructive waves are generated by a coastal storm through high wind and friction with the water. The stronger and more sustained the wind in the storm, the higher and more forceful the resulting wave. Other factors are the length of the lake water surface the wind is in contact with, or the fetch.

As driving winds from the coastal storms occur, the waves from the lake are pushed onto the shore and as those waves retreat, precious sand is removed from the shorelines.

#### Coastal Storm / Erosion: Recent Occurrences

In October of 2014, large waves beat the shoreline and removed approximately 75-115 feet of shoreline from the Indiana Dunes National Lakeshore's Portage Lakefront and Riverwalk. Fencing was placed in the most vulnerable areas to prevent future damage from pedestrians trampling the vegetation which holds much

of the sand in place. This loss, and the continued loss of shoreline in this area, has been attributed to modifications along the shoreline which interrupt the natural cycle of erosion and deposition along the shore. This interruption is keeping approximately 74,000 cubic yards of sand from the Portage Lakefront each year.

In the same area, in October of 2018, the trail was permanently closed due to continued erosion and **Figure 3-1** shows the damage to the seating area which occurred in November of 2018. It is expected that continued erosion such as this will put the larger pavilion and over \$20.0M of existing infrastructure at risk.



*Figure 3-1 Erosion at Portage Lakefront Park and Riverwalk (Joyce Russell, The Times)*



In July of 2015, the National Parks Service was also forced to close the Central Avenue Beach and associated parking area in Beverly Shores. According to an article posted in the Chesterton Tribune, "...large waves buffeting the beach earlier in the week eroded what little sand was left at the site". This impacted not only the beach itself, but ranger-led hikes were also cancelled and moved to a different location.

While considering the amount of shoreline lost over the last 10 to 15 years and understanding the frequency with which various thunder and windstorms occur in and around Porter County, the probability of a coastal storm was determined. Results ranged from "Unlikely" in Chesterton, Hebron, Kouts, Town of Pines, and Valparaiso; to "Highly Likely" within unincorporated areas of the county along the shoreline; Beverly Shores, Burns Harbor, Dune Acres, Ogden Dunes, Portage, and Porter. Impacts from such an event are anticipated to range from "Negligible" to "Significant" based upon communities with shoreline and communities without shorelines. The warning time is anticipated to be 12-24 hours for those that would be impacted, and that the duration of such an event is anticipated to last less than one week. A summary is shown **Table 3-3**.

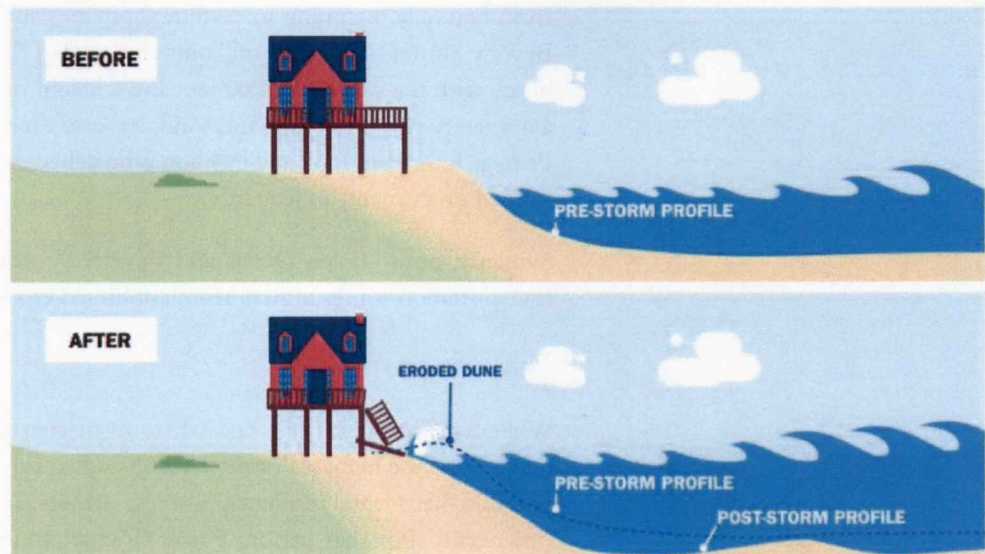
**Table 3-3 CPRI for Coastal Storm/Coastal Erosion**

|                        | PROBABILITY   | MAGNITUDE/<br>SEVERITY | WARNING<br>TIME | DURATION  | CPRI   |
|------------------------|---------------|------------------------|-----------------|-----------|--------|
| Porter County          | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Beverly Shores | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Burns Harbor   | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Chesterton     | Unlikely      | Negligible             | > 24 Hours      | < 6 Hours | Low    |
| Town of Dune Acres     | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Hebron         | Unlikely      | Negligible             | > 24 Hours      | < 6 Hours | Low    |
| Town of Kouts          | Unlikely      | Negligible             | > 24 Hours      | < 6 Hours | Low    |
| Town of Ogden Dunes    | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| City of Portage        | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Porter         | Highly Likely | Significant            | 12-24 Hours     | < 1 Week  | Severe |
| Town of Town of Pines  | Unlikely      | Negligible             | > 24 Hours      | < 6 Hours | Low    |
| City of Valparaiso     | Unlikely      | Negligible             | > 24 Hours      | < 6 Hours | Low    |

Many of the noted differences in considerations for the metrics above stem from the location of each community and their proximity to Lake Michigan and the amount of shoreline within each entity. As the Town of Hebron is far away from the shoreline, they are unlikely to be impacted and are afforded great warning time for such an event. Conversely, the Town of Ogden Dunes located directly on the shore and is anticipated to be critically impacted by such a storm event.

### Coastal Storm / Erosion: Assessing Vulnerability

While a coastal storm or coastal erosion may not be as catastrophic as other hazards in terms of potential damages, the suddenness of a coastal storm or the sometimes-immense loss of shoreline due to erosion may still cause great damages, injuries, or even death. Along the shoreline of Lake Michigan in Porter County, several communities have residential areas, commercial/industrial areas, and a National Lakeshore Park which attracts thousands of visitors each year. Several miles are continually affected by shoreline erosion shown in **Figure 3-2**.



*Figure 3-2 Coastal Erosion Example*

Direct and indirect effects from either a coastal storm or erosion may include:

#### **Direct Effects:**

- Structural and content damages and/or loss of revenue for properties affected by increased water
- Loss or damage to infrastructure such as roads and bridges near to shoreline
- Increased costs associated with additional response personnel, evacuations, and sheltering needs

#### **Indirect Effects:**

- Increased response times for emergency personnel if roads are impassable
- Increased costs associated with personnel to carry out evacuations in needed areas
- Losses associated with missed work or school due to closures or recovery activities



*Estimating Potential Losses*

The winds and increased water levels associated with coastal storms may vary markedly along the shoreline and therefore, may impact municipalities, or parts of municipalities very differently with each storm event. Storms may lead to little beach erosion, or as much as 12 feet of beaches in some areas as has occurred in Portage during some storms. This leads to some difficulty in determining overall potential losses.

It has been estimated by the US ACE in 2012 that the amount of sand prevented from naturally migrating to eastern shorelines such as the Dunes National Park or Beverly Shores, is over 10 million cubic yards. This is the equivalent of a one-mile beach with the width of 1,200 feet and a height of 36 feet. While it is hard to place a monetary value or loss to this sand, it is also estimated that when the dune near the Portage Lakefront Park and Pavilion is breached, it will leave over \$20.0M in taxpayer funded investments in jeopardy.

Similarly, both Ogden Dunes and Beverly Shores have residential areas and main transportation routes in peril from continued erosion along the shoreline.

*Future Considerations*

While the occurrence of a coastal storm or coastal erosion event in Porter County may not be the highest priority hazard studied for the development of the Plan, it is possible that several residents, business owners, and visitors may be affected should one occur. For that reason, Porter County, and more specifically Beverly Shores, Burns Harbor, Dune Acres, Ogden Dunes, Portage, and Porter should continue to provide education and outreach regarding coastal storms and erosion hazards along with education and outreach for other hazards. As the coastal communities within the county continue to grow and develop, the proper considerations for the potential of a coastal storm to occur may help to mitigate against social, physical, or economic losses in the future. Growth in these communities has been directed away from the shoreline as appropriate, especially for residential developments. This helps to reduce the overall vulnerability of impacts caused by coastal erosion. Elected officials in all communities have placed an importance on reducing the hazard to their constituents and visitors as well as protecting the unique natural landscapes from further development.

Coastal Storm / Erosion: Relationship to Other Hazards

A coastal storm and resulting erosion may occur following an earthquake or associated aftershocks due to the shifting of the lake beds and water levels in Lake Michigan or near Porter County. It is not anticipated that other hazards studied for this effort would result in a coastal storm. However, coastal erosion may be experienced along the shoreline during times of flooding and some may consider this to be categorized as land subsidence.



### 3.3.2 Drought



#### Drought: Overview

Drought, in general, means a moisture deficit extensive enough to have social, environmental, or economic effects. Drought is not a rare and random climate incident; rather, it is a normal, naturally recurring feature of climate. Drought may occur in virtually all climactic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration and is different from aridity, which is restricted to low rainfall regions.



*Figure 3-3 Drought Affected Soil*

There are four academic approaches to examining droughts; these are meteorological, hydrological, agricultural, and socio-economic. Meteorological drought is based on the degree, or measure, of dryness compared to a normal, or average amount of dryness, and the duration of the dry period. Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply. Agricultural drought is related to agricultural impacts; focusing on precipitation shortages, differences between actual and potential evapo-transpiration, soil water deficits, reduced ground water or reservoir levels, and crop yields. Socioeconomic drought relates the lack of moisture to community functions in the full range of

societal functions, including power generation, the local economy, and food sources. **Figure 3-3** shows soil affected by drought conditions.

#### Drought: Recent Occurrences

Data gathered from the U.S. Drought Monitor indicated that between January 2011 and January 2019, there were two weeks (both in 2012) where some portion of Porter County was considered to be in a “Severe Drought”. Additionally, for 16 weeks of 2012 and six weeks of 2013 portions of the county were categorized as “Moderate Drought”. **Figure 3-4**, from the U.S. Drought Monitor, describes the rationale to classify the severity of droughts.

In June 2011, much of Indiana was experiencing drought conditions ranging from “D0-Abnormally Dry” to “D1-Moderate Drought”. **Figure 3-5** identifies those areas and categories of drought throughout Indiana for August 7, 2011, the peak of

| Category | Description         | Possible Impacts                                                                                                                                                                                                                                                                             |
|----------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D0       | Abnormally Dry      | Going into drought: <ul style="list-style-type: none"> <li>short-term dryness slowing planting, growth of crops or pastures</li> </ul> Coming out of drought: <ul style="list-style-type: none"> <li>some lingering water deficits</li> <li>pastures or crops not fully recovered</li> </ul> |
| D1       | Moderate Drought    | <ul style="list-style-type: none"> <li>Some damage to crops, pastures</li> <li>Streams, reservoirs, or wells low, some water shortages developing or imminent</li> <li>Voluntary water-use restrictions requested</li> </ul>                                                                 |
| D2       | Severe Drought      | <ul style="list-style-type: none"> <li>Crop or pasture losses likely</li> <li>Water shortages common</li> <li>Water restrictions imposed</li> </ul>                                                                                                                                          |
| D3       | Extreme Drought     | <ul style="list-style-type: none"> <li>Major crop/pasture losses</li> <li>Widespread water shortages or restrictions</li> </ul>                                                                                                                                                              |
| D4       | Exceptional Drought | <ul style="list-style-type: none"> <li>Exceptional and widespread crop/pasture losses</li> <li>Shortages of water in reservoirs, streams, and wells creating water emergencies</li> </ul>                                                                                                    |

Figure 3-4 US Drought Monitor Drought Severity Classification

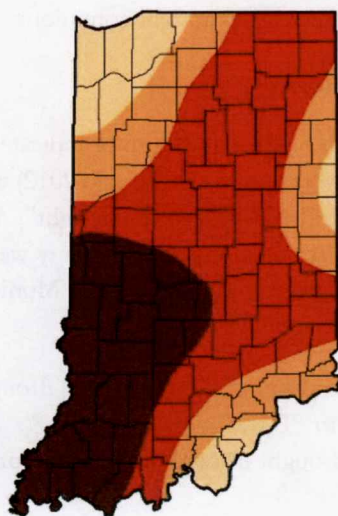
the drought. Porter County is located entirely in the “D1-Moderate Drought” zone. This includes damages to crops and pastures, dryness and developing shortages in streams and rivers and the start of voluntary water-use restrictions. It wasn’t until the April 2, 2013 report that the entire county was considered out of drought condition status.

The National Data Climate Center (NCDC) does not report any events or property or crop losses within Porter County during this planning period.

The Planning Committee, utilizing the CPRI, determined the overall risk of drought throughout Porter County is “Low”. The impact of drought was determined to be the same for many communities within the county and increased for the unincorporated areas, Hebron, and Kouts due to the possible agricultural impacts. The committee agreed that a drought is “Possible” (to occur within the next five years) and the magnitude of drought is anticipated to

be “Negligible” to “Limited”. Further it is anticipated that with the enhanced weather forecasting abilities, the warning time for a drought is greater than 24 hours and the duration will be greater than one week. A summary is shown in Table 3-4.

### U.S. Drought Monitor Indiana



August 7, 2012

(Released Thursday, Aug. 9, 2012)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

|                                      | None   | D0    | D1    | D2    | D3    | D4    |
|--------------------------------------|--------|-------|-------|-------|-------|-------|
| Current                              | 0.00   | 0.00  | 10.25 | 21.19 | 43.56 | 25.00 |
| Last Week<br>07-31-2012              | 0.00   | 0.41  | 14.74 | 25.80 | 34.79 | 24.26 |
| 3 Months Ago<br>05-08-2012           | 88.34  | 11.66 | 0.00  | 0.00  | 0.00  | 0.00  |
| Start of Calendar Year<br>01-01-2012 | 100.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Start of Water Year<br>09-27-2011    | 55.11  | 38.81 | 0.08  | 0.00  | 0.00  | 0.00  |
| One Year Ago<br>08-09-2011           | 26.94  | 42.71 | 30.35 | 0.00  | 0.00  | 0.00  |

#### Intensity

D0 Abnormally Dry D3 Extreme Drought  
D1 Moderate Drought D4 Exceptional Drought  
D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

#### Author

Mark Svoboda  
National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

Figure 3-5 August 7, 2012 Indiana Drought Map



**Table 3-4 CPRI for Drought**

|                        | PROBABILITY | MAGNITUDE/<br>SEVERITY | WARNING<br>TIME | DURATION | CPRI     |
|------------------------|-------------|------------------------|-----------------|----------|----------|
| Porter County          | Possible    | Limited                | > 24 Hours      | > 1 Week | Elevated |
| Town of Beverly Shores | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Burns Harbor   | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Chesterton     | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Dune Acres     | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Hebron         | Possible    | Limited                | > 24 Hours      | > 1 Week | Elevated |
| Town of Kouts          | Possible    | Limited                | > 24 Hours      | > 1 Week | Elevated |
| Town of Ogden Dunes    | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| City of Portage        | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Porter         | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| Town of Town of Pines  | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |
| City of Valparaiso     | Possible    | Negligible             | > 24 Hours      | > 1 Week | Low      |

According to the National Drought Mitigation Center, scientists have difficulty predicting droughts more than one month in advance due to the numerous variables such as precipitation, temperature, soil moisture, topography, and air-sea interactions. Further anomalies may also enter the equation and create more dramatic droughts or lessen the severity of droughts. Based on the previous occurrences of significant droughts and drought related impacts felt within Porter County, the Committee estimated that the probability of a drought occurring in the area is “Possible”; or occurrence is probable within the next five years.

Damages from “Negligible” to “Limited” are anticipated throughout the county as many municipalities rely on groundwater supplies for fire response efforts and face a higher risk during times of prolonged drought. Throughout the unincorporated areas of the county, increased crop and livestock damages would also be expected during a significant drought.

#### Drought: Assessing Vulnerability

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

#### **Direct Effects:**

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



- Citizens served by drinking water wells may be impacted during low water periods and may require drilling of deeper wells or loss of water service for a period of time.

**Indirect Effects:**

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

Development in many areas results in the change from agricultural land uses to other land uses such as residential, commercial or industrial. This has been the case for communities in Porter County. For example, in the last several years, Valparaiso has expanded in nearly all directions, Portage has also continued to expand, and development in the southern portions of the county continues. This results in a net loss of agricultural land use, lowering the vulnerabilities of crop losses associated with a drought. Conversely, to meet the needs of the municipal developments, these municipalities have had to increase their services such as providing water, which has caused them to realize an increase in the vulnerability in this regard.



*Figure 3-6 Crops Affected by Drought*

***Estimating Potential Losses***

It is difficult to estimate the potential losses associated with a drought for Porter County because of the nature and complexity of this hazard and the limited data on past occurrences. However, for the purpose of this MHMP Update, a scenario was used to estimate the potential crop loss and associated revenue lost due to a drought similar to that experienced during the drought of record from 1988. In 2018, Porter County produced approximately 10.6M bushels of corn and 3.4M bushels of soybeans, as reported by the United States Department of Agriculture (USDA) National Agricultural Statistics Service. Using national averages of \$3.40 per bushel of corn and \$9.50 per bushel of soybeans, the estimated crop receipts for 2018 would

be \$104.3M. Using the range of crop yield decreases reported in 1988 and 1989, just after the 1988 drought period (50%-86%) and assuming a typical year, economic losses could range between \$52.2M-\$89.7M; depending on the crop produced and the market demand. Effects of drought on corn crops can be seen in **Figure 3-6**.

*Purdue Agriculture News* reports that as of March 2013, Indiana producers received more than \$1.0B in crop insurance payments for 2012 corn, soybean, and wheat losses. This amount is nearly double that of the previous record, \$522M following 2008 losses, also due to drought.

According to a July 5, 2012 article in *The Times* (Noblesville, IN), “The effects of drought also could touch agricultural businesses, such as handlers and processors, equipment dealers, and seed, fertilizer and pesticide providers”. Further, “...consumers are likely to see an increase in food prices of 2.5 percent to 3.5 percent into 2013”.

Additional losses associated with a prolonged drought are more difficult to quantify. Drought has lasting impacts on urban trees: death to all or portions of a tree, reduction in the tree’s ability to withstand insects and diseases, and interruption of normal growth patterns. Such effects on trees, especially urban trees can lead to additional impacts, both environmentally and monetarily in terms of the spread of Emerald Ash Borer insect and the weakening of tree limbs and trunks which may lead to increased damages during other hazard events such as wind and ice storms.

#### *Future Considerations*

Advancements in plant hybrids and development have eased the impacts from short-lived droughts. Seeds and plants may be more tolerant of dryer seasons and therefore fewer crop losses may be experienced.

As the more urban areas of the county continue to grow and expand, protocols may need to be developed which create a consistency throughout the communities and the unincorporated portions of the county for burn bans and water usage advisories.

According to the Indiana Climate Change Impacts Assessment, Indiana has experienced a rise in the average annual precipitation between 1895 and 2016; an increase of 5.6 inches for the area of Porter County. This increase in precipitation may lessen the likelihood or overall impact of a drought in Porter County. However, the Assessment also notes seasonal shifts in precipitation which may lead to seasonal short-term droughts. In either scenario, changes in precipitation are not anticipated to relieve the area of a probability of a drought occurring.

#### Drought: Relationship to Other Hazards

Discussions with the Planning Committee were held regarding the similar effects of prolonged periods of extreme heat and the similar impacts that may be experienced during these times. Planning and mitigation efforts for one hazard may benefit the other. It is anticipated that rural areas of the county may be more susceptible to

cropland or woodland fires during a drought, while urban areas may experience these impacts in areas where several abandoned buildings or overgrown lots exist, and this may lead to increased losses associated with a fire.



### 3.3.3 Earthquake

#### Earthquake Overview



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 the 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. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of the plates.

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

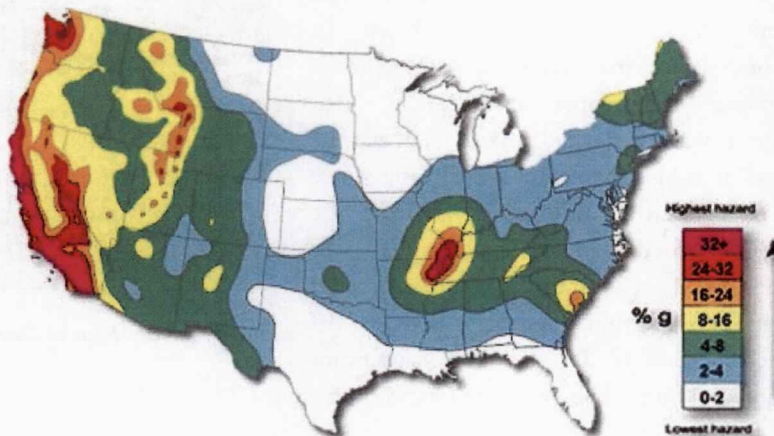


Figure 3-7 Earthquake Hazard Areas in the US

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70-75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the United States approach \$200B. Scientists are currently studying the New Madrid fault area and have predicted that the chances of an earthquake in the M8.0 range occurring within the next 50 years are approximately 7%-10%. However, the chances of an earthquake at a M6.0 or greater, are at 90% within the next 50 years.

There are 45 states and territories in the United States at moderate to very high risk from earthquake, and they are located in every region of the country (Figure 3-7). California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes-most located in uninhabited areas. The largest earthquakes felt in the United States were along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 occurred over the entire Eastern United States, with Missouri, Tennessee, Kentucky,

Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking.

#### Earthquake: Recent Occurrences

Indiana, as well as several other Midwestern states, lies in the most seismically active region east of the Rocky Mountains. Regarding Porter County, the nearest area of concern is the Wabash Seismic Zone.

On April 18, 2008, an M5.2 quake, reported by the Central United States Earthquake Consortium, struck southeast Illinois in Wabash County and included reports of strong shaking in southwestern Indiana, Kansas, Georgia, and the upper peninsula of Michigan. With over 25,000 reports of feeling the earthquake, there were no reports of injuries or fatalities caused by the event.

On December 30, 2010, central Indiana experienced an earthquake with a magnitude of 3.8; rare for this area in Indiana as it is only the 3<sup>rd</sup> earthquake of notable size to occur north of Indianapolis. Even rarer is the fact that scientists believe that the quake was centered in Greentown, Indiana approximately 13 miles southeast of Kokomo, Indiana. According to *The Kokomo Tribune*, “113 people called 911 in a 15-minute period after the quake, which was the first tremor centered in Indiana since 2004”. Further, a geophysicist from the USGS in Colorado stated, “It was considered a minor earthquake”, and “Maybe some things would be knocked off shelves, but as far as some significant damage, you probably wouldn’t expect it from a 3.8”.



**Figure 3-8 Earthquake Damaged Porch**

Most recently, an M5.8 centered in Mineral, Virginia affected much of the East Coast on August 23, 2011. According to USA Today, 10 nuclear power plants were shutdown of precautionary inspections following the quake, over 400 flights were delayed, and the Washington Monument was closed indefinitely pending detailed inspections by engineers.

Based on historical earthquake data, local knowledge of previous earthquakes, and the results of HAZUS-MH scenarios, the Committee determined that the probability of an earthquake occurring in Porter County or any of the communities is “Unlikely”. Should an earthquake occur, the impacts associated with this hazard are anticipated to be “Negligible” within all areas of the county. As with all earthquakes, it was determined that the residents of Porter County would have little to no warning time



(less than six hours) and that the duration of the event would be expected to be less than six hours. A summary is shown in **Table 3-5**.

**Table 3-5 CPRI for Earthquake**

|                        | PROBABILITY | MAGNITUDE/<br>SEVERITY | WARNING<br>TIME | DURATION  | CPRI |
|------------------------|-------------|------------------------|-----------------|-----------|------|
| Porter County          | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Beverly Shores | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Burns Harbor   | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Chesterton     | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Dune Acres     | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Hebron         | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Kouts          | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Ogden Dunes    | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| City of Portage        | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Porter         | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| Town of Town of Pines  | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |
| City of Valparaiso     | Unlikely    | Negligible             | < 6 Hours       | < 6 Hours | Low  |

Per the Ohio Department of Natural Resources Division of Geological Survey, "...it is difficult to predict the maximum-size earthquake that could occur in the state and certainly impossible to predict when such an event would occur. In part, the size of an earthquake is a function of the area of a fault available for rupture. However, because all known earthquake-generating faults in Ohio are concealed beneath several thousand feet of Paleozoic sedimentary rock, it is difficult to directly determine the size of these faults." Further according to the Indiana Geological Survey, "...no one can say with any certainty when or if an earthquake strong enough to cause significant property damage, injury, or loss of life in Indiana will occur...we do indeed face the possibility of experiencing the potentially devastating effects of a major earthquake at some point in the future". The Committee felt that an earthquake occurring within or near to Porter County is "Unlikely" to occur within the next ten years.

#### Earthquake: Assessing Vulnerability

Earthquakes generally affect broad areas and potentially many counties at one time. Within Porter County, direct and indirect effects from an earthquake may include:

#### **Direct Effects:**

- Urban areas may experience more damages due to the number of structures and critical infrastructure located in these areas
- Rural areas may experience losses associated with agricultural structures such as barns and silos
- Bridges, buried utilities, and other infrastructure may be affected throughout the county and municipalities



**Indirect Effects:**

- Provide emergency response personnel to assist in the areas with more damage
- Provide shelter for residents of areas with more damage
- Delays in delivery of goods or services originating from areas more affected by the earthquake



*Figure 3-9 Minor Earthquake Damages*

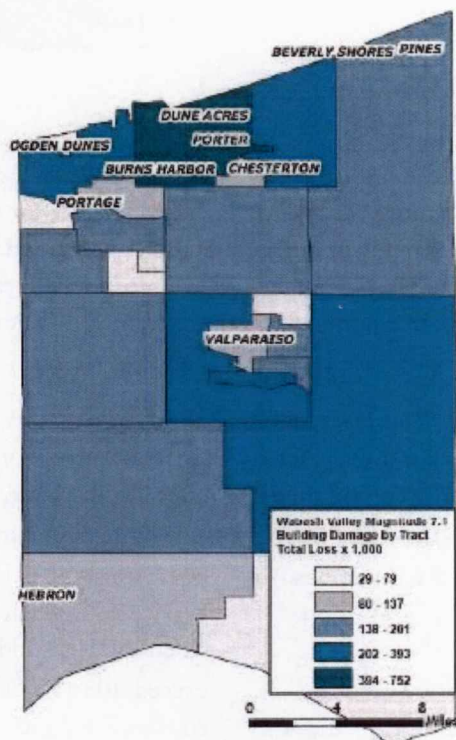
Types of loss caused by an earthquake could be physical, economic, or social in nature. Due to the unpredictability and broad impact regions associated with an earthquake, all critical and non-critical infrastructure are at risk of experiencing earthquake related damages. Damages to structures, infrastructure, and even business interruptions can be expected following an earthquake. Examples of varying degrees of damages are shown in **Figure 3-8** and **Figure 3-9**.

*Estimating Potential Losses*

In order to determine the losses associated with an earthquake, the HAZUS-MH software was utilized in the 2011 Porter County MHMP to determine the potential impacts anticipated from a 7.1 magnitude earthquake in the Wabash Valley Fault system.

Per the HAZUS-MH scenario noted above, total economic losses are anticipated to be near \$4.4M with damages to approximately 18 buildings. The HAZUS-MH model computes anticipated economic losses for the hypothetical earthquake due to direct building losses and business interruption losses. Direct building losses are the costs to repair or to replace the damage caused to the building and contents, while the interruption losses are associated with the inability to operate a business due to the damage sustained. Business interruption losses also include the temporary living expenses for those people displaced from their homes. Much of the damage is anticipated to be experienced within the eastern portion of the county as indicated on **Figure 3-10**.

The HAZUS-MH Earthquake Model allows local building data to be imported into the analysis. However, these local data are imported as “general building stock”, meaning that the points are assigned to a census tract rather than a specific XY coordinate. HAZUS performs the damage analysis as a county wide analysis and reports losses by census tract. While the results of the hypothetical scenario appear to be plausible, care should be taken when interpreting these results.



*Figure 3-10 Anticipated Building Damage from Earthquake Scenario, 2011 MHMP*

### *Future Considerations*

While the occurrence of an earthquake in or near to Porter County may not be the highest priority hazard studied for the development of the plan, it is possible that residents, business owners, and visitors may be affected should an earthquake occur anywhere within the state. For that reason, Porter County should continue to provide education and outreach regarding earthquakes and even earthquake insurance along with education and outreach for other hazards. As Porter County and the communities within the county continue to grow and develop, the proper considerations for the potential of an earthquake to occur may help to mitigate against social, physical, or economic losses in the future.

It can be anticipated that while all structures in Porter County will remain at-risk to earthquake damages and effects, new construction or redevelopment may reduce the overall risks such as those presented in Figure 3-8. As redevelopment occurs in the more urban areas of Portage and Valparaiso, the new construction may be significantly sturdier, lowering the overall monetary vulnerability. Further, as blighted or abandoned areas are addressed, those communities and the county as a whole, are less susceptible to economic and physical damages associated

with earthquakes.

### Earthquake: Relationship to Other Hazards

Hazardous materials incidents may occur as a result of damage to material storage containers or transportation vehicles involved in road crashes or train derailments. Further, dam failures may occur following an earthquake or associated aftershocks due to the shifting of the soils in these hazard areas. These types of related hazards may have greater impacts on Porter County communities than the earthquake itself. It is not expected that earthquakes will be caused by other hazards studied within this plan.



### 3.3.4 Extreme Temperature



#### Extreme Temperatures: Overview

Extreme heat is defined as a temporary elevation of average daily temperatures that hover 10 degrees or more above the average high temperature for the region for the duration of several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a dome of high atmospheric pressure traps water-laden air near the ground. In a normal year, approximately 175 Americans die from extreme heat.

According to the NWS, “The Heat Index or the “Apparent Temperature” is an accurate measure of how hot it really feels when the Relative Humidity is added to the actual air temperature”. To find the Heat Index Temperature, refer to the Heat Index Chart in **Figure 3-11**. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index – how hot it feels – is 121°F. The Weather

Service will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F for at least two consecutive days.

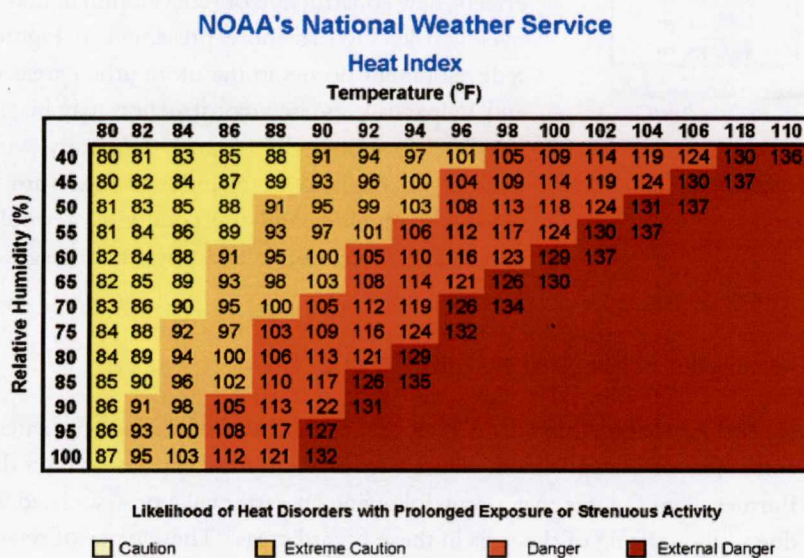


Figure 3-11 Heat Index Chart

It is important to also note that these heat index values were devised for shady, light wind conditions. Exposure to full sunshine may increase heat index values by up to 15°F. Further, strong winds, particularly with very hot, dry air, can also be extremely hazardous.

As Figure 3-9 indicates, there are four cautionary categories associated with varying heat index temperatures.

- Caution: 80°-90°F: Fatigue is possible with prolonged exposure and physical activity
- Extreme Caution: 90°-95°F: Sunstroke, heat cramps, heat exhaustion may occur with prolonged physical activity
- Danger: 105°-130°F: Sunstroke, heat cramps, or heat exhaustion is likely
- Extreme Danger: >130°F: Heatstroke is imminent

Extreme cold is defined as a temporary, yet sustained, period of extremely low temperatures. Extremely low temperatures can occur in winter months when

continental surface temperatures are at their lowest point and the North American Jet Stream pulls arctic air down into the continental United States. The jet stream is a current of fast-moving air found in the upper levels of the atmosphere. This rapid current is typically thousands of kilometers long, a few hundred kilometers wide, and only a few kilometers thick. Jet streams are usually found somewhere between 10-15 km (6-9 miles) above the Earth's surface. The position of this upper-level jet stream denotes the location of the strongest surface temperature contrast over the continent. The jet stream winds are strongest during the winter months when continental temperature extremes are greatest. When the jet stream pulls arctic cold air masses over portions of the United States, temperatures can drop below 0° F for one week or more. Sustained extreme cold poses a physical danger to all individuals in a community and can affect infrastructure function as well.

In addition to strictly cold temperatures, the wind chill temperature must also be considered when planning for extreme temperatures. The wind chill temperature, according to the NWS, is how cold people and animals feel when outside and it is based on the rate of heat loss from exposed skin. **Figure 3-12** identifies the Wind

## Wind chill is a guide to winter danger

### New wind chill chart

Frostbite occurs in 15 minutes or less

|            |    | Temperature (°F) |    |    |     |     |     |     |     |     |     |     |     |
|------------|----|------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|            |    | 30               | 25 | 20 | 15  | 10  | 5   | 0   | -5  | -10 | -15 | -10 | -25 |
| Wind (MPH) | 5  | 25               | 19 | 13 | 7   | 1   | -5  | -11 | -16 | -22 | -28 | -34 | -40 |
|            | 10 | 21               | 15 | 9  | 3   | -4  | -10 | -16 | -22 | -28 | -35 | -41 | -47 |
|            | 15 | 19               | 13 | 6  | 0   | -7  | -13 | -19 | -26 | -32 | -39 | -45 | -51 |
|            | 20 | 17               | 11 | 4  | -2  | -9  | -15 | -22 | -29 | -35 | -42 | -48 | -55 |
|            | 25 | 16               | 9  | 3  | -4  | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 |
|            | 30 | 15               | 8  | 1  | -5  | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 |
|            | 35 | 14               | 7  | 0  | -7  | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 |
|            | 40 | 13               | 6  | -1 | -8  | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 |
|            | 45 | 12               | 5  | -2 | -9  | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 |
|            | 50 | 12               | 4  | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 |
|            | 55 | 11               | 4  | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 |
|            | 60 | 10               | 3  | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 |

Figure 3-12 NWS Wind Chill Chart

Chill Chart and how the same ambient temperature may feel vastly different in varying wind speeds.

### Extreme Temperature: Recent Occurrences

The effects of extreme temperatures extend across large regions, typically affecting several counties, or states, during a single event. According to the NCDC, there has been one reported occurrence of extreme heat and four extreme cold events between January 2011 and March 2019.

The extreme heat related event occurred over the period of July 4-7, 2012. At this time, temperatures reached into the 100's with heat index values within the area of 115° each day. Low temperatures during this time didn't reach much below 80°, providing little relief.

The events occurred in January 2014 and January 2015. During the 2014 event, wind chill reports of -30° to -45° and blowing snow led to numerous vehicle accidents and vehicle slide-offs. In 2015, nearly the same conditions led to school delays and closures throughout the region. Additionally, in January 2019 where temperatures dipped to -47° in Valparaiso as it became extremely cold in northwestern Indiana over January 30<sup>th</sup> and 31<sup>st</sup>.

It is difficult to predict the probability that an extreme temperature event will affect Porter County residents within any given year. However, based on historic



knowledge and information provided by the community representatives, an extreme temperature event is “Highly Likely” (possible within the next calendar year) to occur and if an event did occur, it would result in “Limited” to “Significant” magnitude. **Table 3-6** identifies the CPRI for extreme temperature events for all NFIP communities in Porter County.

**Table 3-6 CPRI for Extreme Temperatures**

|                        | PROBABILITY   | MAGNITUDE/<br>SEVERITY | WARNING<br>TIME | DURATION | CPRI     |
|------------------------|---------------|------------------------|-----------------|----------|----------|
| Porter County          | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Beverly Shores | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Burns Harbor   | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Chesterton     | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Dune Acres     | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Hebron         | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Kouts          | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Ogden Dunes    | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| City of Portage        | Highly Likely | Limited                | > 24 Hours      | < 1 Week | Elevated |
| Town of Porter         | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| Town of Town of Pines  | Highly Likely | Significant            | > 24 Hours      | < 1 Week | Severe   |
| City of Valparaiso     | Highly Likely | Limited                | > 24 Hours      | < 1 Week | Elevated |

As shown in the table, index values remain nearly identical throughout each community due to the regional extent and diffuse severity of this hazard event. The anticipation of experiencing such damages is due to the amount of livestock and cropland within the county and the potential to realize impacts within the urban areas.

#### Extreme Temperatures: Assessing Vulnerability

As noted above, this type of hazard will generally affect entire counties and even multi-county regions at one time; however, certain portions of the population may be more vulnerable to extreme temperatures. For example, outdoor laborers, very young and very old populations, low income populations, and those in poor physical condition are at an increased risk to be impacted during these conditions.

By assessing the demographics of Porter County, a better understanding of the relative risk that extreme temperatures may pose to certain populations can be gained. In total, 16% of the county’s population is over 65 years of age, more than 5% of the population is below the age of 5, and approximately 10% of the population is considered to be living below the poverty line. People within these demographic categories are more susceptible to social or health related impacts associated with extreme heat.

**With Prolonged Exposure  
and/or Physical Activity**

|                                                              |
|--------------------------------------------------------------|
| <b>Extreme Danger</b>                                        |
| Heat stroke or sunstroke<br>highly likely                    |
| <b>Danger</b>                                                |
| Sunstroke, muscle cramps,<br>and/or heat exhaustion likely   |
| <b>Extreme Caution</b>                                       |
| Sunstroke, muscle cramps,<br>and/or heat exhaustion possible |
| <b>Caution</b>                                               |
| Fatigue possible                                             |

*Figure 3-13 Danger Levels with Prolonged Heat Exposure*

Extreme heat can affect the proper function of organ and brain systems by elevating core body temperatures above normal levels. Elevated core body temperatures, usually in excess of 104°F are often exhibited as heat stroke. For weaker individuals, an overheated core body temperature places additional stress on the body, and without proper hydration, the normal mechanisms for dealing with heat, such as sweating in order to cool down, are ineffective. Examples of danger levels associated with prolonged heat exposure are identified in **Figure 3-13**.

Extreme cold may result in similar situations as body functions are impacted as the temperature of the body is reduced. Prolonged exposure to cold may result in hypothermia, frostbite, and even death if the body is not warmed.

Within Porter County, direct and indirect effects from a long period of extreme temperature may include:

**Direct Effects:**

- Direct effects are primarily associated with health risks to the elderly, infants, people with chronic medical disorders, lower income families, outdoor workers, and athletes.

**Indirect Effects:**

- Increased need for cooling or warming shelters
- Increased medical emergency response efforts
- Increased energy demands for heating or cooling

*Estimating Potential Losses*

It is difficult to estimate the potential losses due to extreme temperatures as damages are not typically associated with buildings but instead, with populations and persons.

This hazard is not typically as damaging to structures or critical infrastructure as it is to populations so monetary damages associated with the direct effects of the extreme temperature are not possible to estimate. Indirect effects would cause increased expenses to facilities such as healthcare or emergency services, manufacturing facilities where temperatures are normally elevated may need to alter work hours or experience loss of revenue if forced to limit production during the heat of the day, and energy suppliers may experience demand peaks during the hottest and/or coldest portions of the day.

*Future Considerations*

As more and more citizens are experiencing economic difficulties, local power suppliers along with charitable organizations have implemented programs to provide cooling and heating mechanisms to residents in need. Often, these programs are donation driven and the need for such assistance must be demonstrated. As



susceptible populations increase, or as local economies are stressed, such programs may become more necessary to protect Porter County's at-risk populations.

The Climate Change Assessment identifies several temperature related considerations of which communities should be aware and begin planning to avoid further impacts. For example, rising temperatures will increase the number of extreme heat days, thereby increasing the potential for heat related illnesses, potential hospitalizations, and medication costs to vulnerable populations. In addition, added days of extreme heat will impact agriculture, manufacturing, and potentially, water sources.

New construction associated with development of residential areas often brings upgraded and more efficient utilities such as central heating and air units further reducing vulnerabilities to the aging populations in those municipalities mentioned above. Conversely, new development associated with industrial or large commercial structures in the inner-urban centers often result in increased heat over time, which may cause additional stress to labor-related populations.

#### Extreme Temperatures: Relationship to Other Hazards

While extreme temperatures may be extremely burdensome on the power supplies in Porter County, the Committee concluded that this type of hazard is not expected to cause any hazards studied, with the exception of a potential civil disturbance. It is anticipated that due to prolonged extreme temperatures, primarily long periods of high temperatures, citizens may become increasingly agitated and irritable and this may lead to a disturbance requiring emergency responder intervention.

### 3.3.5 Fire

#### Fire: Overview



*Figure 3-14 Wildfire in Forested Area*

A wildfire, also known as a forest fire, vegetation fire, or a bushfire, is an uncontrolled fire in wildland areas and is often caused by lightening; other common causes are human carelessness and arson. Small wildfires may be contained to areas less than one acre, whereas larger wildfires can extend to areas that cover several hundred or even thousand acres. Generally, ambient weather conditions determine the nature and severity of a wildfire event. Very low moisture and windy conditions can help to exacerbate combustion in forested or brush areas (**Figure 3-14**) and turn a small brush fire into a major regional fire event in a very short period. Wildfires can be very devastating for residents and property owners.

A structural fire is an incident where a fire starts within a structure and is largely contained to that structure. Causes of structure fires can be related to electrical shorts, carelessness with ignition sources, poor storage of flammable materials, as well as arson. These types of fires can be deadly if no warning or prevention measures are present. The most dangerous aspect of structural fires is the production of toxic gases and fumes that can quickly accumulate in enclosed areas of structures and asphyxiate those who might be in the structure.

Problems associated with structural fires are compounded when high-rise buildings catch fire. High-rise fires hinder the ability of rescue workers to fight the fire, reach impacted building occupants, and evacuate impacted occupants. Rescue efforts also become more complicated when handicapped or disabled persons are involved. Complications associated with high-rise fires typically increase as the height and occupancy levels of the buildings increase. Structural collapse is another concern associated with high-rise fires. Structural collapse often results in persons becoming trapped and severely injured. However, it is important to note that the concern associated with structural collapse, is not limited to high-rise buildings; the collapse of smaller residential buildings can also lead to severe injury and death.

Typically, a fire will incinerate all structures and objects in its path. A resident may lose all possessions and structures to a wildfire event. Additionally, combating a wildfire or a structure fire may be extremely dangerous. If weather conditions change suddenly, the wildfire may change course and overtake firefighters, causing severe injury or death. Fires can travel at speeds greater than 45 mph. Therefore, these hazard events can pose a serious threat to county residents and response agencies.

#### Fire: Recent Occurrences

Within the NCDC, there are no reports of wildfires occurring within Porter County between January 1950 and March 2019. Within the same time parameter, there were





*Figure 3-15 June 2018 Valparaiso Fire (NWI Times)*

only two reported events within the State of Indiana, both within Pike County in 2006. During each of these events over 350 acres were burned.

The NCDC does not report structure fires; therefore, local sources were utilized to provide historical information. The NWI Times provided details regarding a February 26, 2019 fire at the ArcelorMittal facility in Burns Harbor. The fire resulted when iron entered the slag pit causing minor eruptions and flames.

In June of 2018, Valparaiso firefighters were called to a structure fire in close proximity to several other structures, both residential and commercial. The structure was being used to

repair vintage automobiles. No injuries were reported but the building and contents were a total loss. **Figure 3-15** shows the firefighters actively working to put out the blaze.

Earlier that year in March 2019 the 24/7 Repair Services structure in Valparaiso reported a fire which resulted in approximately \$10.0M in damages. The structure housed a diesel repair company which led to soils contaminated with diesel fuel, battery acid, and oil. Contractors needed to be hired to ensure the clean-up was completed properly, adding to the overall expense associated with the event.

Due to the expansive acreage of cropland and woods within Porter County, and the potential for urban areas to be at risk due to abandoned homes, blighted areas, or industrial activities, the Planning Committee determined the probability to be “Highly Likely” throughout the County. **Table 3-7** identifies the CPRI rankings for fire in Porter County.

**Table 3-7 CPRI for Fire**

|                        | PROBABILITY   | MAGNITUDE / SEVERITY | WARNING TIME | DURATION | CPRI   |
|------------------------|---------------|----------------------|--------------|----------|--------|
| Porter County          | Highly Likely | Limited              | < 6 Hours    | < 1 Day  | Severe |
| Town of Beverly Shores | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Burns Harbor   | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Chesterton     | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Dune Acres     | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Hebron         | Highly Likely | Limited              | < 6 Hours    | < 1 Day  | Severe |
| Town of Kouts          | Highly Likely | Limited              | < 6 Hours    | < 1 Day  | Severe |
| Town of Ogden Dunes    | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| City of Portage        | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Porter         | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| Town of Town of Pines  | Highly Likely | Significant          | < 6 Hours    | < 1 Day  | Severe |
| City of Valparaiso     | Highly Likely | Limited              | < 6 Hours    | < 1 Day  | Severe |

Information provided in **Table 3-8** highlights the number of fire runs for the three largest departments for the time period January 2016 through December 2018. Based on this information, annual damages to structures, contents, and vehicles may be significant for each municipality on an annual basis. Social losses, such as being unable to work following a residential structure fire or losses associated with a business fire should also be considered as an impact.

**Table 3-8 2016 - 2018 Fire Runs**

|                                | 2016 | 2017 | 2018 |
|--------------------------------|------|------|------|
| Town of Chesterton             | 34   | 31   | 42   |
| Morgan Twp Vol Fire Department | 30   | 26   | 12   |
| South Haven Fire Department    | 33   | 39   | 29   |
| City of Valparaiso             | 96   | 87   | 104  |

#### Fire: Assessing Vulnerability

A fire typically affects a large regional area with potential for physical, economic, and/or social losses. In the more urban areas of Porter County, such as Valparaiso, structures are more densely located or have multiple stories increasing the risk of the spread of fire. Typically, however, one of the main functions of fire response is to prevent the fire from spreading to neighboring structures. This type of action works to reduce the magnitude and severity to “Limited” to “Significant” throughout the county and municipalities.

In addition to those areas, much of the southern reaches of Porter County are rural and agricultural in land use, which may be more susceptible to brush or crop fires, especially in times of drought. Furthermore, the forested areas in the riparian zones along waterways may be at an increased risk for woodland fires. As development has occurred throughout Porter County since the last planning effort, vulnerabilities to this hazard have not shifted in location, merely shifted in the land use affected. For example, as Portage has expanded, the land use has changed from agricultural



to residential or urban. This has not necessarily made this area more or less vulnerable to a fire but changed the category from crop fire to residential fire.

Direct and indirect effects of a such an event within Porter County may include:

**Direct Effects:**

- Loss of structures
- Loss of production crop
- Loss of natural resources

**Indirect Effects:**

- Loss of revenue as businesses may be closed
- Increased emergency response times based on safety of roads
- Loss of income if dependent on crop production

*Estimating Potential Losses*

Given the nature and complexity of a potentially large hazard such as a wildfire or a structure fire, it is difficult to quantify potential losses to property and infrastructure. As a result, all critical and non-critical structures and infrastructure may be at some degree of risk.

Monetary damages associated with the direct effects of the fires are difficult to estimate, other than utilizing historic information as provided. Indirect effects would cause increased efforts associated with emergency response services as wildfires are difficult to contain and may accelerate very quickly. Further, multi-level business or residential structures place increased risks to those who work or live within those structures or nearby structures.

*Future Considerations*

As populations increase and communities continue to grow in size, the need to respond to fire will remain an important municipal effort. As new construction or re-development occurs, especially new or existing critical infrastructure, it is important to ensure that these new structures are equipped to deal with the potential risks associated with this hazard. Those may include increased risk for wooden or flammable outer structures and potential lengthy power outages.

In addition, increased populations require increased housing. Many urban communities develop large multi-family residential structures, or apartment complexes, where structures are not only in close proximity to each other, but also contain a large number of citizens. As communities age, some structures may become abandoned, significantly increasing the risk of fire due to potential vagrant populations and lack of maintenance. These areas should be considered at-risk and potentially demolished to avoid such risk and potential hazard.

Fires can also result in substantial indirect costs. Increased emergency response times, loss of work or the inability to get to work, as well as business interruption,

are possible indirect effects of a fire and how it may affect those businesses directly related to cropland or natural resource areas.

#### Fire: Relationship to Other Hazards

Fires may certainly result in a hazardous materials incident if storage structures are within the path of the burn. Material storage containers farther away from the burn path may become damaged by high winds and embers resulting in a spill or release of materials.

Fires may result from lightning associated with a thunderstorm. Typical wind speeds during a thunderstorm may also exacerbate the impacts from any ignitions from the lightning.



### 3.3.6 Flood



#### Flood: Overview

Floods are the most common and widespread of all the natural disasters. Most communities in the United States have experienced some kind of flooding, after spring rains, heavy thunderstorms, or winter snow melts. A flood, as defined by the NFIP, is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waters and unusual and rapid accumulation or runoff of surface waters from any sources, or a mudflow. Floods can be slow or fast rising but generally develop over a period of days.

Flooding and associated flood damages is most likely to occur during the spring because of heavy rains combined with melting snow. However, provided the right saturated conditions, intense rainfall of short duration during summer rainstorms are capable of producing damaging flash flood conditions.

The traditional benchmark for riverine or coastal flooding is a 1% Annual Exceedance Probability (AEP), or the 100-year flood. This is a benchmark used by FEMA to establish a standard of flood protection in communities throughout the country. The 1% AEP is referred to as the “regulatory” or “base” flood. Another term commonly used, the “100-year flood”, can be misleading. It does not mean that only one flood of that size will occur every 100 years, but rather there is a 1% chance of a flood of that intensity and elevation happening in any given year. In other words, the regulatory flood elevation has a 1% chance of being equaled, or exceeded, in any given year and it could occur more than once in a relatively short time period.

#### Flood: Recent Occurrences

The NCDC indicates that between January 2011 and March 2019, there were eight floods and ten flash flood events reported. In total, these events resulted in \$13.98M in property damages and no injuries or deaths reported. According to NCDC, the event which resulted in the highest amount of property damage is the August 22, 2014 flash flood in the South Haven area. The narrative includes information related to 18 evacuations by boat as neighborhoods had four feet of standing water from several hours of thunderstorms. Basements across the area were flooded and three homes were declared completely damaged and uninhabitable. The Duck Creek subdivision was cut off as the entry was impassable. Portions of CR 250W between SR 130 and US 30 were washed away and several other intersections were completely underwater.

Another especially damaging event was the February 2018 event in the Clanricarde area. Approximately 190 homes were damaged along with numerous roads, culverts, and bridges. Portage rainfall total was approximately 4.5 inches, similar to Valparaiso



*Figure 3-16 Stranded Car in Flood Water (Porter Co Sheriff Dept)*

with 4.2 inches. **Figure 3-16)** shows a stranded vehicle being retrieved from floodwaters. Several vehicles were stranded in high water or drivers needed to be rescued as vehicles became inoperable or were washed off the road.

Appendix 6 provides the NCDC information regarding flood events that have resulted in injuries, deaths, or monetary damages to property and/or crops.

Stream gages are utilized to monitor surface water elevations and/or discharges at key locations and time periods. Some such gages are further equipped with NWS' Advanced Hydrologic Prediction Service (AHPS) capabilities. These gages have the potential to provide valuable information regarding historical high and low water stages, hydrographs representing current and forecasted stages, and a map of the surrounding areas likely to be flooded. Within Porter County, there are three active USGS stream gage equipped with AHPS capabilities.

Any property having received two insurance claim payments for flood damages totaling at least \$1,000, paid by the NFIP within any 10-year period since 1978 is defined as a repetitive loss property. These properties are important to the NFIP because they account for approximately 1/3 of the country's flood insurance payments. According to FEMA Region V, there are a total of ten single-family repetitive loss properties in Porter County; six in the unincorporated areas, two in Chesterton and two in Valparaiso. Additionally, there is one non-residential structure in Chesterton, one non-residential structure in Portage, and one non-residential structure in Valparaiso, all identified as repetitive loss properties.

There have been a small number of claims made for damages associated with flooding in Porter County. Within the City of Valparaiso, there have been 54 paid losses resulting in just over \$325.0K in payments. Further, within the unincorporated areas of the county, there were 67 payments totaling approximately \$250.0K. **Table 3-9** identifies the number of claims per community as well as payments made, as provided by IDNR. Information regarding the Town of Kouts was not provided independently and is included within the information for the unincorporated county.



**Table 3-9 Repetitive Loss Properties, Claims, and Payments**

| COMMUNITY              | # OF<br>REPETITIVE<br>LOSS<br>PROPERTIES | CLAIMS<br>SINCE 1978 | \$\$ PAID     |
|------------------------|------------------------------------------|----------------------|---------------|
| Porter County          | 6 single-family<br>2 non-residential     | 67                   | \$143.6K      |
| Town of Beverly Shores |                                          | 12                   | \$0           |
| Town of Burns Harbor   |                                          | 0                    | \$221.1K      |
| Town of Chesterton     | 2 single-family<br>1 non-residential     | 12                   | \$0           |
| Town of Dune Acres     |                                          | 0                    | \$85.7K       |
| Town of Hebron         |                                          | 7                    | \$0           |
| Town of Kouts          |                                          |                      |               |
| Town of Ogden Dunes    |                                          | 0                    | \$0           |
| City of Portage        | 1 non-residential                        | 0                    | \$249.3K      |
| Town of Porter         |                                          | 10                   | \$14.2K       |
| Town of Town of Pines  |                                          | 0                    | \$0           |
| City of Valparaiso     | 2 single-family<br>1 non-residential     | 54                   | \$325.7K      |
| <b>TOTAL</b>           | <b>15</b>                                | <b>183</b>           | <b>\$2.3M</b> |

(IDNR, 2019)

(FEMA Region V, 2019)

Mandatory flood insurance purchase requirements apply to structures in 1% annual chance of flooding delineated areas. Total flood insurance premiums for Porter County and the NFIP communities is approximately \$153.8K. Total flood insurance coverage for Porter County and the NFIP communities is just over \$46.0M. **Table 3-10** further indicates the premiums and coverage totals for individual communities. Information regarding the Town of Kouts was not provided independently and is included within the information for the unincorporated county.

**Table 3-10 Insurance Premiums and Coverage**

| COMMUNITY              | FLOOD<br>INSURANCE<br>PREMIUMS | FLOOD<br>INSURANCE<br>COVERAGE |
|------------------------|--------------------------------|--------------------------------|
| Porter County          | \$69.9K                        | \$32.1M                        |
| Town of Beverly Shores | \$170                          | \$42.0K                        |
| Town of Burns Harbor   | \$849                          | \$490.0K                       |
| Town of Chesterton     | \$17.8K                        | \$6.3M                         |
| Town of Dune Acres     | \$415                          | \$350.0K                       |
| Town of Hebron         | \$2.3K                         | \$1.1M                         |
| Town of Kouts          |                                |                                |
| Town of Ogden Dunes    | \$3.2K                         | \$60.0K                        |
| City of Portage        | \$26.1K                        | \$7.2M                         |
| Town of Porter         | \$6.0K                         | \$4.0M                         |
| Town of Town of Pines  | \$2.2K                         | \$60.0K                        |
| City of Valparaiso     | \$24.8K                        | \$325.7K                       |
| <b>TOTAL</b>           | <b>\$153.8K</b>                | <b>\$2.3M</b>                  |

(IDNR, 2019)

As determined by the Committee, the probability of a flood occurring throughout Porter County ranges from “Unlikely” in Beverly Shores, Dune Acres, Ogden Dunes, and Town of Pines, to “Possible” in Burns Harbor, Chesterton, Portage, and Porter; “Likely” in Hebron, Kouts, and Valparaiso; and “Highly Likely” in the unincorporated county. This is largely based on the presence or absence of rivers or water systems in or near the communities. Impacts from such an event are anticipated to range from “Negligible” to “Significant”. The Committee also determined that the warning time would be greater than 24 hours based on forecasting methods, local knowledge of stream activities, and the warning provided by gages upstream. Finally, the duration of such an event is anticipated to last greater than one week for some areas, and less than one day for others. A summary is shown in **Table 3-11**.



**Table 3-11 CPRI for Flood**

|                        | PROBABILITY   | MAGNITUDE / SEVERITY | WARNING TIME | DURATION | CPRI     |
|------------------------|---------------|----------------------|--------------|----------|----------|
| Porter County          | Highly Likely | Significant          | > 24 Hours   | >1 Week  | Severe   |
| Town of Beverly Shores | Unlikely      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Burns Harbor   | Possible      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Chesterton     | Possible      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Dune Acres     | Unlikely      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Hebron         | Likely        | Limited              | > 24 Hours   | >1 Week  | Elevated |
| Town of Kouts          | Likely        | Limited              | > 24 Hours   | >1 Week  | Elevated |
| Town of Ogden Dunes    | Unlikely      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| City of Portage        | Possible      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Porter         | Possible      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| Town of Town of Pines  | Unlikely      | Negligible           | > 24 Hours   | < 1 Day  | Low      |
| City of Valparaiso     | Likely        | Negligible           | > 24 Hours   | < 1 Day  | Low      |

As mentioned within this section, there is a 1% chance each year that the regulatory flood elevation will be equaled or exceeded, and these types of events may occur more than once throughout each year. Further, based on information provided by the NCDRC, and previous experiences, the Committee determined that flooding is “Unlikely” to “Highly Likely” throughout the county.

#### Flood: Assessing Vulnerability

Flood events may affect large portions of Porter County at one time as river systems and areas with poor drainage cover much of the county and several communities. The members of the Planning Committee discussed several areas that experience routine flooding such as:

- Riverine flooding along the Kankakee and Little Calumet
- South Haven area
- Intersection of US6 and SR149
- Intersection of US12 and Broadway (Beverly Shores)
- CR 700 north of Willow Street (Portage)
- Stone Avenue (Portage)
- Northern areas of the city (Valparaiso)
- Intersection of Sturdy Rd and Martinal Rd (Valparaiso)
- Lake Michigan shorelines of Beverly Shores, Dune Acres, Ogden Dunes, and Portage

With regard to shoreline flooding and the resulting shoreline erosion, several areas in Porter County are at a higher risk than others. Exhibit 2 shows the Lake Michigan shoreline of Ogden Dunes and Portage. Several structures and a main thoroughfare are at risk due to erosion in both Beverly Shores and Ogden Dunes along with

additional structures, rail lines, and simply ground within Portage. The leaders of all of these communities are actively working to develop solutions to protect the shoreline while maintaining the aesthetics and unique richness of the area. The communities of Chesterton, Dune Acres, and Porter also worry about the impacts of shoreline erosion due to Lake Michigan flooding, although they may have slightly fewer direct impacts.

Within Porter County, direct and indirect effects of a flood event may include:

**Direct Effects:**

- Structural and content damages and/or loss of revenue for properties affected by increased water
- Increased costs associated with additional response personnel, evacuations, and sheltering needs

**Indirect Effects:**

- Increased response times for emergency personnel if roads are impassable
- Increased costs associated with personnel to carry out evacuations in needed areas
- Increased risk of explosions and other hazards associated with floating propane tanks or other debris
- Losses associated with missed work or school due to closures or recovery activities
- Cancellations of special events in impacted areas or water related activities that become too dangerous due to high water

*Estimating Potential Losses*

Critical and non-critical structures located in regulated floodplains, poorly drained areas, or low-lying areas are most at risk for damages associated with flooding. For this planning effort, a GIS Desktop Analysis methodology was utilized to estimate flood damages.

For the GIS Desktop Analysis method, an analysis was completed utilizing the effective Digital FIRMs (DFIRMs) overlaid upon a Modified Building Inventory developed with information provided by Porter County. Structures located within each flood zone were tallied using GIS analysis techniques.

In the assessment, any structure listed as less than 400 ft<sup>2</sup> in area or classified in the Assessor's database as a non-habitable structure was assumed to be an outbuilding. It was assumed that a building was located on a parcel if the value listed in the "Assessed Value (Improvements)" showed a value greater than zero dollars. Parcels that intersected any portion of the FEMA flood zones were considered to be flood prone, and subsequently, further analyzed separately from parcels without structures. were excluded from the analysis. Structure values were calculated using:



Residential = Assessed Value x 0.5  
 Commercial = Assessed Value x 1.0  
 Industrial = Assessed Value x 1.5  
 Agricultural = Assessed Value x 1.0  
 Education = Assessed Value x 1.0  
 Government = Assessed Value x 1.0  
 Religious = Assessed Value x 1.0

In order to estimate anticipated damages associated with each flood zone in Porter County and NFIP communities, it was estimated that 25% of structures in the flood zones would be destroyed, 35% of structures would be 50% damaged, and 40% of structures would be 25% damaged. **Table 3-12** identifies the estimated losses associated with structures in the floodway, the 1% AEP (100-year floodplain), and the 0.2% AEP (500-year floodplain) areas by community within Porter County.

**Table 3-12 Manual GIS Analysis Utilizing DFIRMs, IDNR Best Available, and Porter County Modified Building Inventory**

|                        | FEMA DFIRM |                |            |                |            |                | IDNR BEST AVAILABLE       |                |                        |                |
|------------------------|------------|----------------|------------|----------------|------------|----------------|---------------------------|----------------|------------------------|----------------|
|                        | Floodway   |                | 1%         |                | 0.02%      |                | Unnumbered<br>(Approx FW) |                | Unnumbered<br>(Zone A) |                |
|                        | #          | \$             | #          | \$             | #          | \$             | #                         | \$             | #                      | \$             |
| Porter County          | 0          | \$0            | 98         | \$14.2M        | 3          | \$0.5M         | 108                       | \$15.8M        | 163                    | \$21.9M        |
| Town of Beverly Shores | 0          | \$0            | 5          | \$1.0M         | 7          | \$1.0M         | 1                         | \$0.1M         | 2                      | \$0.2M         |
| Town of Burns Harbor   | 4          | \$0.6M         | 1          | \$0.1M         | 0          | \$0            | 0                         | \$0            | 0                      | \$0            |
| Town of Chesterton     | 8          | \$1.2M         | 9          | \$1.6M         | 191        | \$24.6M        | 3                         | \$0.5M         | 2                      | \$0.2M         |
| Town of Dune Acres     | 0          | \$0            | 0          | \$0            | 0          | \$0            | 0                         | \$0            | 0                      | \$0            |
| Town of Hebron         | 0          | \$0            | 0          | \$0            | 0          | \$0            | 3                         | \$0.6M         | 0                      | \$0            |
| Town of Kouts          | 0          | \$0            | 0          | \$0            | 0          | \$0            | 23                        | \$3.2M         | 14                     | \$2.5M         |
| Town of Ogden Dunes    | 0          | \$0            | 29         | \$3.5M         | 0          | \$0            | 0                         | \$0            | 0                      | \$0            |
| City of Portage        | 36         | \$6.5M         | 38         | \$6.3M         | 8          | \$1.0M         | 0                         | \$0            | 0                      | \$0            |
| Town of Porter         | 7          | \$1.0M         | 7          | \$1.2M         | 355        | \$43.7M        | 0                         | \$0            | 0                      | \$0            |
| Town of Town of Pines  | 0          | \$0            | 0          | \$0            | 0          | \$0            | 0                         | \$0            | 1                      | \$0.1M         |
| City of Valparaiso     | 4          | \$0.9M         | 8          | \$1.5M         | 20         | \$3.9M         | 33                        | \$6.4M         | 38                     | \$4.8M         |
| <b>Totals</b>          | <b>59</b>  | <b>\$10.2M</b> | <b>166</b> | <b>\$29.4M</b> | <b>584</b> | <b>\$74.7M</b> | <b>171</b>                | <b>\$26.6M</b> | <b>220</b>             | <b>\$29.7M</b> |

*Structures and damages within each zone are not inclusive*

Utilizing the same GIS information and process, critical infrastructure within each of the Special Flood Hazard Areas (SFHA) in Porter County was assessed. These buildings are included in the overall number of structures and damage estimate information provided in Table 3-12.

**Table 3-13 Critical Infrastructure by NFIP Community in the SFHA**

| NFIP                   | FLOODWAY                | 1%                                         | 0.2% |
|------------------------|-------------------------|--------------------------------------------|------|
| Porter County          |                         | Burns Waterway Harbor<br>South Haven Sewer |      |
| Town of Beverly Shores |                         |                                            |      |
| Town of Burns Harbor   | Linde Dam               |                                            |      |
| Town of Chesterton     | AT&T (Tier II)          |                                            |      |
| Town of Dune Acres     |                         |                                            |      |
| Town of Hebron         |                         |                                            |      |
| Town of Kouts          |                         |                                            |      |
| Town of Ogden Dunes    |                         |                                            |      |
| City of Portage        | Lake of the Woods Dam B |                                            |      |
| Town of Porter         |                         |                                            |      |
| Town of Town of Pines  |                         |                                            |      |
| City of Valparaiso     |                         |                                            |      |

Further using the IDNR Best Available Data for the Unnumbered Approximate floodway and Zone A, critical infrastructures were evaluated. Structures located within those zones are listed in **Table 3-14**.

**Table 3-14 Critical Infrastructure by NFIP Community in the IDNR Best Available Data Zones**

| NFIP                   | IDNR BEST AVAILABLE                                                                                                                                                                  |                                 |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
|                        | Unnumbered (Approx. Floodway)                                                                                                                                                        | Unnumbered (Zone A)             |
| Porter County          | Roy Nicholson Dam<br>Dog Lake Control Structure<br>Lake Eliza Control Structure<br>Lake of the Woods dam<br>Old Longs Mill Dam<br>Rice Lake Dam<br>Indiana Dunes State Park Pavilion | Porter County Municipal Airport |
| Town of Beverly Shores |                                                                                                                                                                                      | Old North Church                |
| Town of Burns Harbor   |                                                                                                                                                                                      |                                 |
| Town of Chesterton     |                                                                                                                                                                                      |                                 |
| Town of Dune Acres     |                                                                                                                                                                                      |                                 |
| Town of Hebron         |                                                                                                                                                                                      |                                 |
| Town of Kouts          |                                                                                                                                                                                      | Merit Steel Company             |
| Town of Ogden Dunes    |                                                                                                                                                                                      |                                 |
| City of Portage        |                                                                                                                                                                                      |                                 |
| Town of Porter         |                                                                                                                                                                                      |                                 |
| Town of Town of Pines  |                                                                                                                                                                                      |                                 |
| City of Valparaiso     |                                                                                                                                                                                      |                                 |



Utilizing the information in Table 3-12 regarding the number of structures within each SFHA, it is also important to note the number of flood insurance policies within each area in Porter County. **Table 3-15** provides the comparison between the number of structures in the SFHA and the number of flood insurance policies. It is also important to note that flood insurance is voluntary unless the property owner carries a federally subsidized mortgage; insurance coverage may be discontinued when the mortgage is completed.

**Table 3-15 Number of Structures in the SFHA and Number of Flood Insurance Policies**

| NFIP COMMUNITY         | # STRUCTURES IN SFHA | # POLICIES |
|------------------------|----------------------|------------|
| Porter County          | 101                  | 86         |
| Town of Beverly Shores | 12                   | 1          |
| Town of Burns Harbor   | 5                    | 2          |
| Town of Chesterton     | 208                  | 22         |
| Town of Dune Acres     | 0                    | 1          |
| Town of Hebron         | 0                    | 4          |
| Town of Kouts          | 0                    | 0          |
| Town of Ogden Dunes    | 29                   | 7          |
| City of Portage        | 82                   | 32         |
| Town of Porter         | 369                  | 13         |
| Town of Town of Pines  | 0                    | 1          |
| City of Valparaiso     | 32                   | 22         |
| <b>Total</b>           | <b>838</b>           | <b>250</b> |

(IDNR, 2019)

#### *Future Considerations*

As the municipalities within Porter County continue to grow in population, it can be anticipated that the number of critical and non-critical infrastructure will also increase accordingly. Within Porter County, it is strongly encouraged that new schools, medical facilities, community centers, municipal buildings, and other critical infrastructure are located outside the 0.2% AEP (500-year) floodplain and/or are protected to that level along with a flood-free access to reduce the risk of damages caused by flooding and to ensure that these critical infrastructures will be able to continue functioning during major flood events. Flooding due to poor drainage, low-lying land, or flash flooding is also an important consideration. It will be important for recognition of potential flood impacts to residents and businesses in these areas to be coupled with proper planning for future development and redevelopment of the flood zones.

It is also important to ensure that owners and occupants of residences and businesses within the known hazard areas, such as delineated or approximated flood zones and fluvial erosion hazard areas, are well informed about the potential impacts from

flooding incidents as well as proper methods to protect themselves and their property.

Increased precipitation, as predicted in the Indiana Climate Change Assessment, is anticipated to come in the form of heavier, shorter events which lead to the increased potential for flooding and stress on infrastructure such as sanitary and storm sewers. Heavy precipitation events are anticipated to occur more frequently as temperatures rise, replacing rain when previously there was snow.

Despite these efforts, the overall vulnerability and monetary value of damages is expected to increase in the area unless additional measures, such as those discussed later in Chapter 4 of this report, are implemented.

Indirect effects of flooding may include increased emergency response times due to flooded or redirected streets (**Figure 3-17**), the danger of dislodged and floating propane tanks causing explosions, and the need for additional personnel to carry out the necessary evacuations. Additional effects may include sheltering needs for those evacuated, and the loss of income or revenue related to business interruptions. As many communities within Porter County are closely tied to the river systems, special events occurring near to or on these rivers and waterways may be cancelled or postponed during periods of flooding or high-water levels.

#### Flood: Relationship to Other Hazards



*Figure 3-17 Fire Engine in Flood Waters*

While flooding creates social, physical, and economic losses, it may also cause other hazards to occur. For example, flooding may increase the potential for a hazardous materials incident to occur. Above ground storage facilities may be toppled or become loosened and actually migrate from the original location. In less severe situations, the materials commonly stored in homes and garages such as oils, cleaners, and degreasers, may be mobilized by flood waters. Should access roads to hazardous materials handlers become flooded, or if bridges are damaged by flood waters, response times to more significant incidents may be increased, potentially increasing the damages associated with the release.

Increased volumes of water during a flood event may also lead to a dam failure. As the water levels rise in areas protected by dams, at some point, these structures will over-top or will breach leading to even more water released. These two hazards, flood and dam failure, when combined, may certainly result in catastrophic damages.



In a similar fashion, a snow storm or ice storm can also lead to flooding on either a localized or regional scale. When a large amount of snow or ice accumulates, the potential for a flood is increased. As the snow or ice melts, and the ground becomes saturated or remains frozen, downstream flooding may occur. Ice jams near bridges and culverts may also result in flooding of localized areas and potentially damage the bridge or culvert itself.

Flooding in known hazard areas may also be caused by dams that experience structural damages or failures not related to increased volumes or velocities of water. These “sunny day failures”, while not typical, may occur wherever these structures exist.

### 3.3.7 Hailstorms, Thunderstorms, and Windstorms



#### Hailstorms, Thunderstorms, and Windstorms: Overview

Hail occurs when frozen water droplets form inside a thunderstorm cloud, and then grow into ice formations held aloft by powerful thunderstorm updrafts, and when the weight of the ice formations becomes too heavy, they fall to the ground as hail. Hail size ranges from smaller than a pea to as large as a softball, and can be very destructive to buildings, vehicles (**Figure 3-18**), and crops. Even small hail can cause significant damage to young and tender plants. Residents should take cover immediately in a hailstorm, and protect pets and livestock, which are particularly vulnerable to hail, and should be under shelter as well.

Thunderstorms are defined as strong storm systems produced by a cumulonimbus cloud, usually accompanied by thunder, lightning, gusty winds, and heavy rains. All thunderstorms are considered dangerous as lightening is one of the by-products of the initial storm. In the United States, on average, 300 people are injured, and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms. Other associated dangers of thunderstorms included tornados, strong winds, hail, and flash flooding.

Windstorms or high winds can result from thunderstorm inflow and outflow, or downburst winds when the storm cloud collapses, and can result from strong frontal systems, or gradient winds (high- or low-pressure systems). High winds are speeds reaching 50 mph or greater, either sustained or gusting.

#### Hailstorm, Thunderstorm, and Windstorm: Recent Occurrences



*Figure 3-18 Damaging Hail on Vehicles*

In Porter County, the NCDC has recorded 24 hailstorms and 53 thunderstorms/windstorms between January 2011 and March 2019. The largest recorded hailstone was 1.75 inches in diameter and has occurred twice during this planning effort. The average diameter hailstone occurring throughout Porter County is approximately 1.75 inch.

Significant windstorms are characterized by the top wind speeds achieved during the incident, characteristically occur in conjunction with thunderstorms, and have historically occurred year-round with the greatest frequency and damage occurring in May, June, and July. Within Porter County, NCDC reports 40 instances between January 2011 and March 2019 where top wind speeds were greater than 60 mph.



Damages for hailstorms, thunderstorms, and windstorms throughout Porter County, as recorded in NCDC, amount to \$204.50K in property damages. No injuries or deaths have been associated with these events. Many event reports included in the NCDC did not provide descriptive information on the social, physical, and economic losses resulting from individual storms specific to the county. However, numerous reports included information such as snapped trees, power lines, and damages to roofs and accessory building.

According to the Institute for Business and Home Safety, central Indiana can expect to experience damaging hailstorms three to four times over 20 years; the average life of a residential roof. Further, thunderstorms and windstorms are considered a high frequency hazard and may occur numerous times per year.

The Committee determined the probability of a hailstorm, thunderstorm, or windstorm occurring in Porter County is “Highly Likely” and will typically affect broad portions of the county at one time resulting in potentially “Limited” damages. As advancements in technologies such as weather radar systems and broadcast alerts are continually made, the warning time for such incidents may increase. Currently, the Committee feels that the warning time is anticipated to be less than 24 hours as storm systems are typically predicted several days in advance with predictions of the strongest of effects more accurate the day of. The duration of such an event is expected to also last less than six hours.

Indicative of a regional hazard, the probability, magnitude, warning time, and duration of a hailstorm, thunderstorm, or windstorm are expected to be the same throughout the county. These events are highly unpredictable, and the occurrences are distributed through the county. Therefore, the CPRI values reflect the equally distributed risk and associated priority for a hailstorm, thunderstorm, or windstorm. A summary is provided in **Table 3-16**.

**Table 3-16 CPRI for Hailstorm, Thunderstorm, and Windstorm**

|                        | PROBABILITY   | MAGNITUDE<br>/ SEVERITY | WARNING<br>TIME | DURATION  | CPRI     |
|------------------------|---------------|-------------------------|-----------------|-----------|----------|
| Porter County          | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Beverly Shores | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Burns Harbor   | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Chesterton     | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Dune Acres     | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Hebron         | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Kouts          | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Ogden Dunes    | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| City of Portage        | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Porter         | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| Town of Town of Pines  | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |
| City of Valparaiso     | Highly Likely | Limited                 | > 24 Hours      | < 6 Hours | Elevated |

Specific locations and frequency of hailstorms, thunderstorms, and windstorms are difficult to predict as many of these individual events are without significant warning time and may have impacts to very limited areas or may affect broader areas. However, based on NCDC data and personal experiences of the Committee, it was determined that all areas within the county are anticipated to experience a hailstorm, thunderstorm, or windstorm within the calendar year. More likely, these communities will be impacted by several of these hazard events each year.

#### Hailstorm, Thunderstorm, and Windstorm: Assessing Vulnerability

The effects of a hailstorm, thunderstorm, or windstorm may be minimal to extensive in nature and may affect small or broad ranges of land area. Within Porter County, direct and indirect effects from a hailstorm, thunderstorm, or windstorm may include:

##### **Direct Effects:**

- Damages to infrastructure (power lines)
- Damages to individual properties (homes, cars)

##### **Indirect Effects:**

- Downed power lines due to falling tree limbs
- Losses associated with power outages
- Damages sustained from blowing debris

#### *Estimating Potential Losses*



**Figure 3-19 Home Damaged During Windstorm**

Due to the unpredictability of this hazard all critical infrastructure and non-critical structures in Porter 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 critical infrastructure or non-critical structures that would be more or less vulnerable to damages. However, areas where utility lines are above ground and areas where dead or dying trees have not been removed may be at a higher risk of property damages or power outages during hailstorms, thunderstorms, and windstorms. Additionally, mobile homes and accessory buildings such as pole barns and sheds may also be at a higher risk of damages from hailstorms, thunderstorms, and windstorms if not properly anchored to the ground. Damages from falling limbs or uprooted trees such as shown in **Figure 3-19**, are common.



*Future Considerations*

As the populations of the communities in Porter County continue to grow, it can be anticipated that the number of critical and non-critical structures will also increase. In order to reduce the vulnerability for damages resulting from a hailstorm, thunderstorm, or windstorm, measures such as proper anchoring, enforcement of the International Building Codes, and burial of power lines should be completed. While measures can be taken to remove existing structures or prevent future structures from being built in known hazard areas such as floodplains and hazardous materials facility buffers, such measures are not applicable to hailstorms, thunderstorms, and windstorms due to the diffuse nature and regional impacts of this hazard.

Indirect effects resulting from a hailstorm, thunderstorm, or windstorm can include power outages caused by downed tree limbs, damages resulting from prolonged power outages, and damages to structures or property as a result of debris.

Hailstorm, Thunderstorm, and Windstorm: Relationship to Other Hazards

Hailstorms, thunderstorms, and windstorms may be the precursor for other hazards. For example, hazardous materials incidents can be the result of a hailstorm, thunderstorm, or a windstorm. Material storage containers can become damaged by high winds, debris, or even lightning, and can result in a spill or release of materials. With wind speeds greater than 58 mph, tankers and other transportation vehicles carrying hazardous materials are also at risk while on the road. High winds may also cause gaseous substances to travel farther distances at a much faster rate, increasing the evacuation area necessary to protect residents and visitors of Porter County.

Additionally, rainfall typically occurs with a thunderstorm and this additional precipitation may lead to localized flooding or riverine flooding depending on the amount of rain during the event. Debris from a windstorm may also lead to localized flooding if debris is deposited over drains or if obstructions are created by downed limbs, trees, or other storm related debris. High winds may also lead to structural damages to a dam or may cause damages to nearby trees or other structures, leading to indirect damages to the dam.

The risk of social losses also increases during a hailstorm, thunderstorm, or windstorm as many times, these hazards result in downed power lines, utility poles, and trees. Debris such as this may impede traffic patterns and make it difficult for emergency vehicles (Fire, EMS, and Police) to pass through affected areas or people may be directly injured as a result of falling debris.

### 3.3.8 Landslide/Subsidence



#### Landslide/Subsidence: Overview

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors. For example, erosion by rivers, glaciers, or ocean waves can cause rock to fall. Rock and soil slopes may be weakened through saturation by snowmelt or heavy rains, earthquakes can create stresses that make weak slopes fail, and excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or man-made structures that may stress weak slopes to the point of collapse.

Land subsidence, according to the USGS, is “a gradual settling or sudden sinking of the Earth’s surface owing to subsurface movement of earth materials”. Further, there are three processes that attribute to subsidence: compaction of aquifer systems, drainage and subsequent oxidation of organic soils, and dissolution and collapse of susceptible rocks.

#### Landslide/Subsidence: Recent Occurrences

The potential for any of landslides or land subsidence within Porter County was discussed by the Planning Committee. To the knowledge of the Planning Committee, there are no Karst areas, underground mines, or many existing areas where a landslide could occur. To date, there has not been any landslides or subsidence events in Porter County.

The Committee determined the probability of a landslide or subsidence occurring in Porter County is “Unlikely” resulting in potentially “Negligible” damages. Currently, the Committee feels that the warning time is anticipated to be greater than 24 hours (as an event such as this is not anticipated to occur) and the duration is expected to last less than six hours. These events are highly unpredictable and the risk, although very low according to the Committee, is distributed throughout the county. Therefore, the CPRI values reflect the distributed risk and associated priority for a landslide or subsidence event. A summary is provided in **Table 3-17**.



**Table 3-17 CPRI for Landslide/Subsidence**

|                        | PROBABILITY | MAGNITUDE / SEVERITY | WARNING TIME | DURATION  | CPRI |
|------------------------|-------------|----------------------|--------------|-----------|------|
| Porter County          | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Beverly Shores | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Burns Harbor   | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Chesterton     | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Dune Acres     | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Hebron         | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Kouts          | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Ogden Dunes    | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| City of Portage        | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Porter         | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| Town of Town of Pines  | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |
| City of Valparaiso     | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low  |

**Landslide/Subsidence: Assessing Vulnerability**

Porter County, without the presence of Karst geology or underground mines, is at a low risk of land subsidence or sink holes. Fluvial erosion, or erosion and failures along water courses, were considered within the flood discussion. Further, as there is little relief within the majority of the county, landslides are not considered, by the Planning Committee, to be of much concern.

The effects of a landslide or subsidence event may be minimal to extensive in nature and may affect small or broad ranges of land area. Within Porter County, direct and indirect effects may include:

**Direct Effects:**

- Damages to infrastructure (power lines, roads, bridges)
- Damages to individual properties (homes, cars)

**Indirect Effects:**

- Increased response time for emergency vehicles
- Losses associated with affected land (crop loss)
- Potential contamination of groundwater resources

**Estimating Potential Losses**

Due to the unpredictability of this hazard all critical infrastructure and non-critical structures in Porter County are at risk of damage including temporary or permanent loss of function. For landslide and subsidence, it is difficult to isolate specific critical infrastructure or non-critical structures that would be more or less vulnerable to damages. However, areas where karst geology or underground mines have been

identified may be at a higher risk of property damages following these events (**Figure 3-20**). To prepare a basic “what-if” scenario, the Indiana MAP karst geology and underground mines GIS layers were overlaid onto aerial photography and parcel data provided by the County. There are no areas of Karst geology or active underground mines within Porter County.



*Figure 3-20 Home Swallowed by Land Subsidence*

#### *Future Considerations*

As the populations of the communities in Porter County continue to grow, it can be anticipated that the number of critical and non-critical structures will also increase. In order to reduce the vulnerability for damages resulting from a landslide or land subsidence, soils GIS layers should be integrated into the building permit or approval process.

Indirect effects resulting from a landslide or land subsidence event can include power outages caused by downed tree limbs, increased response times for emergency personnel if transportation routes are damaged, and potentially shut down of businesses.

#### Landslide/Subsidence: Relationship to Other Hazards

A landslide or a subsidence may be the precursor for other hazards. Depending on the location of the event, material storage containers can become damaged resulting in a spill or release of materials and potentially contaminating groundwater reserves. Dam failures may occur in much the same fashion if located in the potential hazard areas, or resulting from heavy saturation following a rainstorm, heavy snow, or rapid snow melt.

Similarly, these types of an event may be caused by hail, thunder, or windstorms and their effects on the soils; an earthquake may release the ground enough to set a slide in motion; or a flood may add increased soil saturation or weight to at-risk areas increasing the potential for an event and resulting damages.



### 3.3.9 Tornado



#### Tornado: Overview

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 funnel cloud may reach the ground very quickly – becoming a tornado. If there is debris lifted and blown around by the “funnel cloud”, then it has reached the ground and is a tornado.

A tornado is generated when conditions in a strong cell are produced that exhibit a wall of cool air that overrides a layer of warm air. The underlying layer of warm air rapidly rises, while the layer of cool air drops – sparking the swirling action. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally April through June in Indiana, although tornadoes can occur at any time of year. Tornadoes tend to occur in the afternoons and evenings; over 80 percent of all tornadoes strike between 3:00 pm and 9:00 pm but can occur at any time of day or night as shown in **Figure 3-21**. Tornadoes occur most frequently in the United States east of the Rocky Mountains. Tornadoes in Indiana generally come from the south through the east.



*Figure 3-21 Funnel Cloud During a Lightning Storm at Night*

While most tornadoes (69%) have winds of less than 100 mph, they can be much stronger. Although violent tornadoes (winds greater than 205 mph) account for only 2% of all tornadoes, they cause 70% of all tornado deaths. In 1931, a tornado in Minnesota lifted an 83-ton rail car with 117 passengers and carried it more than 80 feet. In another instance, a tornado in Oklahoma carried a motel sign 30 miles and dropped it in Arkansas. In 1975, a Mississippi tornado carried a home freezer more than a mile.

#### Tornado: Recent Occurrences

The classification of tornadoes utilizes the Enhanced Fujita Scale of tornado intensity and damages, described in **Table 3-18**. Tornado intensity ranges from low intensity (EF0) tornadoes with effective wind speeds of 65-85 mph to high intensity (EF5+) tornadoes with effective wind speeds of 200+ mph. According to the NCDC, Porter County has not experienced a tornado within this planning effort, or between January 2011 and March 2019.

**Table 3-18 Enhanced Fujita Scale of Tornado Intensity**

| EF-SCALE | WINDS       | CHARACTER OF DAMAGE | RELATIVE FREQUENCY | TYPICAL DAMAGES                                                             |
|----------|-------------|---------------------|--------------------|-----------------------------------------------------------------------------|
| EF0      | 65-85 mph   | Light damage        | 29%                | Shallow rooted trees blown over; damage to roofs, gutters, siding           |
| EF1      | 86-110 mph  | Moderate damage     | 40%                | Mobile homes overturned, roofs stripped, windows broken                     |
| EF2      | 111-135 mph | Considerable damage | 24%                | Large trees snapped, light-object missiles generated, cars lifted           |
| EF3      | 136-165 mph | Severe damage       | 6%                 | Severe damages to large buildings, trains overturned                        |
| EF4      | 166-200 mph | Devastating damage  | 2%                 | Whole houses destroyed, cars thrown                                         |
| EF5      | 200+ mph    | Incredible damage   | <1%                | High-rise buildings with significant damage, strong framed homes blown away |

The Committee estimated the probability of a tornado occurring in Porter County would be “Likely” within all areas. While this may not seem to coincide with the number of tornadoes recorded by NCDC, it is the anticipation of the Planning Committee that this hazard may occur. The magnitude and severity of such an event is anticipated to be “Limited” to “Significant” if a tornado were to strike any of the municipalities. As with many hazardous events, the Committee anticipated a short warning time, less than six hours, and a short duration, also less than six hours. The summary is shown in **Table 3-19**.

**Table 3-19 CPRI for Tornado**

|                        | PROBABILITY | MAGNITUDE / SEVERITY | WARNING TIME | DURATION  | CPRI     |
|------------------------|-------------|----------------------|--------------|-----------|----------|
| Porter County          | Likely      | Limited              | < 6 Hours    | < 6 Hours | Elevated |
| Town of Beverly Shores | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Burns Harbor   | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Chesterton     | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Dune Acres     | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Hebron         | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Kouts          | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Ogden Dunes    | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| City of Portage        | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Porter         | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| Town of Town of Pines  | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |
| City of Valparaiso     | Likely      | Significant          | < 6 Hours    | < 6 Hours | Elevated |

The Indiana State Climate Office estimates that throughout Indiana, there is an average of 20 tornado touchdowns per year. Based on the number of tornado touchdowns previously reported through the NCDC and local weather agencies, the



Committee determined the general probability of a future tornado occurring in Porter County is likely (within the next three five years).

#### Tornado: Assessing Vulnerability

As a path of a tornado is not pre-defined, it is difficult to isolate specific critical infrastructure and non-critical structures, or areas of Porter County that would be more or less vulnerable to a tornado. Direct and indirect effects from a tornado may include:

#### **Direct Effects:**

- Damages to older construction structures, mobile homes, and accessory structures (pole barns, sheds, etc.)
- Damages to above ground utility lines and structures

#### **Indirect Effects:**

- Expenses related to debris clean-up and/or reconstruction
- Loss of revenue for affected businesses
- Loss of work if employers are affected

#### *Estimating Potential Losses*

Due to the unpredictability of this hazard, all critical and non-critical structures within the county are at risk of future damage or loss of function. Estimates of potential physical losses were determined through a hypothetical exercise where an F2 intensity tornado traveled through portions of the county. This is intended to present a “what-if” scenario of a tornado incident and associated damages.

Damage estimates were derived by assuming that 25% of all structures in the path of the tornado would be completely destroyed, 35% would be 50% damaged, and 40% would have only 25% damage. These estimations were also determined utilizing three wind speed zones based on distance from the tornado path. Zone A is nearest the center of the tornado path, while Zone C is the farthest from the path and with a theoretical lower wind speed. **Table 3-20** provides summary data for the hypothetical tornado, which is identified on Exhibit 3.

***Table 3-20 Summary of Hypothetical Tornado Damages***

|               | Zone 1 |         | Zone 2 |         | Zone 3 |         | Total |          |
|---------------|--------|---------|--------|---------|--------|---------|-------|----------|
|               | #      | \$      | #      | \$      | #      | \$      | #     | \$       |
| Valparaiso    | 439    | \$62.1M | 401    | \$58.2M | 344    | \$49.8M | 1,184 | \$170.1M |
| Porter County | 216    | \$34.1M | 190    | \$28.2M | 160    | \$21.6M | 566   | \$83.9M  |

### Future Considerations

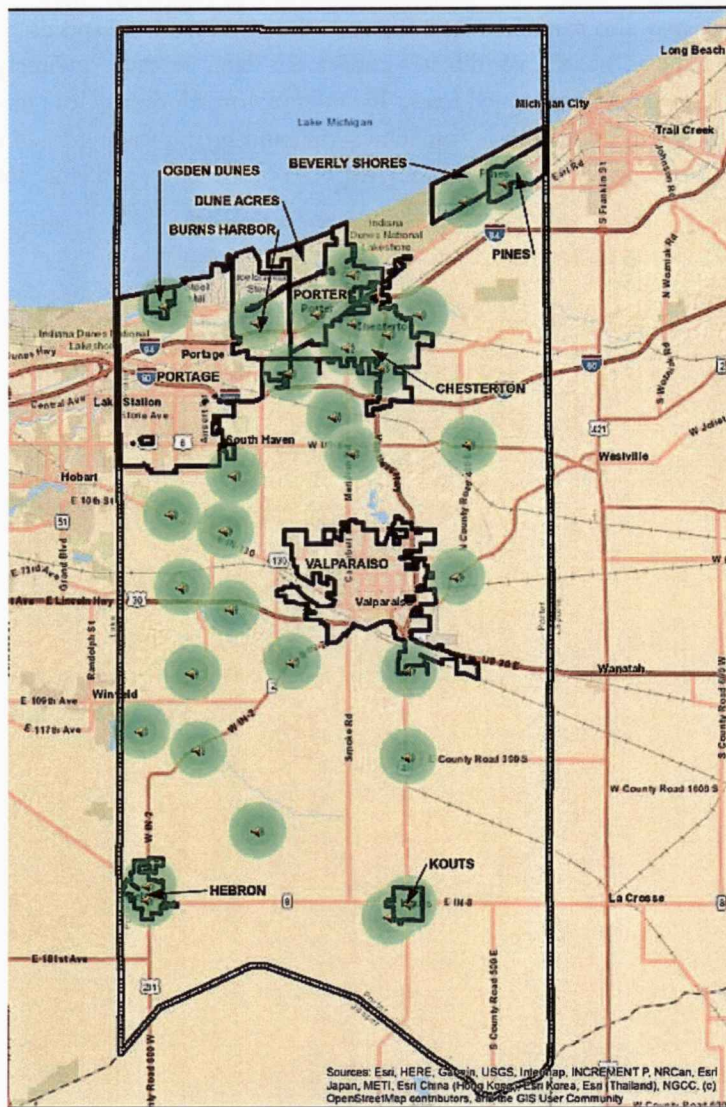


Figure 3-22 Porter County Outdoor Warning Sirens

Within Porter County, there are numerous events each year that draw thousands of guests. Due to this, it is imperative that the EMA place continued importance on the need to maintain, and as necessary, upgrade their outdoor warning siren coverage. Currently, much of the more populous areas of the county are covered by the audible ranges of the existing outdoor warning sirens. The existing outdoor warning siren locations and their estimated audible ranges are provided in **Figure 3-22**.

While it can be anticipated that new construction associated with development may be stronger than older or existing construction, most of Porter County will remain vulnerable in areas left uncovered by outdoor warning sirens. It is impossible to predict the path of a tornado and therefore all current and future development will continue to be at-risk for damages. However, risk to the citizens of Porter County has been lessened through participation in mass notification programs and outdoor warning siren activations

There may also be indirect effects of a tornado event. For example, post-event clean-up may result in high expenses or inability to work for property owners that have experienced damages from either the tornado directly or by debris from high winds. Affected business owners may experience loss of revenue if unable to

continue operations following the event. Similarly, if a business is affected and unable to operate, employees may experience a loss of wages during the period of recovery.

### Tornado: Relationship to Other Hazards

Tornadoes may result in a hazardous materials incident. Material storage containers can become damaged by high winds and debris can result in a spill or release of materials. As wind speeds increase, the potential for damages to above ground



storage containers also increases. Tankers and other transportation vehicles carrying hazardous materials are also at an increased risk while on the road or rail.

Tornadoes may also result in a dam failure as the increased wind speeds, and debris caused by the tornado, may directly impact the dam, or cause indirect damages through large debris or downed trees. In addition, tornadoes may lead to structural fires as the destruction path is sometimes long and broad, leading to an increased number of potentially damaged homes, exposed power lines, and large amounts of debris.

### 3.3.10 Winter Storm & Ice



#### Winter Storm & Ice: Overview

A winter storm can range from moderate snow over a few hours to blizzard conditions with high winds, ice storms, freezing rain or sleet, heavy snowfall with blinding wind-driven snow, and extremely cold temperatures that can last for several days. Some winter storms may be large enough to affect several states while others may affect only a single community. All winter storms are accompanied by cold temperatures and blowing snow, which can severely reduce visibility. A winter storm is one that drops four or more inches of snow during a 12-hour period, or six or more inches during a 24-hour span. An ice storm occurs when freezing rain falls from clouds and freezes immediately on impact. All winter storms make driving and walking extremely hazardous. The aftermath of a winter storm can affect a community or region for days, weeks, and even months.



*Figure 3-23 Ice Covered Power Lines*

Storm effects such as extreme cold, flooding, and snow and ice accumulation (**Figure 3-23**) can cause hazardous conditions and hidden problems for people in the affected area. People can become stranded on the road or trapped at home, without utilities or other services, including food, water, and fuel supplies. The conditions may overwhelm the capabilities of a local jurisdiction. Winter storms are considered deceptive killers as they may indirectly cause transportation accidents, and injury and death resulting from exhaustion/overexertion, hypothermia and frostbite from wind chill, and

asphyxiation; and house fires occur more frequently in the winter due to lack of proper safety precautions.

Wind chill is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined. On November 1, 2001, the NWS implemented a replacement Wind Chill Temperature (WCT) index for the 2001/2002 winter season. The reason for the change was to improve upon the current WCT Index, which was based on the 1945 Siple and Passel Index.

A winter storm watch indicates that severe winter weather may affect your area. A winter storm warning indicates that severe winter weather conditions are definitely on the way. A blizzard warning means that large amounts of falling or blowing snow and sustained winds of at least 35 mph are expected for several hours. Winter storms



are common in Porter County. Such conditions can result in substantial personal and property damage, even death.

#### Winter Storm & Ice: Recent Occurrences

Since January 2011, the NCDC has recorded three blizzards, one ice storm, six heavy snow, seven lake-effect snow, three winter weather events, and three winter storms. NCDC reports did not include injuries, deaths, or monetary damages associated with any of the events. Narrative descriptions indicated poor travel conditions, power outages and debris associated with similar events.



*Figure 3-24 Blizzard of 2011, I-94 in Portage (Jon L. Hendricks)*

The February 24, 2016 blizzard event included heavy snowfalls with wind gusts making visibility conditions at zero for much of the area. Drifting and blowing snow resulted in the closure of ramps to I65, with cars and drivers stuck on the ramps and in the snow. A local state of emergency was declared as accumulations totaled between 13 and 15 inches in the county.

In February of 2011 a system moved through the region resulting in blizzard conditions across much of the state. According to NCDC, “Hundreds of motorists and their vehicles became stranded during the evening hours as conditions deteriorated, and snow quickly accumulated. Many communities began assisting

stranded motorists using plow trucks and many police officers began riding with plow truck drivers to respond to emergency calls because their cars were getting stuck in the snow”. Snow accumulations were reported as 19.5 inches near Portage, 18.9 inches near Hebron, and 13.6 inches near Valparaiso. **Figure 3-24** shows the nearly empty Interstate 94 in Portage during the 2011 blizzard.

The probability, magnitude, warning times, and duration of a snow storm or ice storm causing disruption to residents and businesses in Porter County, as determined by the Planning Committee, is expected to be consistent throughout the County and communities. It is “Highly Likely” that this type of hazard will occur in this area and will typically affect the entire county, and possibly several surrounding counties, at one time, resulting in primarily “Negligible” severity. It is anticipated to increase to “Limited” severity due to the difficulty in reaching residents in the more isolated areas of the unincorporated county as well as the potential damages associated with the agricultural land uses. The warning time for severe temperatures or several inches of snow associated with a winter storm is usually greater than 24 hours while the duration of the incident is anticipated to last less than one week. A summary is shown in **Table 3-21**.

**Table 3-21 CPRI for Winter Storm and Ice**

|                        | PROBABILITY   | MAGNITUDE / SEVERITY | WARNING TIME | DURATION | CPRI     |
|------------------------|---------------|----------------------|--------------|----------|----------|
| Porter County          | Highly Likely | Limited              | > 24 Hours   | < 1 Week | Elevated |
| Town of Beverly Shores | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Burns Harbor   | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Chesterton     | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Dune Acres     | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Hebron         | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Kouts          | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Ogden Dunes    | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| City of Portage        | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Porter         | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| Town of Town of Pines  | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |
| City of Valparaiso     | Highly Likely | Negligible           | > 24 Hours   | < 1 Week | Elevated |

The Planning Committee determined that the probability for a snow storm or ice storm to occur in Porter County or any of the communities within is “Highly Likely” or will occur within the calendar year. Based on historical data and the experience of the Planning Committee, snow storms are common within Porter County and will continue to be an annual occurrence.

#### Winter Storm & Ice: Assessing Vulnerability

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

##### **Direct Effects:**

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

##### **Indirect Effects:**

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

#### Estimating Potential Losses

Given the nature and complexity of a regional hazard such as a snow storm, it is difficult to quantify potential losses to property and infrastructure. As a result, all critical and non-critical structures and infrastructure are at risk from snow storm and ice storm incidents.



For planning purposes, information collected in snow storms impacting other communities around the nation is also useful in assessing the potential social, physical, and economic impact that a winter storm could have on Porter County communities. For example, a March 2003 snow storm in Denver, Colorado dropped approximately 31 inches of snow and caused an estimated \$34M in total damages. In addition, a February 2003 winter storm dropped an estimated 15-20 inches of snow in parts of Ohio. The Federal and Ohio Emergency Management Agencies and U.S. Small Business Administration surveyed damaged areas and issued a preliminary assessment of \$17M in disaster related costs. These costs included snow and debris removal, emergency loss prevention measures, and public utilities repair. The agencies found over 300 homes and businesses either damaged or destroyed in six counties. Snow storms and blizzards also make road travel difficult and dangerous, as in **Figure 3-25**.



*Figure 3-25 Travel Impacted During Snow Storm*

The Denver, Colorado area snowstorms from December 2006 through January 2007 surpassed the expenses and damages of the 2003 winter storms. In snow removal costs alone, it is estimated that over \$19M was spent throughout the area, with approximately \$6.4M of that allocated to clearing Denver International Airport. Additional economic expenses are realized when such a large storm closes local businesses and Denver International Airport for nearly 48 hours.

While the above examples indicate the wide-ranging and large-scale impact that winter storms can have on a community or region, in general, winter storms tend to result in less direct economic impacts than many other natural hazards. According to the Workshop on the Social and Economic Impacts of Weather, which was sponsored by the U.S. Weather Research Program, the American Meteorological Society, the White House Subcommittee on Natural Disaster Relief, and others, winter storms resulted in an average of 47 deaths and more than \$1B in economic losses per year between 1988 and 1995. However, these totals account for only 3% of the total weather-related economic loss and only 9% of fatalities associated with all weather-related hazards over the same period.

#### *Future Considerations*

As populations increase and communities continue to grow, the need to respond to snow storms or ice storms will remain an important municipal effort. As new construction or re-development occurs, especially new or existing critical

infrastructure, it is important to ensure that these new structures are equipped to deal with the potential risks associated with this hazard. Those may include lengthy power outages and potentially impassable transportation routes, making it difficult to obtain supplies or for passage of response vehicles.

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

#### Winter Storm & Ice: Relationship to Other Hazards



*Figure 3-26 Flooding Caused by Snow Melt*

Winter storms and ice storms can lead to flooding as the precipitation melts and enters local receiving water bodies. This increased volume of water on already saturated, or still frozen ground can quickly result in flooding related damages to structures and properties (**Figure 3-26**) as well as within the stream or river channel. The increased flooding may then lead to a dam failure within the same area, further exacerbating the damages.

Hazardous materials incidents may be caused by poor road conditions during winter storms or ice storms. Many hazardous materials are transported by rail or by tanker over highways and interstates. In the more rural areas of Porter County, or where open areas are more susceptible

to drifted roads, the possibility of a traffic related hazardous materials incident may increase. Such incidents may also be caused by a roof collapse as in the previously described example.

Power outages and other infrastructure failures may also occur during a winter storm. Weight from snow and ice accumulations can directly or indirectly cause power lines to fail. During extreme cold temperatures, power outages may prove deadly for certain populations such as the elderly or ill.



## TECHNOLOGICAL HAZARDS

### 3.3.11 Dam/Levee Failure



#### Dam/Levee Failure: Overview

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is a collapse, breach, or other failure resulting in downstream flooding.

A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may impound or detain many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream.

Of the approximately 80,000 dams identified nationwide in the National Inventory of Dams, the majority are privately owned. Each dam is assigned a downstream hazard classification based on the potential loss of life and damage to property should the dam fail. The three classifications are high, significant, and low. With changing demographics and land development in downstream areas, hazard classifications are updated continually. The following definitions of hazard classification currently apply to dams in Indiana:

- High Hazard Dam: a structure the failure of which may cause the loss of life and serious damage to homes, industrial and commercial buildings, public utilities, major highways, or railroads.
- Significant Hazard Dam: a structure the failure of which may damage isolated homes and highways or cause the temporary interruption of public utility services.
- Low Hazard Dam: a structure the failure of which may damage farm buildings, agricultural land, or local roads.

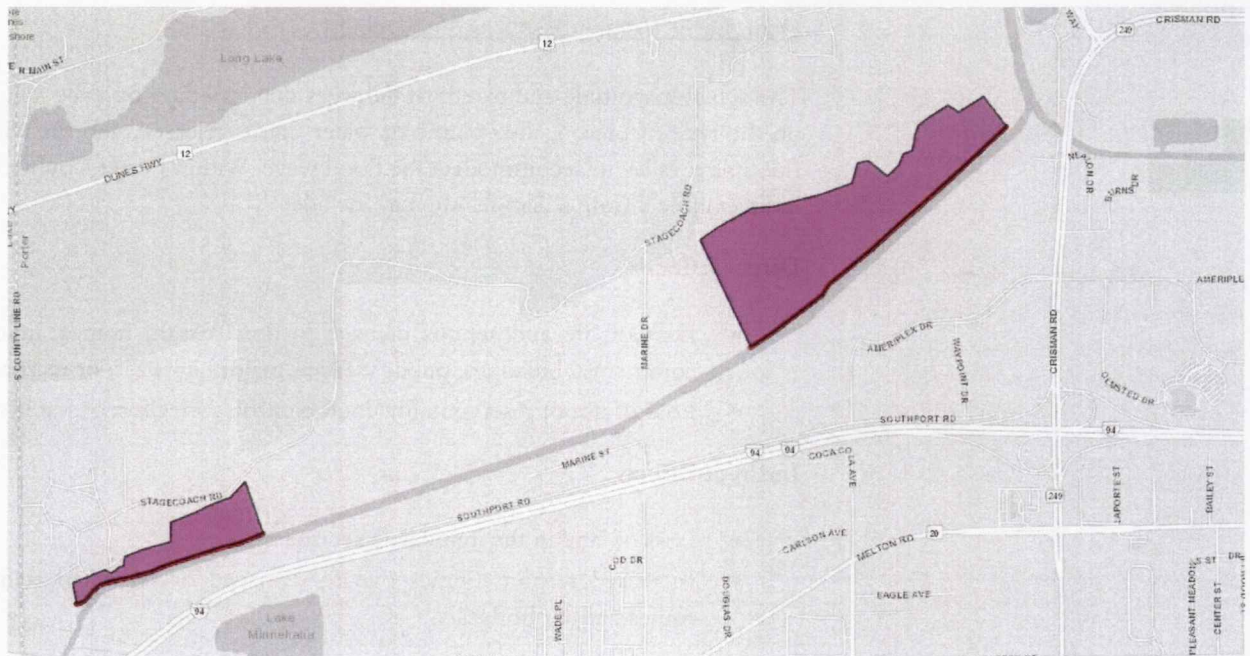
A levee is a flood control structure designed to hold water away from a building. Levees protect buildings from flooding as well as from the force of water, from scour at the foundation, and from impacts of floating debris. The principle causes of levee failure are like those associated with dam failure and include overtopping, surface erosion, internal erosion, and slides within the levee embankment or the foundation walls. Levees are designed to protect against a particular flood level and may be overtopped in a more severe event. When a levee system fails or is overtopped, the result can be catastrophic and often more damaging than if the levee were not there, due to increased elevation differences and water velocity. The water flowing through

the breach continues to erode the levee and increase the size of the breach until it is repaired or water levels on the two side of the levee have equalized.

#### Dam/Levee Failure: Recent Occurrences

Within Porter County, there are four IDNR regulated High Hazard dams as shown on Exhibit 2; Proffits Dam at Loomis Lake, Lake of the Four Seasons Dam, Lake Louise Dam and Lake of the Woods Dam. Further, there are four Significant Hazard Dams and 11 Low Hazard Dams.

According to the National Levee Database (NLD) managed by the USACE, there are two levee systems which provide protection for portions of Porter County along Burns Ditch (**Figure 3-27**). Currently, neither of the systems are accredited and recognized on the FIRM as providing protection for the 1% AEP flood. There have been no reported levee failures within Porter County within this reporting period.



**Figure 3-27 Levees in Porter County Indiana**

Based on the information provided to them, the Committee determined the probability of a dam failure is “Unlikely” to “Possible” due to location of dams and levees and the inspections associated with the dams. Anticipated damages from a failure range from “Negligible” in areas where dams or levees are not located upstream of the community to “Significant” in those areas in the anticipated inundation areas of a dam. For a failure that occurs on a sunny day, the warning time is anticipated to be less than six hours (those areas without a dam or levee will have a much longer warning time); and the duration is anticipated to last less than one week. **Table 3-22** provides a summary of the Planning Committee’s expectations during a dam or levee failure.



**Table 3-22 CPRI for Dam/Levee Failure**

|                        | PROBABILITY | MAGNITUDE / SEVERITY | WARNING TIME | DURATION  | CPRI     |
|------------------------|-------------|----------------------|--------------|-----------|----------|
| Porter County          | Possible    | Significant          | < 6 Hours    | < 1 Week  | Elevated |
| Town of Beverly Shores | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Burns Harbor   | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Chesterton     | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Dune Acres     | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Hebron         | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Kouts          | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Ogden Dunes    | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| City of Portage        | Possible    | Negligible           | < 6 Hours    | < 6 Hours | Low      |
| Town of Porter         | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| Town of Town of Pines  | Unlikely    | Negligible           | > 24 Hours   | < 6 Hours | Low      |
| City of Valparaiso     | Possible    | Significant          | < 6 Hours    | < 1 Week  | Elevated |

**Dam/Levee Failure: Assessing Vulnerability**

The actual magnitude and extent of damages due to a dam or levee failure depend on the type of breach, the volume of water that is released, and the width of the floodplain valley to accommodate the flood wave. Within Porter County, direct and indirect effects from a dam failure may include:

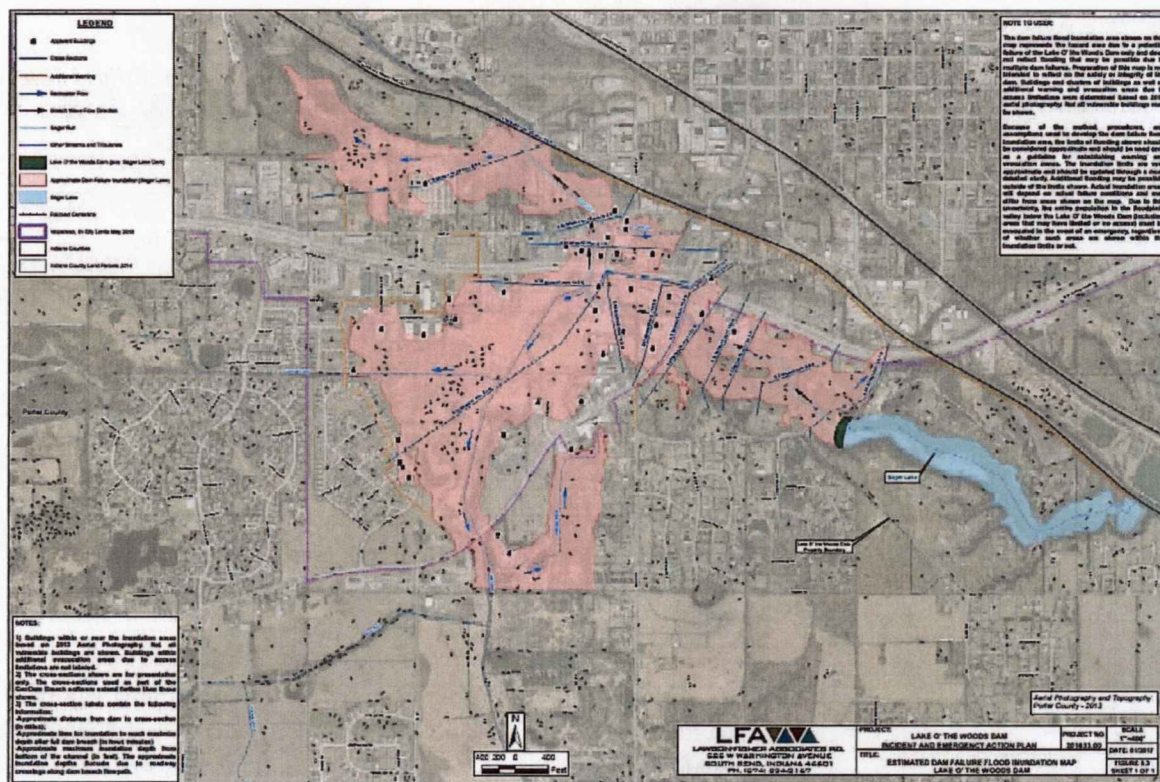
**Direct Effects:**

- Loss of life and serious damage to downstream homes, industrial and commercial buildings, public utilities, major highways, or railroads
- Loss of use of reservoirs for flood control, recreation or water supply

**Indirect Effects:**

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

Due to the conditions beyond the control of the dam or levee owner or engineer, there may be unforeseen structural problems, natural forces, mistakes in operation, negligence, or vandalism that may cause a dam to fail. Fortunately, all of the High Hazard dams in Porter County have an Incident and Emergency Action Plan (IEAP) prepared along with estimated dam failure inundation mapping. Further, the IEAPs are routinely reviewed with county response agencies to review the action items and efforts needed during various phases and levels of emergency. An example of such potential mapping is illustrated in **Figure 3-28**. The potential dam failure inundation area for Lake of the Woods dam is shown in pink.



*Figure 3-28 Potential Dam Failure Inundation Area, Lake of the Woods Dam*

### Estimating Potential Losses

To provide an example of anticipated damages, the potential dam failure inundation area maps (created during the development of the IEAP) for the high hazard dams were reviewed to estimate the number of critical and non-critical structures that may be affected by a sunny day dam failure. The actual magnitude and extent of damages due to a dam failure depend on the type of dam break, volume of water that is released, and the width of the floodplain valley to accommodate the dam break flood wave. The estimated number of structures and the estimated damages are outlined in **Table 3-23**.



**Table 3-23 Estimated Dam Failure Damages**

| DAM                         | ESTIMATED DAMAGES |          |
|-----------------------------|-------------------|----------|
|                             | #                 | \$       |
| Lake of the Four Seasons    | 5                 | \$611.1K |
| Lake Louise                 | 186               | \$24.1M  |
| Lake of the Woods           | 44                | \$14.9M  |
| Proffits Dam at Loomis Lake | 139               | \$17.2M  |

In addition, **Table 3-24** lists critical infrastructure also located within the potential dam failure inundation areas.

**Table 3-24 Critical Infrastructure within Potential Dam Failure Inundation Areas**

| DAM                         | CRITICAL INFRASTRUCTURE                                                            |
|-----------------------------|------------------------------------------------------------------------------------|
| Lake of the Four Seasons    | (none)                                                                             |
| Lake Louise                 | Cell Tower                                                                         |
| Lake of the Woods           | ABC Magic Nursery Daycare<br>Porter County Juvenile Center<br>Tier II Facility (2) |
| Proffits Dam at Loomis Lake | Whispering Sands Mobile Home Park                                                  |

As discussed earlier, there are two levee systems in Porter County, neither of which is accredited through FEMA. FEMA accredits levees as providing adequate risk reduction on the FIRM if the certification and adopted operation and maintenance plan provided by the levee owner are confirmed to be adequate. This accreditation process is not a standard of safety; it only affects insurance and building requirements for the areas protected by the levee.

**Table 3-25** provides overview information of each of the levee systems noted in the NLD as relevant for Porter County Indiana. The primary purpose of each of these systems is to protect agricultural lands and crop production. No municipalities within Sullivan County are provided flood protection by the levee systems and no critical infrastructure are anticipated to be impacted should a levee breach.

**Table 3-25 Porter County Indiana Levee Systems**

| LEVEE SYSTEM            | NLD RISK     | PEOPLE AT RISK | # STRUCTURES / \$ VALUE | ACCREDITATION |
|-------------------------|--------------|----------------|-------------------------|---------------|
| City of Portage Levee 1 | Not Screened | 0              | 0 / \$0                 | No            |
| City of Portage Levee 2 | Not Screened | 2              | 1 / \$241K              | No            |

#### *Future Considerations*

As areas near existing dams continue to grow in population, it can be anticipated that the number of critical and non-critical structures will also increase accordingly. Location of these new facilities should be carefully considered, and precautions

should be taken to ensure that schools, medical facilities, municipal buildings, and other critical infrastructure are located outside of the delineated or estimated dam failure inundation areas. Also, flood-free access should be provided for these facilities.

It is also very important to all downstream communities and property owners that IEAPs are kept up-to-date, and routinely exercised to ensure the greatest safety to those within the hazard area. Large, undeveloped areas remain downstream of several dams in Porter County. Until such development or re-development downstream of a dam is prohibited, those areas remain vulnerable to losses and damages associated with a failure of that structure.

It is also very important to all downstream communities and property owners that dam IEAPs are developed, kept up-to-date, and routinely exercised to ensure the greatest safety to those within the hazard areas.

In regard to levee structures, a document similar to the IEAP for dams should be prepared levees, the Flood Warning and Emergency Evacuation Plan, FWEEP. Along with the development of the FWEEP, it is important that recommendations from studies completed along the Burns Ditch be implemented to provide additional protection, especially in areas where interior drainage remains the primary concern. This will continue to reduce risk in these areas, as well as provide additional protections to existing structures and potentially allow additional acres to be used in economic development projects.

#### Dam/Levee Failure: Relationship to Other Hazards

With the large volumes and velocities of water released during a breach, it can be expected that such a failure would lead to flooding within the inundation areas downstream of the dam and behind the levee. Downstream bridges and roads are also in danger of being destroyed or damaged. Bridges may become unstable and portions of road surfaces may be washed away, or the entire road may be undermined. Other infrastructure such as utility poles and lines may be damaged as the water flows along the surface or pipes may become exposed due to scouring; all of which may lead to utility failures within the area downstream of the dam or levee failure.

Several other independent hazards may also lead to a dam or levee failure. Hazards such as flooding, the melting of snow or ice, or rapid precipitation associated with thunderstorms, may all lead to increased pressure on the dam structures or overtopping of the structures, leading to failure. Additionally, earthquakes or tornadoes may cause damage to the structures or earthen components of the dam or levee resulting in irreparable damages or failure.



### 3.3.12 Hazardous Materials Incident



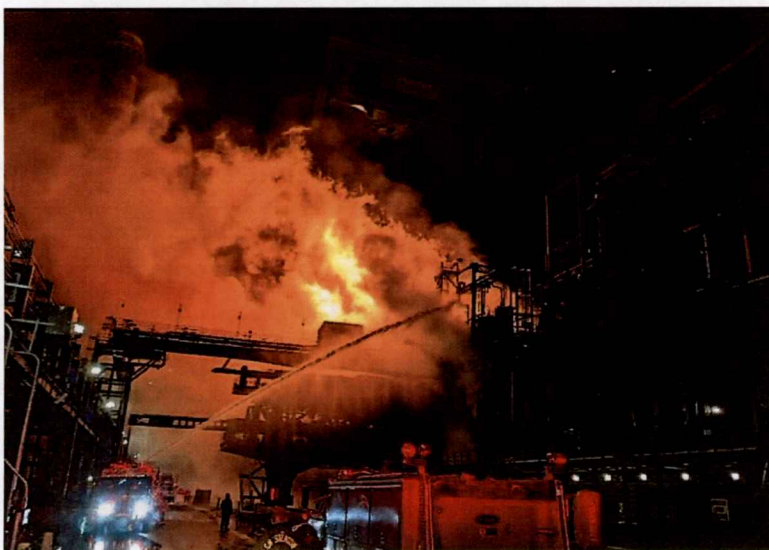
#### Hazardous Materials Incident: Overview

Hazardous materials are substances that pose a potential threat to life, health, property, and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases. Despite precautions taken to ensure careful handling during manufacture, transport, storage, use, and disposal, accidental releases are bound to occur. These releases create a serious hazard for workers, neighbors, and emergency response personnel. Emergency response may require fire, safety/law enforcement, search and rescue, and hazardous materials response units.

As materials are mobilized for treatment, disposal, or transport to another facility, all infrastructure, facilities, and residences in close proximity to the transportation routes are at an elevated risk of being affected by a hazardous materials release. Often these releases can cause serious harm to Porter County and its residents if proper and immediate actions are not taken. Most releases are the result of human error or improper storage, and corrective actions to stabilize these incidents may not always be feasible or practical in nature.

Railways often transport materials that are classified as hazardous and preparations need to be made and exercised for situations such as derailments, train/vehicle crashes, and/or general leaks and spills from transport cars.

#### Hazardous Materials Incident: Recent Occurrences



*Figure 3-29 February 2019 ArcelorMittal Burns Harbor Event*

During conversations with Committee members and through information provided by local news outlets, it was noted that numerous small and moderately sized incidents involving manufacturing facilities and transportation routes have occurred since the development of the original MHMP. However, the number of facilities utilizing, storing, and/or manufacturing chemicals and the number of high-volume transportation routes increase the likelihood of a major incident.

When a hazardous materials incident does occur within the county, there is always the threat it will worsen in nature,

or lead to another type of event, such as a fire. This is what occurred at the ArcelorMittal Burns Harbor facility in Burns Harbor in February of 2019. Approximately 10,000 gallons of ammonia liquor were spilled following a short power outage. This outage also resulted in towering flames from the burning of excess gases. **Figure 3-29** shows firefighters battling the flames at the site.



*Figure 3-30 January 2012 Train Collision in Porter County northeast of Valparaiso*

In what may have been significantly more disastrous, three trains collided in January 2012 in a rural area of Porter County northeast of Valparaiso. The first train was stopped on the tracks and was rear-ended, which caused debris to be sent into a passing third train. No significant leaks or spills were observed although several empty hazardous materials rail cars were being pulled at the time of the derailment. Several roads were closed and nearby homes of nearly 100 residents were evacuated. **Figure 3-30**, taken by Tim Olk, shows the aftermath of the train derailment.

According to the Committee, the probability of a hazardous materials release or incident is “Highly Likely” within all areas due to the number of facilities and transportation routes within and through the municipalities and unincorporated areas of the county. “Significant” to “Critical” damages are anticipated to result from an incident regardless of the location of the incident. As with hazards of this nature, a short warning time of less than six hours and an event duration of less than one week is anticipated based on the type of potential release involved in that municipality. A summary is shown in **Table 3-26**.



**Table 3-26 CPRI for Hazardous Materials Incident**

|                        | PROBABILITY   | MAGNITUDE / SEVERITY | WARNING TIME | DURATION | CPRI   |
|------------------------|---------------|----------------------|--------------|----------|--------|
| Porter County          | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Beverly Shores | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Burns Harbor   | Highly Likely | Critical             | < 6 Hours    | < 1 Week | Severe |
| Town of Chesterton     | Highly Likely | Critical             | < 6 Hours    | < 1 Week | Severe |
| Town of Dune Acres     | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Hebron         | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Kouts          | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Ogden Dunes    | Highly Likely | Critical             | < 6 Hours    | < 1 Week | Severe |
| City of Portage        | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| Town of Porter         | Highly Likely | Critical             | < 6 Hours    | < 1 Week | Severe |
| Town of Town of Pines  | Highly Likely | Significant          | < 6 Hours    | < 1 Week | Severe |
| City of Valparaiso     | Highly Likely | Critical             | < 6 Hours    | < 1 Week | Severe |

Relatively small hazardous materials incidents have routinely occurred throughout Porter County in the past and are likely, according to the Committee, to occur again. As the number of hazardous materials producers, users, and transporters increase within or surrounding Porter County, it can be anticipated that the likelihood of a future incident will also increase.

#### Hazardous Materials Incident: Assessing Vulnerability

Within Porter County, direct and indirect effects from a hazardous materials incident may include:

##### **Direct Effects:**

- More densely populated areas with a larger number of structures, railroad crossings, and heavily traveled routes are more vulnerable
- Expense of re-construction of affected structures

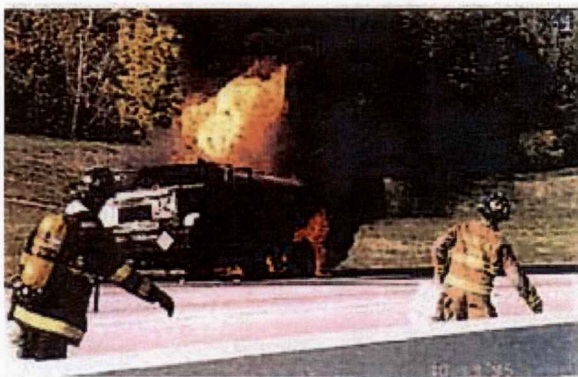
##### **Indirect Effects:**

- Loss of revenue or production while recovery and/or reconstruction occurs
- Anxiety or stress related to event
- Potential evacuation of neighboring structures or facilities

While the possibility of an incident occurring may be likely, the vulnerability of Porter County has been lowered due to the enactment of Superfund Amendments and Reauthorization Act (SARA) Title III national, state and local requirements. SARA Title III, also known as the Emergency Planning and Community Right to Know Act (EPCRA), establishes requirements for planning and training at all levels of government and industry. EPCRA also establishes provisions for citizens to have

access to information related to the type and quantity of hazardous materials being utilized, stored, transported or released within their communities.

One local result of SARA Title III is the formation of the Local Emergency Planning Commission (LEPC). This commission has the responsibility for preparing and implementing emergency response plans, cataloging Material Safety Data Sheets (MSDS), chemical inventories of local industries and businesses, and reporting materials necessary for compliance.



*Figure 3-31 Fuel Tanker Fire*

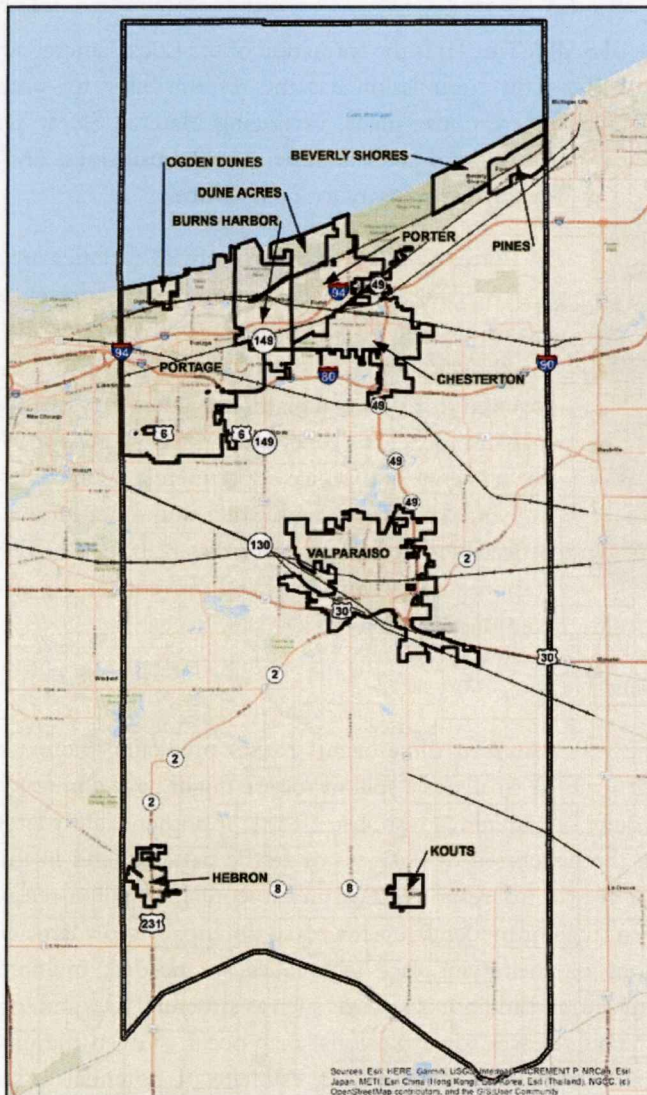
In Porter County, approximately 80 facilities are subject to SARA Title III provisions due to the presence of listed hazardous materials in quantities at or above the minimum threshold established by the Act. These facilities are also required to create and distribute emergency plans and facility maps to local emergency responders such as the LEPC, fire departments, and police departments. With this knowledge on hand, emergency responders and other local government officials can be better prepared to plan for an emergency, the response it would require, and prevent serious affects to the community involved.

#### *Estimating Potential Losses*

In addition, the very nature of these events makes predicting the extent of their damage very difficult. A small-scale spill or release might have a minor impact and would likely require only minimal response efforts. Another slightly larger incident might result in the disruption of business or traffic patterns, and in this situation might require active control response measures to contain a spill or release. On the other hand, even small or moderate events could potentially grow large enough that mass evacuations or shelter in place techniques are needed, multiple levels of response are utilized, and additional hazards such as structural fires and/or additional hazardous materials releases (or explosions) may occur. Given the unpredictable nature of hazardous materials incident, an estimate of potential losses was not estimated.



### *Future Considerations*



**Figure 3-32 Porter County Transportation Routes**

Additional facilities, both critical and non-critical in nature may be affected if a hazardous materials release were to occur along a transportation route (**Figure 3-32**). Several routes including Interstates 80, 90, and 94; US Highways 6, 12, 20, 30, and 231; SR 2, 8, 49, 130, 149, and 249 are traveled by carriers of hazardous materials. Additionally, several rail companies have active lines within the county.

By restricting development within the known hazardous materials facility buffer zones, future losses associated with a hazardous materials release can be reduced. Critical infrastructure should be especially discouraged from being located within these areas. Further, by restricting construction in these zones, the number of potentially impacted residents may also be greatly reduced, lowering the risk for social losses, injuries, and potential deaths. Future construction of hazardous materials facilities should be located away from critical infrastructure such as schools, medical facilities, municipal buildings, and daycares. Such construction would likely reduce the risk to highly populated buildings and populations with special needs or considerations such as children, elderly, and medically unfit.

Local zoning ordinances help to ensure facilities constructed near a hazardous materials facility are similar in nature. This reduces the risk and vulnerability to some populations. However, there are several existing facilities and numerous transportation routes located throughout each of

the communities making current and future development at risk for losses associated with a hazardous materials release.

### Hazardous Materials Incident: Relationship to Other Hazards

Dependent on the nature of the release, conditions may exist where an ignition source such as a fire or spark is in close proximity to a flammable or explosive substance. As the fire spreads throughout the facility or the area, structural and/or property damages will increase. Response times to a hazardous materials incident may be prolonged until all necessary information is collected detailing the type and amount of chemicals potentially involved in the incident. While this may increase

structural losses, it may actually decrease the social losses such as injuries or even deaths.



## 3.4

## HAZARD SUMMARY

For the development of this MHMP, the Committee utilized the CPRI method to prioritize the hazards they felt affected Porter County. Hazards were assigned values based on the probability or likelihood of occurrence, the magnitude or severity of the incident, as well as warning time and duration of the incident itself. A weighted CPRI was calculated based on the percent of the county's population present in the individual communities.

**Table 3-27** summarizes the CPRI values for the various hazards studied within this MHMP.

- Hazards ranked as “Low” were Drought; Earthquake and Landslide and Subsidence.
- Hazards ranked as “Elevated” were Dam/Levee Failure; Flood; Hail, Thunder, and Windstorms; Winter Storm and Ice; and Tornado.
- Hazards ranked as “Severe” were Extreme Temperature; Fire; and Hazardous Materials Incident.

Table 3-27 Combined CPRI

| TYPE OF HAZARD | LIST OF HAZARDS               | WEIGHTED AVERAGE CPRI                                                                 |
|----------------|-------------------------------|---------------------------------------------------------------------------------------|
| Natural        | Coastal Storm/Coastal Erosion |    |
|                | Drought                       |    |
|                | Earthquake                    |    |
|                | Extreme Temperature           |    |
|                | Fire                          |    |
|                | Flood                         |   |
|                | Hail/Thunder/Windstorm        |  |
|                | Landslide/Subsidence          |  |
|                | Tornado                       |  |
|                | Winter Storm/Ice              |  |
| Technological  | Dam/Levee Failure             |  |
|                | Hazardous Materials Incident  |  |



It can be important to understand the cause and effect relationship between the hazards selected by the Committee. **Table 3-28** can be utilized to identify those relationships. For example, a winter storm (along the side of the table) can result in a flood (along the top of the table). In a similar fashion, a hazardous materials incident (along the top of the table) can be caused by an earthquake; flood; tornado; or a winter storm or ice storm (along the side of the table)

**Table 3-28 Hazard Relationship Table.**

| EFFECT<br>↓           | Coastal Storm | Drought | Earthquake | Extreme Temperature | Fire | Flood | Hail/ Thunder/ Wind | Landslide/ Subsidence | Tornado | Winter Storm / Ice | Dam/Levee Failure | Hazardous Materials |
|-----------------------|---------------|---------|------------|---------------------|------|-------|---------------------|-----------------------|---------|--------------------|-------------------|---------------------|
| CAUSE<br>↓            |               |         |            |                     |      |       |                     |                       |         |                    |                   |                     |
| Coastal Storm         |               |         |            |                     |      |       |                     | X                     |         |                    |                   | X                   |
| Drought               |               |         |            |                     |      |       |                     |                       |         |                    |                   |                     |
| Earthquake            | X             |         |            |                     | X    |       |                     | X                     |         |                    | X                 | X                   |
| Extreme Temperature   |               |         |            |                     |      |       |                     |                       |         |                    |                   | X                   |
| Fire                  |               |         |            |                     |      |       |                     |                       |         |                    |                   | X                   |
| Flood                 |               |         |            |                     |      |       |                     | X                     |         |                    | X                 | X                   |
| Hail/ Thunder/ Wind   |               |         |            |                     | X    | X     |                     | X                     |         |                    | X                 | X                   |
| Landslide/ Subsidence |               |         |            |                     |      |       |                     |                       |         |                    |                   | X                   |
| Tornado               |               |         |            |                     | X    |       |                     |                       |         |                    | X                 | X                   |
| Winter Storm/ Ice     |               |         |            |                     |      | X     |                     |                       |         |                    | X                 | X                   |
| Dam/Levee Failure     |               |         |            |                     |      | X     |                     | X                     |         |                    |                   | X                   |
| Hazardous Materials   |               |         |            |                     | X    |       |                     |                       |         |                    |                   |                     |

As a method of better identifying the potential relationships between hazards, Exhibit 3 can be referenced to indicate the proximity of one or more known hazard areas such as the delineated floodplains and the locations of hazardous materials facilities. For this reason, the City of Portage, the City of Valparaiso or any other community may be impacted by more than one hazard at a time, depending on certain conditions. It can be anticipated that if a flood were to occur within these areas, there would be a potentially increased risk of this facility experiencing a hazardous materials incident.

Future development in areas where multiple known hazard areas (dam and levee failure inundations areas, floodplains and surrounding hazardous materials facilities) overlap should undergo careful design, review, and construction protocol to reduce the risk of social, physical, and economic losses due to a hazard incident. While it may certainly be difficult, critical infrastructure should not be constructed within these regions.



## CHAPTER 4

# MITIGATION GOALS AND PRACTICES

This section identifies the overall goal for the development and implementation of the Porter County MHMP. A summary of existing and proposed mitigation practices discussed by the Committee is also provided.

### 4.1 MITIGATION GOAL

#### **REQUIREMENT §201.6(c)(3)(i):**

*[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

The Committee reviewed the mitigation goals as outlined within the 2011 Porter County MHMP and determined that each of these remain valid and effective. In summary, the overall goal of the Porter County MHMP is to reduce the social, physical, and economic losses associated with hazard incidents through emergency services, natural resource protection, prevention, property protection, public information, and structural control mitigation practices.

### 4.2 MITIGATION PRACTICES

#### **REQUIREMENT §201.6(c)(3)(ii):**

*[The mitigation strategy shall include a] section that identifies and analyzed a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

#### **REQUIREMENT §201.6(c)(3)(iii):**

*[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

In 2005, the Multi-Hazard Mitigation Council conducted a study about the benefits of hazard mitigation. This study examined grants over a 10-year period (1993-2003) aimed at reducing future damages from earthquake, wind, and flood. It found that mitigation efforts were cost-effective at reducing future losses; resulted in significant benefits to society; and represented significant potential savings to federal treasury in terms of reduced hazard-related expenditures. This study found that every \$1 spent on mitigation efforts resulted in an average of \$4 savings for the community. The study also found that FEMA mitigation grants are cost-effective since they often lead to additional non-federally funded mitigation activities and have the greatest benefits in communities that have institutionalized hazard mitigation programs.

A more recent (2017) study by the National Institute of Building Sciences, reviewed over 20 years of federally funded mitigation grants, not only from FEMA, but also

from the US Economic Development Administration (EDA) and the US Department of Housing and Urban Development (HUD). From this broadened review, it has been determined that for every \$1 spent on mitigation, \$6 are saved on disaster costs. In addition, by designing and construction buildings which exceed select items in the 2015 International Code, \$4 can be saved for every \$1 invested in those changes.

Six primary mitigation practices defined by FEMA are:

- **Emergency Services** – measures that protect people during and after a hazard.
- **Natural Resource Protection** – opportunities to preserve and restore natural areas and their function to reduce the impact of hazards.
- **Prevention** – measures that are designed to keep the problem from occurring or getting worse.
- **Property Protection** – measures that are used to modify buildings subject to hazard damage rather than to keep the hazard away.
- **Public Information** – those activities that advise property owners, potential property owners, and visitors about the hazards, ways to protect themselves and their property from the hazards.
- **Structural Control** – physical measures used to prevent hazards from reaching a property.

#### 4.2.1 Existing Mitigation Practices

As part of this planning effort, the Committee discussed the strengths and weaknesses of existing mitigation practices and made recommendations for improvements, as well as suggested new practices. The following is a summary of existing hazard mitigation practices within Porter County. Mitigation measures that were included in the 2011 Porter County MHMP are noted as such.

##### Emergency Services

- The county has developed a centralized system for testing and operation of outdoor warning sirens, which may be operated by Central Dispatch or the EMA.
- Weather radios are encouraged and provided throughout the county during presentations, events, and on the EMA website.
- Stream gages on the Kankakee and Little Calumet rivers and Salt Creek, the NWS, and other alerts are utilized for flood forecasting and flood warnings for various stream levels.
- Porter County Fire Departments have developed a dive/water rescue team and has agreements with Crown Point for ice rescues as needed.
- All-terrain vehicles are available for rescue efforts if needed.
- Tier II facility maps and response plans are kept up-to-date with the LEPC
- Porter County has established a Hazmat Response Team.



### Natural Resource Protection

- Porter County, the towns of Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Ogden Dunes, Porter, and Town of Pines; and the cities of Portage and Valparaiso are in good standing with the NFIP Program and has flood protection ordinances which exceed the minimum requirements.

### Prevention

- Information related to hazard mitigation has been incorporated, where appropriate, into individual Comprehensive Land Use Plans, other long-range plans, and decision-making processes.
  - Both Chesterton and Valparaiso have created policies specifically outlining the need to protect floodplains and wetlands from encroachment.
  - The Porter County Land Use Plan discusses the need to ensure the protection of the dunes, river and stream corridors, and watersheds by limiting the type and intensity of development near these areas.
- Municipalities and the county have developed protocols for records backup and redundancies.
- The Porter County LEPC provides routine training regarding hazard event planning, response, and mitigation
- Electric providers routinely complete preventative maintenance on trees within the ROW and utility corridor.
- Local developers routinely bury new and retrofitted utilities to minimize exposure to hazards.

### Property Protection

- Porter County and the municipalities follow the International Building Code which includes requirements to minimize damages from natural hazards.
- Ordinances have been adopted which prohibit construction within known flood hazard areas (*2011 Measure*)
- Porter County purchased a mobile sand bagging device which is capable of filling 20 bags at one time

### Public Information

- Outreach materials are routinely provided within office and agencies throughout Porter County, large public events, speaking opportunities within schools, etc.
- The EMA partners with municipalities and various social media platforms to provide updates on impending weather and other hazardous events as needed.

### Structural Control

- Stormwater conveyances and regulated drains are maintained on a routine basis to prevent localized flooding, increased erosion, and material deposition as a result of rainfall or snowmelt.
- Porter County completes a biennial bridge survey of bridges, then completes repairs or replacements based on a prioritization and as funding is available, approximately six replacements per year
- The EMA is involved in the development, review and exercise of the IEAPs prepared for the high hazard dams.

#### 4.2.2 Proposed Mitigation Practices

After reviewing existing mitigation practices, the Committee reviewed mitigation ideas for each of the hazards studied and identified which of these they felt best met their needs as a community according to selected social, technical, administrative, political, and legal criteria. The following identifies the key considerations for each evaluation criteria:

- **Social** –mitigation projects will have community acceptance, they are compatible with present and future community values, and do not adversely affect one segment of the population.
- **Technical** –mitigation project will be technically feasible, reduce losses in the long-term, and will not create more problems than they solve.
- **Administrative** –mitigation projects may require additional staff time, alternative sources of funding, and have some maintenance requirements.
- **Political** –mitigation projects will have political and public support.
- **Legal** –mitigation projects will be implemented through the laws, ordinances, and resolutions that are in place.
- **Economic** –mitigation projects can be funded in current or upcoming budget cycles.
- **Environmental** –mitigation projects may have negative consequences on environmental assets such as wetlands, threatened or endangered species, or other protected natural resources.

**Table 4-1** lists a summary of all proposed mitigation practices identified for all hazards, as well as information on the local status, local priority, benefit-cost ratio, project location, responsible entity, and potential funding source, associated with each proposed practice. The proposed mitigation practices are listed in order of importance to Porter County for implementation. Projects identified by the Committee to be of “high” local priority may be implemented within five years from final Plan adoption. Projects identified to be of “moderate” local priority may be implemented within five to ten years from final Plan adoption, and projects identified by the Committee to be of “low” local priority may be implemented ten or more



years from final Plan adoptions. However, depending on availability of funding, some proposed mitigation projects may take longer to implement.

As part of the process to identify potential mitigation projects, the Planning Committee weighed the benefit derived from each mitigation practice against the estimated cost of that practice. This basic benefit-cost ratio was based on experience and professional judgement and was utilized to identify the mitigation practices as having a high (higher benefit than cost), moderate (equal benefit to cost), or low (lower benefit than cost) benefit-cost ratio. Preparing detailed benefit cost ratios was beyond the scope of this planning effort and the intent of the MHMP.

The update of this MHMP is a necessary step of a multi-step process to implement programs, policies, and projects to mitigate the effect of hazards in Porter County. The intent of this planning effort was to identify the hazards and the extent to which they affect Porter County and to determine what type of mitigation strategies or practices may be undertaken to mitigate for these hazards. A FEMA-approved MHMP is required in order to apply for and/or receive project grants under the HMGP, PDM, and FMA. Although this MHMP meets the requirements of DMA 2000 and eligibility requirements of these grant programs additional detailed studies may need to be completed prior to applying for these grants. **Section 5.0** of this plan includes an implementation plan for all high priority mitigation practices identified by the Committee.



The CRS program credits NFIP communities a maximum of 72 points for setting goals to reduce the impact of flooding and other known natural hazards; identifying mitigation projects that include activities for prevention, property protection, natural resource protection, emergency services, structural control projects, and public information.

Table 4-1 Proposed Mitigation Practices

| MITIGATION PRACTICE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                                                 | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | STATUS                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRIORITY | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                                                                                                                                                                                                                                             | FUNDING SOURCE                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Safer Rooms and Community Shelters</b><br>1. Assess current agreements (capacity) and develop any needed shelter, safe rooms, warming center agreements within the County. Equip with generators and response materials (2011 Measure)<br>2. Clearly advertise location of safer areas and community shelters for large gatherings of people (sporting events, 4H fair, etc.)<br>3. Develop a domestic animal friendly evacuation plan and domestic animal friendly shelter<br>4. Investigate incentives for buildings with approved safe rooms and encourage construction of safe rooms in all new municipal facilities | <input checked="" type="checkbox"/> Emergency Services<br><input type="checkbox"/> Nat. Res. Protection<br><input type="checkbox"/> Prevention<br><input type="checkbox"/> Property Protection<br><input checked="" type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control                                  | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input checked="" type="checkbox"/> Earthquake<br><input checked="" type="checkbox"/> Extreme Temperature<br><input checked="" type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input checked="" type="checkbox"/> Hail/Thunder/Wind<br><input checked="" type="checkbox"/> Landslide/Subsidence<br><input checked="" type="checkbox"/> Tornado<br><input checked="" type="checkbox"/> Winter Storm/Ice<br><input checked="" type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br>1. Shelter locations are spaced throughout the county as available and as needed<br><br><b>Proposed Enhancement –</b><br>1. Continue to determine if additional shelter locations or services are needed<br>2. Provide additional signage or announcements during events for out-of-town guests<br>3. Develop plan and shelter for humans and domestic animals<br>4. Investigate potential offerings to buildings with approved safe rooms | High     | High                | EMA<br><br>Red Cross<br><br>Large Event Planners<br><br>Porter County Humane Society<br><br>Building / Planning Departments<br>(County, Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Ogden Dunes, Portage, Porter, Town of Pines, Valparaiso) | Grant<br><br>Existing budget<br><br>Facility owners |
| <b>Community Rating System</b><br>1. Reduce flood insurance premiums through participation in the NFIP's CRS Program.<br><br>(Will assist with NFIP compliance)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input checked="" type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control | <input type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident                                                                                                               | <b>Ongoing –</b><br>1. No communities participate in the CRS program<br><br><b>Proposed Enhancement –</b><br>1. Participation from Porter County, Chesterton, Portage, and Valparaiso with highest number of policies and Ogden Dunes based on interest                                                                                                                                                                                                        | High     | Moderate            | Floodplain Administrator<br>(County, Chesterton, Ogden Dunes, Portage, Valparaiso)                                                                                                                                                                             | Existing budget                                     |



| MITIGATION PRACTICE                                                                                                                                                                                                                                                                                                                                                                                                                                 | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                           | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | STATUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRIORITY | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                                                                                                                                                                                                                                                                                                     | FUNDING SOURCE               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Flood Studies</b><br>1. Continue to conduct detailed flood studies for problem areas and/or areas with repetitive flooding problems<br>2. Prioritize areas and complete flood depth mapping (RiskMAP) to better understand flood risk potential<br>3. Conduct watershed studies, stormwater master plans, or coastal erosion studies to develop action strategies for mitigation and protection<br><br><i>(Will assist with NFIP compliance)</i> | <input type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br>1. Studies have been completed in the past for problem areas<br><br><b>Proposed Enhancements –</b><br>1. Study prioritized areas such as those along the Kankakee River, South Have, and Portage lake front<br>2. Prioritize flood risk areas and secure funding to complete flood depth mapping to better understand flood potential<br>3. Review completed studies, prioritize unstudied areas to develop a countywide list for studies and action plans | High     | Moderate            | Floodplain Administrators<br><i>(County, Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Ogden Dunes, Portage, Porter, Town of Pines, Valparaiso)</i><br><br>Porter County Surveyor<br><br>KRBC                                                                                                          | Existing budget<br><br>Grant |
| <b>Hazardous Materials Response</b><br>1. Inventory needs and procure additional equipment as funding is available<br>2. Develop or update evacuation places for hazardous materials facilities                                                                                                                                                                                                                                                     | <input checked="" type="checkbox"/> Emergency Services<br><input type="checkbox"/> Nat. Res. Protection<br><input type="checkbox"/> Prevention<br><input type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input type="checkbox"/> Structural Control                                  | <input type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident            | <b>Ongoing –</b><br><br><b>Proposed Enhancement –</b><br>1. Review and prioritize equipment needs and purchase as funding becomes available<br>2. Create evacuation zone and contact list for each facility within that zone around each Tier II facility. Include outlining of primary and secondary evacuation routes for “typical” events                                                                                                                                   | High     | Moderate            | Fire Departments<br><i>(Beverly Shores, Burns Harbor, Chesterton, Hebron, Indiana Dunes Lakeshore Fire, Kouts, Lakes of the Four Seasons, Liberty Twp, Mittal Steel, Morgan Twp, Ogden Dunes, Pine Twp, Portage, Porter Twp, South Haven, Union Twp, US Steel, Valparaiso, Washington Twp)</i><br><br>LEPC<br><br>HMRT | Existing budget              |

| MITIGATION PRACTICE                                                                                                                                                                                                                                                                                 | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                           | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | STATUS                                                                                                                                                                                                                                              | PRIORITY | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                              | FUNDING SOURCE  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|-------------------------------------------------|-----------------|
| <b>Management of Dams</b><br>1. Review regular inspection and maintenance records of high hazard dams regardless of ownership                                                                                                                                                                       | <input type="checkbox"/> Emergency Services<br><input type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control                       | <input type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input checked="" type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident                                                                                                                          | <b>Ongoing –</b><br><br><b>Proposed Enhancements –</b><br>1. Review all inspection reports and maintenance records to remain aware of potential for dam failure                                                                                     | High     | Moderate            | Dam Owners<br><br>EMA                           | Existing budget |
| <b>Transportation</b><br>1. Review and/or revise transportation survey to determine the typical chemicals and quantities of chemicals being transported through Porter County (2011 Measure)                                                                                                        | <input checked="" type="checkbox"/> Emergency Services<br><input type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input type="checkbox"/> Structural Control                       | <input type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident                                                                                                                          | <b>Ongoing –</b><br><br><b>Proposed Enhancement –</b><br>1. Complete transportation survey in Porter County focusing on the Grand Trunk rail area                                                                                                   | High     | Moderate            | INDOT<br><br>Rail companies<br><br>LEPC         | Existing budget |
| <b>Geographic Information Systems</b><br>1. Develop a countywide GIS consortium with standards for file development and review procedures<br>2. Develop countywide GIS with address verification within E911 to improve emergency response times (2011 Measure)<br>3. Train first responders on GIS | <input checked="" type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input type="checkbox"/> Structural Control | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input checked="" type="checkbox"/> Drought<br><input checked="" type="checkbox"/> Earthquake<br><input checked="" type="checkbox"/> Extreme Temperature<br><input checked="" type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input checked="" type="checkbox"/> Hail/Thunder/Wind<br><input checked="" type="checkbox"/> Landslide/Subsidence<br><input checked="" type="checkbox"/> Tornado<br><input checked="" type="checkbox"/> Winter Storm/Ice<br><input checked="" type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br><br><b>Proposed Enhancement –</b><br>1. Develop standards and protocols for countywide data layers<br>2. Use GIS to improve address verification with E911<br>3. Create layers and train responders on use during hazard events | High     | Low                 | GIS Department<br>(County, Portage, Valparaiso) | Existing Budget |



| MITIGATION PRACTICE                                                                                                                                                                                                                                                                                                                                                     | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                                      | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | STATUS                                                                                                                                                                                                                                                                                      | PRIORITY                                                                                  | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                                                                                                                                                                                            | FUNDING SOURCE               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Flood Protection</b><br>1. Conduct stream maintenance in regulated drains to reduce flood risks <i>(2011 Measure)</i><br>2. Repair drainage tiles and culverts and redirect surface runoff <i>(2011 Measure)</i><br><br><i>(Will assist with NFIP compliance)</i>                                                                                                    | <input type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control            | <input type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident            | <b>Ongoing –</b><br>1. Stream maintenance is conducted as needed and as funding is available<br><br><b>Proposed Enhancements –</b><br>1. Develop protocol to prioritize stream maintenance based on flood potential<br>2. Develop list of prioritize areas in need of repair                | High<br><i>(maintenance)</i><br><br>Moderate<br><i>(tiles and culverts)</i>               | Moderate            | Floodplain Administrators<br><i>(County, Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Ogden Dunes, Portage, Porter, Town of Pines, Valparaiso)</i><br><br>Porter County Surveyor<br><br>KRBC | Existing budget<br><br>Grant |
| <b>Floodplain Management</b><br>1. Protect existing critical facilities in floodplain<br>2. Institute a voluntary retrofit and/or buyout plan for prioritized structures subject to repetitive flooding<br>3. Develop floodplain overlay district to further protect area from development while allowing passive uses<br><br><i>(Will assist with NFIP compliance)</i> | <input checked="" type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input type="checkbox"/> Fire<br><input checked="" type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br><br><b>Proposed Enhancements –</b><br>1. Determine need protective measures and implement as funding is secured<br>2. Develop protocols and program to retrofit or buyout prioritized properties<br>3. Develop overly district to further protect SFHA from development | High<br><i>(critical facilities, buyout)</i><br><br>Moderate<br><i>(overlay district)</i> | Moderate            | Floodplain Administrators<br><i>(County, Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Ogden Dunes, Portage, Porter, Town of Pines, Valparaiso)</i><br><br>KRBC<br><br>Property Owners        | Existing budget<br><br>Grant |







| MITIGATION PRACTICE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                                                 | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | STATUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PRIORITY                                                                                                                            | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                                                                                                                                                                                                                                                                                                                                      | FUNDING SOURCE               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Building Protection</b><br>1. Install additional dry-hydrants throughout the county<br>2. Harden critical or public facilities to withstand severe wind damages<br>3. Assess and prioritize needs of individual fire departments to create a prioritized county listing (2011 Measure)<br>4. Install inertial valves in critical facilities (2011 Measure)                                                                                                                                                                                      | <input checked="" type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input checked="" type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input checked="" type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input checked="" type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input checked="" type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input checked="" type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident                       | <b>Ongoing –</b><br>1. Some dry hydrants are present in the county<br>3. Fire Departments have needs prioritized<br><br><b>Proposed Enhancements –</b><br>1. Prioritize areas where dry hydrants would be valuable, install as landowners agree and as equipment is purchased<br>2. Inventory and prioritize which facilities need hardening and complete structural bracing as funding is secured<br>3. Create countywide listing of prioritized needs<br>4. Install inertial valves in prioritized critical facilities        | High<br><i>(dry hydrants, harden facilities)</i><br><br>Moderate<br><i>(fire dept needs)</i><br><br>Low<br><i>(inertial valves)</i> | Moderate            | EMA<br><br>Fire Departments<br><i>(Beverly Shores, Burns Harbor, Chesterton, Hebron, Indiana Dunes Lakeshore Fire, Kouts, Lakes of the Four Seasons, Liberty Twp, Mittal Steel, Morgan Twp, Ogden Dunes, Pine Twp, Portage, Porter Twp, South Haven, Union Twp, US Steel, Valparaiso, Washington Twp)</i><br><br>Facility owners<br><br>Property owners | Grant<br><br>Existing budget |
| <b>Power Back-Up Generators</b><br>1. Secure a fuel reserve, or ensure emergency provisions are outlined in contracts, and designate a fuel route, to ensure critical infrastructure may run on power back-up for extended periods of time<br>2. Inventory, prioritize, and retrofit public facilities and/or critical facilities with appropriate wiring and electrical capabilities for utilizing a large generator for power back up (2011 Measure)<br>3. Investigate the potential to utilize alternative (solar) generators where appropriate | <input checked="" type="checkbox"/> Emergency Services<br><input type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input type="checkbox"/> Public Information<br><input checked="" type="checkbox"/> Structural Control                       | <input checked="" type="checkbox"/> Coastal Storm/Erosion<br><input type="checkbox"/> Drought<br><input checked="" type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input checked="" type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input checked="" type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input checked="" type="checkbox"/> Tornado<br><input checked="" type="checkbox"/> Winter Storm/Ice<br><input checked="" type="checkbox"/> Dam/Levee Failure<br><input checked="" type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br>1. County vehicles typically are provided fuel as needed<br>2. Some facilities have wiring or generators<br><br><b>Proposed Enhancements –</b><br>1. Secure fuel reserve via contract service agreements and determine most direct route with each access between fuel source and generators within each community<br>2. Inventory and prioritize critical facilities for retrofitting wiring and generator capabilities<br>3. Determine viability of alternative generators at facilities in Porter County | High<br><i>(wiring, fuel reserve)</i><br><br>Low<br><i>(alternative generators)</i>                                                 | Low                 | EMA<br><br>Facility Owners<br><br>Municipal Liaisons<br><i>(County, Beverly Shores, Burns Harbor, Chesterton, Dune Acres, Hebron, Kouts, Ogden Dunes, Portage, Porter, Town of Pines, Valparaiso)</i>                                                                                                                                                   | Existing budget<br><br>Grant |



| MITIGATION PRACTICE                                                                                                                                             | MITIGATION STRATEGY                                                                                                                                                                                                                                                                                                                      | HAZARD ADDRESSED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | STATUS                                                                                                                                                             | PRIORITY | BENEFIT -COST RATIO | RESPONSIBLE ENTITY                                                                            | FUNDING SOURCE  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|-----------------------------------------------------------------------------------------------|-----------------|
| <b>Water Conservation Ordinance</b><br>1. Investigate and propose local water conservation ordinance and contingency plans to impose at time of water shortages | <input checked="" type="checkbox"/> Emergency Services<br><input checked="" type="checkbox"/> Nat. Res. Protection<br><input checked="" type="checkbox"/> Prevention<br><input checked="" type="checkbox"/> Property Protection<br><input checked="" type="checkbox"/> Public Information<br><input type="checkbox"/> Structural Control | <input type="checkbox"/> Coastal Storm/Erosion<br><input checked="" type="checkbox"/> Drought<br><input type="checkbox"/> Earthquake<br><input type="checkbox"/> Extreme Temperature<br><input checked="" type="checkbox"/> Fire<br><input type="checkbox"/> Flood<br><input type="checkbox"/> Hail/Thunder/Wind<br><input type="checkbox"/> Landslide/Subsidence<br><input type="checkbox"/> Tornado<br><input type="checkbox"/> Winter Storm/Ice<br><input type="checkbox"/> Dam/Levee Failure<br><input type="checkbox"/> HazMat Incident | <b>Ongoing –</b><br><br><b>Proposed Enhancement –</b><br>1. Determine appropriate language, propose, and adopt water conservation ordinances for each municipality | Moderate | Moderate            | Municipal Water Suppliers<br><i>(Hebron, Kouts, Valparaiso)</i><br><br>Indiana American Water | Existing budget |

**CHAPTER 5****IMPLEMENTATION PLAN**

The following is a proposed plan for implementing all high priority mitigation practices identified in this Plan. It should be noted that implementation of each of these proposed practices may involve several preparatory or intermediary steps. However, to maintain clarity, not all preparatory or intermediary steps are included.

**5.1 BUILDING PROTECTION**

Install additional dry-hydrants throughout the county

- Inventory existing dry hydrants throughout county and develop GIS layer usable by first responders and the GIS consortium
- Prioritize areas not covered by municipal hydrant services or by existing dry hydrants
- Develop partnerships with landowners in prioritized areas and install dry hydrants as agreements are established and funding is secured

Harden critical or public facilities to withstand severe wind damages

- Inventory and prioritize facilities which may need to be hardened
- Determine needs of each facility
- Harden facilities as funding becomes available

**5.2 COMMUNITY RATING SYSTEM**

Reduce flood insurance premiums through participation in the NFIP's CRS Program

- Review guidance materials and gather supporting documentation
- Calculate credits and contact ISO representative
- Submit materials for entry to the CRS program
- Maintain and record information as necessary for annual recertification

**5.3 EMERGENCY PREPAREDNESS & WARNING**

Improve disaster preparedness and emergency response at the local level through the CERT or COAD program

- Develop annual training programs for existing volunteers
- Review geographic locations of existing volunteers and prioritize neighborhoods, regions, or large employers for recruitment based on areas not yet covered
- Provide announcement and press release to partner agencies to increase the reach of the information



- Develop and implement training program for new volunteers

Increase awareness of hazard information broadcast systems used by municipalities to distribute mass notifications to every phone number or email in the system

- Develop outreach efforts designed to inform residents and visitors of the messaging available
- Post information on municipal and county websites
- Continue to provide information at large events and speaking engagements while encouraging people to enroll during the event

Create bilingual notifications and hazard preparedness materials

- Develop a partnership with the International Connection at Valparaiso University
- Provide existing notifications and hazard preparedness materials to the International Connection for translation (Spanish throughout the county; Lithuanian in Beverly Shores)
- Post to municipal websites and provide to appropriate communities

Increase interdepartmental communications related to hazard awareness and planning efforts

- Outline other municipal departments involved in hazard awareness or hazard planning
- Determine their current roles or roles in which they may have
- Develop working partnerships between those departments by including them in planning, training, or exercises

Investigate and propose an ordinance to require developers to install additional outdoor warning sirens for new developments or pay into a siren fund as part of a new development.

- Research existing ordinances
- Localize language as necessary for communities interested in such an ordinance or program
- Propose ordinance to appropriate committee
- Implement an education component once ordinance has been adopted

Develop MOUs between the EMA and municipalities regarding the provisions of power and maintenance of outdoor warning sirens

- Determine which outdoor warning sirens are located in areas in need of power supplies from municipal sources

- Develop language and propose an MOU between the EMA and the municipality outlining the terms of power supply and maintenance duties regarding the outdoor warning siren
- Review MOUs annually to remind partners of responsibilities and determine if adjustments are needed

**5.4****EMERGENCY RESPONSE AND RECOVERY**

Inventory needs for mobile data terminals (hardware or software) in response vehicles and purchase and install as prioritized

- Work with municipal liaisons to inventory existing terminals, software, and accessories throughout all response agencies (fire, police/sheriff, EMS)
- Determine needs to adequately cover each community and to allow cross-communication between agency and between community
- Prioritize purchases, upgrades, or training and implement as feasible.

Investigate an immunization program for all emergency responders, building inspectors, and families

- Review which immunizations are currently offered through the County Health Department
- Determine which immunizations would be most effective for county responders and inspection staff
- Implement a program to offer additional immunizations to responders
- Expand the current program to also include inspection staff and families of staff and responders

Improve recordkeeping to achieve accurate and community specific information following each hazard event including extent, magnitude, cost, response, and recovery efforts

- Review current protocols for post-event communications
- Utilize existing IDHS software or develop a county-wide database
- Review database with each municipality to review what information should be collected and reported in a consistent manner

Develop a debris management program for vegetation removal, including procurement of equipment such as chippers and grinders

- Determine what debris management equipment is currently available to the EMA
- Determine if additional equipment is needed to operate an effective program
- Prioritize and purchase equipment as funding becomes available



Develop municipal and county continuity of government (COG) and individual departmental continuity of operations (COOP) plans

- Gather guidance materials to assist with development of COG and COOP plans
- Prepare COG plans for county and municipalities
- Hold training sessions with municipal liaisons to inform them how to begin development of their COOP plans
- Review COOP plans annually with staff to ensure familiarity

## 5.5 FLOOD STUDIES

Continue to conduct detailed flood studies for problem areas and/or areas with repetitive flooding problems

- Review listing of flood prone or problem areas and prioritize based on previous damages, at-risk populations, or potential for damage to critical infrastructure
- Secure funding, municipal bond, or funds from existing budgets to complete floodplain studies
- Update the Floodplain Prioritization Study to direct future analyses

Prioritize areas and support FEMA-approved flood depth mapping (RiskMAP) to better show the flood risk potential

- Review areas in process of RiskMAP development
- Support mapping efforts by providing information on local studies and efforts to reduce flooding and associated damages
- Utilize flood depth mapping in land use decisions

Prioritize and conduct watershed studies, stormwater master plans or coastal erosion studies to develop action strategies for mitigation and protection

- Work with municipalities and the unincorporated county to develop a listing of areas not studied or in need of a restudy
- Develop a prioritized listing of watersheds or coastal areas in need of additional studies
- Perform studies as funding becomes available
- Implement recommendations and strategies within completed studies to reduce flood or coastal erosion risk

## 5.6 FLOOD PROTECTION

Conduct stream maintenance in regulated drains to reduce flood risks

- Develop checklist to be utilized when completing stream or ditch inspections
- Develop prioritization listing for maintenance activities
- Conduct maintenance as funding and staffing allow

Repair drainage tiles and culverts and redirect surface runoff

- Prioritize drain tiles and culverts in need of repair based on flood potential
- Prepare Porter County listing of needed repairs
- Conduct repairs as funding becomes available

## 5.7 FLOODPLAIN MANAGEMENT

Protect existing critical facilities in the floodplain

- Review listing of critical facilities within floodplains
- Completed studies to determine localized flood depths
- Provide recommendations for protection measures for each structure
- Prioritize structures and implement recommendations as funding allows

Institute a voluntary retrofit and/or buyout plan for structures subject to repetitive flooding

- Identify areas routinely flooded and the structures within them
- Prioritize areas and structures according to those most at risk
- Seek grant funding or other funding source to implement buy-out program for interested property owners

Develop floodplain overlay district to further protect area from development while allowing passive uses

- Review language from example overlay districts
- Review existing ordinances and zoning codes
- Develop language and requirements for the proposed new zone
- Create educational materials to provide to developers and place on website to explain new requirements



## 5.8

## GEOGRAPHIC INFORMATION SYSTEMS

Develop a county-wide GIS consortium with standards for file development and review procedures

- Review procedures and capabilities of existing municipal GIS systems
- Utilize representatives from each municipality to develop basic standards so files may be shared throughout the county
- Create and adopt standards on file structure, review process, and submission procedures

Develop county-wide GIS with address verification within E911 to improve emergency response times

- Utilize GIS to field verify existing addresses and structures
- Build upon developed structure to create additional addresses as needed
- Provide E911 and first responders with verified addresses and mapping capabilities

Train first responders in GIS

- Determine which first responders currently have a mobile data terminal
- Determine capabilities utilized most commonly by first responders
- Develop and conduct trainings for responders

## 5.9

## HAZARDOUS MATERIALS

Inventory needs of each fire department and hazmat crew, prioritize, and procure additional equipment as funding is available

- Work with each fire department to prepare a prioritized listing of equipment needs
- Prioritize equipment needs countywide to determine what is needed to provide better response overall
- Secure funding or grants to procure equipment

Develop or update evacuation plans for hazardous materials spills

- Review chemicals and quantities in each Tier II facility
- Determine “typical” or most likely event which could occur
- Develop a contact listing of each facility within the determined evacuation zone
- Denote primary and secondary evacuation routes from the facility

**5.10 MANAGEMENT OF DAMS**

Review regular inspection reports and maintenance records of high hazard dams regardless of ownership

- Coordinate with high hazard dam owners and IDNR to receive copies of regular inspection reports and maintenance records
- Continue coordination and collaboration to ensure inspections are completed, the dam and surrounding area is maintained, and risks are assessed accordingly

**5.11 POWER BACK-UP GENERATORS**

Secure a fuel reserve, or ensure emergency provisions are outlined in contracts, to ensure critical infrastructure may run on power back-up for extended periods of time

- Determine where county and municipal vehicles (and generators) routinely receive fuel
- Review contract language to ensure municipal and critical facilities have ability to receive fuel prior to other clients
- If necessary, add such language to contracts
- Develop fuel reserve transportation route to critical facilities

Inventory and retrofit public facilities and/or all critical facilities with appropriate wiring, transfer switches and capabilities for utilizing a large generator for power back-up

- Utilize listing of critical facilities and coordinate with facility owners or operators
- Determine presence or absence of generator, fuel capacity, and fuel reserve
- Determine if additional needs are required to ensure compatibility with generator
- Secure or allocate funding to make necessary purchases or facility adjustments to ensure functioning generators are present and operable

**5.12 SAFER ROOMS AND COMMUNITY SHELTERS**

Assess current agreements (capacity) and develop any needed shelter, safe rooms, or warming center agreements within the county. Equip with generators and response materials

- Review locations and capabilities of existing shelters within the county
- Determine if adequate coverage is provided in populated areas or in centralized areas of the unincorporated areas within the county



- Determine if alternative shelters are available (those which may not be Red Cross certified but may be suitable for short term shelter at the agreement of the client)
- Determine need for sheltering of domestic animals; develop appropriate plans and shelter agreements

Clearly advertise location of safer areas and community shelters for large gatherings of people (sporting events, 4H fair, etc.)

- Partner with event representatives to assess methods possible to advertise safe locations in case of emergencies
- Incorporate advertisement of safe locations into early planning and coordination steps of events such as sporting events, community festivals, and large outdoor events

Develop a domestic animal friendly evacuation plan and domestic animal friendly shelter

- Review any existing animal relevant plans developed through partnering agencies
- Research animal plans in other areas of Indiana
- Develop animal plan for each municipality for small events as well as a larger Porter County plan in the event of a larger hazard incident
- Establish a shelter capable of housing domestic animals and their owners

Investigate incentives for buildings with approved safe rooms and encourage construction of safe rooms in all new municipal facilities

### 5.13 TRANSPORTATION

Review/revise transportation survey to determine typical chemicals and quantities of chemicals being transported through Porter County

- Review existing commodity studies to determine where updates or revisions are needed
- Work with INDOT to determine parameters for new commodity study
- Focus on heavier traffic areas such as Interstates and US Routes; the Grand Trunk

## CHAPTER 6

## PLAN MAINTENANCE PROCESS

## 6.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

**REQUIREMENT §201.6(c)(4)(i):**

*[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

To effectively reduce social, physical, and economic losses in Porter County, it is important that implementation of this MHMP be monitored, evaluated, and updated. The EMA Director is ultimately responsible for the MHMP. As illustrated in Section 4.2 Mitigation Practices, this Plan contains mitigation program, projects, and policies from multiple departments within each community. Depending on grant opportunities and fiscal resources, mitigation practices may be implemented independently, by individual communities, or through local partnerships. Therefore, the successful implementation of this MHMP will require the participation and cooperation of the entire Committee to successfully monitor, evaluate, and update the Porter County MHMP.

The EMA Director will reconvene the MHMP Committee on an annual basis and follow a significant hazard incident to determine whether:

- the nature, magnitude, and/or type of risk have changed
- the current resources are appropriate for implementation
- there are implementation problems, such as technical, political, legal, or coordination issues with other agencies
- the outcomes have occurred as expected
- the agencies and other partners participated as originally proposed

During the annual meetings the Implementation Checklist provided in **Appendix 10** will be helpful to track any progress, successes, and problems experienced.

The data used to prepare this MHMP was based on “best available data” or data that was readily available during the development of this Plan. Because of this, there are limitations to the data. As more accurate data becomes available, updates should be made to the list of critical infrastructures, the risk assessment and vulnerability analysis.

DMA 2000 requires local jurisdictions to update and resubmit their MHMP within five years (from the date of FEMA approval) to continue to be eligible for mitigation project grant funding. In early 2024, the EMA Director will once again reconvene the MHMP Committee for a series of meetings designed to replicate the original planning process. Information gathered following individual hazard incidents and annual meetings will be utilized along with updated vulnerability assessments to



assess the risks associated with each hazard common in Porter County. These hazards, and associated mitigation goals and practices will be prioritized and detailed as in Section 3.0 this MHMP. Sections 4.0 and 5.0 will be updated to reflect any practices implemented within the interim as well as any additional practices discussed by the Committee during the update process.

Prior to submission of the updated MHMP, a public meeting will be held to present the information to residents of Porter County and to provide them an opportunity for review and comment of the draft MHMP. A media release will be issued providing information related to the update, the planning process, and details of the public meeting.

## 6.2 INCORPORATION INTO EXISTING PLANNING MECHANISMS

### **REQUIREMENT §201.6(c)(4)(ii):**

*[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as the comprehensive or capital improvements, when appropriate.*

Many of the mitigation practices identified as part of this planning process are ongoing with some enhancement needed. Where needed, modifications will be proposed to be made to each communities' planning documents and ordinances during the regularly scheduled update. Among other things, local planning documents and ordinances may include comprehensive plans, floodplain management plans, zoning ordinances, building codes, site development regulations, or permits. Modifications include discussions related to hazardous material facility buffers, floodplain areas, and discouraging development of new critical infrastructure in known hazard areas.

Based on added language within each of the Comprehensive Plan updates the appropriate Zoning Ordinances and Floodplain Management Ordinances within each community would also need to be amended.

## 6.3 CONTINUED PUBLIC INVOLVEMENT

### **REQUIREMENT §201.6(c)(4)(iii):**

*[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.*

Continued public involvement is critical to the successful implementation of the Porter County MHMP. Comments gathered from the public on the MHMP will be received by the EMA Director and forwarded to the MHMP Committee for discussion. Education efforts for hazard mitigation will be the focus of the annual Severe Weather Awareness Week as well as incorporated into existing stormwater planning, land use planning, and special projects/studies efforts. Once adopted, a

copy of this Plan will be available for the public to review in the EMA Office and the Porter County website.

Updates or modifications to the Porter County MHMP will require a public notice and/or meeting prior to submitting revisions to the individual jurisdictions for approval.



The CRS program credits NFIP communities a maximum of 37 points for adopting the Plan; establishing a procedure for implementation, review, and updating the Plan; and submitting an annual evaluation report.



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## CHAPTER 7

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